

*In the Interest of Truth:*

The Life and Science  
of Surgeon General  
George Miller Sternberg

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*For*  
*My wife, Carolyn and*  
*friends, mentors, and colleagues,*  
*Robert J. T. Joy and Dale C. Smith*



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# Foreword

I am delighted that Dr. Stephen Craig authored this biography of George Miller Sternberg and chose to culminate his labors by permitting the Borden Institute of the Office of The Army Surgeon General to publish this exhaustive work. The words and deeds of George Miller Sternberg are a powerful historical example of Army Medical Department (AMEDD) strategic leadership and provide an exceptional study for contemporary and future military medical leaders.

As an Army War College student seeking lessons on strategic leadership from among the pantheon of past senior military and civilian scientists, clinicians, and educators, Robert Joy, then Chairman of Medical History at the Uniformed Services University of the Health Sciences (USUHS), guided me to Sternberg. I was not disappointed by what I learned of this remarkable man and his work. Even stripped of the myth and hagiography that characterizes much of what is written about Sternberg and his feats, one is left with an appreciation for his accomplishments during a period of both conventional (American Civil and Spanish-American) and irregular (Indian) warfare, coupled with astonishing advances in science and medicine. A century before human immunodeficiency virus (HIV) disease, pandemic influenza, and emerging infectious diseases spurred by globalization, Sternberg emerged as a national leader in the budding field of bacteriology. He did this while balancing the routine duties of frontier postings and the care of a lean and dispersed Army in the late nineteenth century.

Upon graduating from the War College, I was privileged to serve with then-Colonel Craig and excited to learn of his extended scholarly study of this pivotal leader in Army Medicine. Steve worked tirelessly for almost a decade to find primary sources to definitively examine the life and career of George Miller Sternberg. He probed and dissected the amazing relationship between Sternberg and one of the most iconic figures in Army Medicine and international health: Major Walter Reed.

Serving as The Army Surgeon General during the Spanish-American War, Sternberg faced scandal, censure, and overwhelming challenges in the protection of

soldiers in a rapidly mobilizing nation with a poorly organized logistics system and a rudimentary notion of preventive medicine. In the face of adversity, Sternberg's keen vision and futuristic focus led him to send the Yellow Fever Commission under Reed to Cuba to resolve the question of the transmission of yellow fever. His leadership ultimately led to control of a disease that not only killed millions of people throughout the western hemisphere and Africa for the previous three centuries but also crippled economies and hampered progress on many fronts. Lessons learned from his leadership—together with parallel work in malaria transmission garnered from the work of Sir Ronald Ross in India and applied to the Isthmus of Panama by William Gorgas—ultimately opened the world to the United States. It changed the course of history.

Today's practitioners of military medicine face devastating blast injuries, traumatic brain injuries, and deadly diseases such as HIV and pandemic influenza—all formidable issues—but Sternberg and colleagues tackled problems that decimated civilian and military populations and crippled the economies of entire countries. Dr. Craig's brilliant text documents Sternberg's heroic efforts to promote health and will be an important resource for future generations of leaders.

Lieutenant General Eric B. Schoomaker, M.D., Ph.D.  
The Surgeon General and Commanding General  
United States Army Medical Command



# Preface

## THE QUEST FOR GEORGE MILLER STERNBERG

The inspiration for this book has two sources. The first is the old Walter Reed Army Institute of Research (WRAIR). Although bearing Reed's name, it truly is George Sternberg's legacy to Army medicine. The Army Medical School—the first school of public health in the nation—that Sternberg created resided at a number of locations in Washington before moving into building 40 on the Walter Reed campus in 1923. What would become the WRAIR in 1955 required additions and name changes over the years to keep pace with its evolving educational and research functions. For 75 years, building 40 was the home of state-of-the-art military medical research, where military and civilian scientists worked shoulder to shoulder. The names of these men—Vedder, Strong, Craig, Buescher, Hilleman, Artenstein—still echo through the cavernous main hall of the building, their ghosts move silently through the warren of passages and offices on the upper floors, and for many years Brigadier General George Miller Sternberg observed—with an intense steady gaze from his perch above the main entrance—all who entered.

As a resident in preventive medicine working on the second floor, I passed him every morning and began to hear of his accomplishments in my studies. He appeared to be a veritable godfather to military preventive medicine, but literature searches turned up only two biographies, one by Mrs. Sternberg and the other by John M. Gibson, and a few papers, the majority of which recapitulated the same tales rather superficially. The search for Mrs. Sternberg's biography, my second inspiration, began and ended during a Saturday excursion through used bookstores in Georgetown. On the gilt-edged pages of her book from 1920, she inscribed the many accomplishments of a husband, whom she loved and respected, and the memories of a 50-year marriage. But her love, respect, and Victorian upbringing led her to produce a eulogy that described a hero in marble that she had known in the flesh, and only hinted at the depth and breadth of his character and his life. Undoubtedly,

he had desires and passions as well as disappointments to accompany the many and varied achievements of his long and productive life. Each of Mrs. Sternberg's vignettes left me unsatisfied as to who George Sternberg really was, and so the quest for George Miller Sternberg, the man, began.

Finding primary and very useful secondary source material relating to my subject was not difficult—just time-consuming—in that there was so much of it to read and digest. At the time of his death in 1915, Sternberg was a nationally and internationally known and respected soldier, physician, scientist, author, administrator, humanitarian, medical community leader, and civic activist, who was—with the exception of the military—still active in all of these venues. From his reports as an Assistant Surgeon during the Civil War to his last article published posthumously in 1916, he contributed voluminously to the medical and lay press. Written in an era when editorial censorship of content was less stringent, many of these articles contain references to Sternberg's professional and personal feelings as well as collaborators in his research, dates, and places, and therefore were extremely valuable in fleshing out a number of the details of his career. John M. Gibson's book, *Soldier in White* from 1958, is largely a recapitulation of Mrs. Sternberg's biography. However, it is unique, and was valuable in my quest, for two reasons. First, Gibson gave a detailed bibliography of Sternberg's publications, although he did not use many of them in preparing his book. Second, Gibson gained access to a number of letters between General and Mrs. Sternberg. This personal correspondence provided insights into their marriage, some of the more trying episodes in their life, as well as some of Sternberg's elations and frustrations concerning his early work on yellow fever in Cuba. Although these letters have apparently disappeared, I did obtain a copy of a short autobiography written by Sternberg's father, the Reverend Levi Sternberg, and a Sternberg family genealogy through the kindness of Mr. Albert Martin of Decatur, Alabama. Regrettably, Sternberg wrote little about himself, composing only two small autobiographical sketches for the army when he was a junior officer. These and other personal and professional—both medical and military—papers reside in the National Archives and the National Library of Medicine. Out of this not insignificant body of material an image began to emerge. Unshackled from the historical straitjacket of a single, set piece of accomplishments and failures, the image came into sharper focus as a man of humble yet uncommon origins; a man of intelligence, self-discipline, character, and courage; a kind and generous man with human flaws; and a physician, scientist, and soldier whose life was much more remarkable, more compelling, than his earlier biographers suggested.

The son of well-educated Lutheran evangelicals of limited means, Sternberg earned a medical degree from the College of Physicians and Surgeons of New York in 1860, but failed to establish a medical practice on Long Island and took refuge in the Army Medical Department as shells fell on Fort Sumter. By the time Grant and Lee met at Appomattox Court House, he had established a reputation as a competent field surgeon and intrepid soldier. He moved west with the postwar army. At Forts Harker and Riley on the Kansas Plains, Sternberg struggled with cholera, Indian campaigns, and

the monotony of routine sick call and administrative duties. In the large amount of unstructured time left over, Sternberg found an opportunity to satisfy his voracious appetite for scientific literature and inquisitive, experimental nature. Of particular interest was Joseph Lister's work (1867) on the antiseptic treatment of fractures and abscesses, a technique based on Pasteur's nascent airborne germ theory and the germicidal action of carbolic acid dressings. In the laboratory he fashioned in his quarters, Sternberg obtained a microscope and taught himself the fundamentals of microscopy, photomicrography, and the new science that would become bacteriology. He recognized that if Pasteur and Lister were correct then other disease germs and poisons might be found under the microscope and prohibited by disinfection.

Sternberg's desire to pursue experimental medical research as a full-time duty assignment was frustrated by an Army Medical Department with too few physicians and too many posts to support. Over the next 20 years, Sternberg served at army posts from one end of the country to the other. With the exception of the Nez Perce War, in which he revalidated his field medical skills and won a brevet promotion to Lieutenant Colonel for gallantry at the Clearwater Battle, Sternberg pursued medical science relentlessly with a scientific conservatism and always "in the interest of truth."<sup>1</sup> His seminal work in the evaluation of commercial disinfectants; investigations into the etiology, treatment, and immunization techniques of yellow fever, and a variety of other bacterial and parasitic organisms; and his many valuable contributions to the professional literature made him an internationally respected bacteriologist and public health expert. He created and taught some of the first lectures in bacteriology at Johns Hopkins University, became the Director of the Hoagland Laboratory—one of the first bacteriological research laboratories in the country—in Brooklyn, New York, and published the first American textbooks on bacteriology.

In late May 1893, Sternberg's selection as Surgeon General over 10 senior officers was not only an acknowledgment of his outstanding military service but also a sign of the times. The intellectual atmosphere among the captains of industry, politics, medicine, and the military who advocated Sternberg's selection recognized him as the personification of the new medical science and professionalism of the emerging Progressive Era. Sternberg did not disappoint his supporters. In just a little over three weeks from the time he took office, the Army postgraduate medical school was established in the Army Medical Museum and Library in Washington. During his nine-year tenure as Surgeon General, the school became the cornerstone of a larger professionalization and modernization program for the Medical Department. The laboratory mission was expanded, a hospital construction and renovation program was begun, the modern combat medic was created, and a Nurse and Dental Corps were established.

Upon retirement from the Army in 1902, Sternberg continued to be active in medicine—particularly public health education and reform—in Washington, DC. Public health reform with its emphasis on sanitation—air, water, and milk free of contaminating germs, and clean city streets—was a natural ally of the social reform

movement of the era, particularly in the realm of tenement/slum eradication and urban planning. Sternberg brought his organizational, educational, and medical expertise to bear in a number of areas: teaching at George Washington University, working with the National Tuberculosis Association, directing local anti-tuberculosis activities in the nation's capitol, and struggling to eradicate Washington's alley slums.

This book is the story of a remarkable man who strode across a broad stage in both the military and medical professions during an era of tremendous scientific, technological, and social change. His contributions to both professions were significant, enduring, and all in the interest of truth.

I am indebted to a large number of individuals for their assistance in the production of this book. Special thanks go to Robert J. T. Joy, Colonel, Medical Corps, USA (Ret.), Professor Emeritus, and Dale C. Smith, Ph.D., Professor and Chair, Medical History, Uniformed Services University. We spent many profitable and enjoyable hours discussing 19th and early 20th century military medicine and medical history. Their enthusiasm for the project, encouragement, and mentoring as I proceeded, as well as the critical review of the manuscript, were invaluable.

I would like to thank Mr. Lambert A. Martin of Decatur, Alabama, for an autobiographical sketch of the Reverend Levi Sternberg and Sternberg genealogical data. My sincere thanks also go to Alan Kraut, Ph.D., Professor of History, American University, for his guidance in creating an informational prospectus for publishers, and to historians Robert M. Utley and Katherine Rogers for their assistance with Sternberg's life in Kansas.

Many archivists and librarians were tremendously helpful in my research. First, I would like to thank Stephen Greenberg and his staff at the National Library of Medicine for their patience and assistance. Mike Rhode, Otis Archives, National Medical Museum, and a variety of staff members at the National Archives, Library of Congress, and at the Military History Institute, Carlisle Barracks, Pennsylvania, also provided hours of invaluable assistance. I am grateful to Shelly Wallace, now retired, at Hartwick College, Oneonta, New York, for her fruitful research in the Hartwick Seminary Archives, and to Linda Lohr, Health Sciences Library, University of Buffalo School of Medicine; Stephen Novak, Augustus C. Long Health Sciences Library, Columbia Presbyterian Medical Center; and Lorinda Klein, New York University Medical Center, for their help in understanding Sternberg's medical education. I must also thank Andrew Harrison, Alan M. Chesney Archives, Johns Hopkins University; George A. Miles, Beinecke Library, Yale University; Patricia Copeland, Tulane University Medical School; G. David Anderson and staff, Gelman Library, George Washington University; Jean Larson, Georgetown University Medical School; Beth Bensman, Jefferson Medical College; William R. Erwin, Special Collections Library, Duke University; Marilyn Pethe, University of Tampa; Wendy Jakobs and Andrea Ecklund, University of Maryland; Judith Salm, Forsyth Library, Fort Hays State University; Janet Bloom, William L. Clements Archives, University of Michigan, Ann Arbor; W. S. Hoole Special Collections Library, University of Alabama, Tuscaloosa; Karla Pearce at the American Public Health Association,

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Last, but certainly not least, I want to express my appreciation to the state and county historical and genealogical societies that facilitated my work: Wayne Wright and Susan Friedlander, New York State Historical Society, Cooperstown, New York; Joy Whirling, Washington State Historical Society, Tacoma, Washington; the staff at the Idaho State Historical Society, Boise, Idaho; Wallace Van Houten and Martha Foland, Schoharie County Historical Association, Middleburgh, New York; Donna Bettenbrock, Ellsworth County Historical Society, Ellsworth, Kansas; and staff members at the Erie County Historical Society, Buffalo, New York; Fort Vancouver Historical Society of Clark County, Vancouver, Washington; Clearwater County Historical Society, Orofino, Idaho; Lewis County Historical Society, Kamiah, Idaho; Luna House Historical Society, Lewiston, Idaho; the Pensacola Historical Society, Pensacola, Florida; Montgomery County, Maryland historian David Newman; and Kathryn Lehman, Clerk, Washington Grove Town Hall, Montgomery County, Maryland.

<sup>1</sup>GMS, Letter to the Editor, *New Orleans Medical & Surgical Journal* 8 (November 1880):484, and Letter to the Editor, *Medical News* 41 (1882):332.



## *Chapter One*

# Palatines, Pietists, and Medicine

**O**n June 8, 1838, a small house three-quarters of a mile south of the Hartwick Lutheran Seminary in Otsego County, New York, reverberated with the wailing of a newborn infant. It was the home of Reverend Levi Sternberg. His wife, Margaret, with the assistance of her mother and sisters, had delivered a healthy boy whom they christened George Miller in honor of his maternal grandfather. George Miller Sternberg was born and raised in a stable, well-ordered society directed by academic endeavors and the church bell. His early education, both religious and secular, prepared him to enter the evangelical Lutheran ministry, but his passion for science led him to medicine, and two failed civilian practices led him into the Army Medical Department in the spring of 1861. It was an inauspicious beginning for a man who would become an internationally recognized bacteriologist, medical researcher, sanitarian, social reformer, and author; a combat-proven medical officer respected by his peers and line officers alike; and the Army Surgeon General. Sternberg's contributions to medical science and military medicine made a profound impact not only during his lifetime, but they also established a valuable legacy for the Army Medical Department of the 20th century.

Sternberg's ancestors were German Palatines who came to the New World in 1709 searching for peace and economic stability not to be found in Europe. They settled in the Schoharie Valley in upstate New York, raised large families, and became valued members of the Otsego County community and the Lutheran Church. Sternberg's father was named Levi, for the Hebrew tribe charged with the service of the sanctuary, by his mother and she consecrated him at his baptism to the work of the Lord.<sup>1</sup>

That work began for 14-year-old Levi in the spring of 1828 when he moved into the George B. Miller home at Hartwick Seminary just south of Cooperstown, New York. Reverend Miller, an assistant professor at the seminary, would become principal of the Classical and Theological Schools in 1830. Through Miller's mentorship and guidance, Levi developed academically and spiritually. He graduated

from Union College in Schenectady in 1835 and returned to Hartwick in the fall of that year to resume theological studies under Miller. In early 1837, Levi looked forward to becoming a licensed minister, and, with a secure position and salary at the seminary as assistant professor, he had purchased a small cottage three-quarters of a mile south of the seminary. He was now in a strong position to press his matrimonial ambitions with Miller's eldest daughter. Margaret Levering Miller was 19; well educated; read German, French, Italian, and Spanish; and was an accomplished organist. Levi had known her since she was 10-years-old, and he had watched her mature into a charming, talented woman of extraordinary character. On September 7, 1837, Reverend Miller joined the couple in marriage. Nine months later, on June 8, 1838, Levi's ordination by the Hartwick Synod was eclipsed by the birth of his first son.<sup>2</sup>

George Miller Sternberg was born into a society based on peace, charity, and Christian brotherhood, and tempered with patience and moderation. This small, utopian world in which he resided was a tranquil island, created largely by the Moravian-influenced Lutheran religious philosophy of Ernest Hazelius and grandfather Miller that floated in a sea of Lutheran Pietist radicalism. This radicalism grew from dissatisfaction with the New York Lutheran Synod concerning essential church doctrine and its implementation. For almost a generation, fervent Pietist congregations of upstate New York had watched the New York Synod slip into an acceptance of rationalist thought while simultaneously rejecting the "New Measures" of revivalism, extended prayer meetings, public conversion, and moral reform. This was anathema to the Lutheran Pietists, particularly those in Schoharie and Montgomery counties, where a millennialist philosophy was fervently embraced, and Hartwick became caught up in the religious turmoil.<sup>3</sup>

Fortunately for Levi and Margaret, the Hartwick Synod had a vacant pastoral position in Danville, New York. In the fall of 1839, Levi took charge of the Lutheran churches in these communities. Levi was a powerful and successful evangelist with a strong desire to bring people into the bonds of Christ. While Levi's position in the community and the synod grew, so did the Sternberg family. Theodore was born September 15, 1840, followed by John Frederick on March 12, 1843, and Rosina on March 8, 1845.<sup>4</sup> By the time Rosina was born, her father had developed a chronic hoarseness and sore throat, commonly known as "minister's sore throat," after a severe cold in the winter of 1844–1845.<sup>5</sup> Although the cold did not help, Levi's condition—more correctly termed granular pharyngitis—resulted from his extended and forceful dissertations from the pulpit. Pronounced incurable by physicians, his condition compelled him to resign his position in Danville in favor of recruiting duties. Over the next few months, Levi traveled through Pennsylvania and Maryland, visited the Gettysburg Seminary, and received an education in church politics while his throat healed. He also thought a great deal about his future in the church and where he could perform valuable service now that his throat would no longer allow him to preach to large congregations. Levi focused on the city of Buffalo, with its increasing



German population and only one German Lutheran Church of the New York Synod, in the summer of 1845, and the hope of establishing an English-speaking Lutheran congregation among Buffalo's German population.<sup>6</sup>

Formal education for seven-year-old George began in the fall of 1845 in Buffalo's English-speaking public schools. The three years he spent in Buffalo left happy memories, but in mid-1848 Grandmother Miller took him back to Hartwick. This was no small change for a boy of 10 years; however, George did not give it much attention in a biographical sketch written years later. Apparently, Mrs. Miller thought his health was suffering in the harsh Buffalo climate. This may have been true, but the Sternbergs had been thriving in the long, hard winters of upstate New York for generations. A more plausible explanation for George's return to the academy was for the educational opportunities it offered under the guidance of Grandfather Miller. The fact that Theodore joined his older brother at Hartwick the following year adds credence to this theory. Although George could not appreciate it at the time, he was more fortunate than most of his peers in that his parents and maternal grandparents were extremely well educated. They placed a high premium upon secular and religious education and—apparently—would not deny these to their children merely because it demanded family separation. But for 10-year-old George, who was particularly attached to his mother, it was the separation that loomed large as he said farewell to parents and siblings.<sup>7</sup>

George's new home was the principal's house at the seminary. It was a large, two-story, T-shaped structure, and, in the words of Alfred Hiller who later married George's Aunt Henrietta, "a model Christian home with its air of unselfish love and devotion and intellectual culture."<sup>8</sup> If George thought his home in Buffalo was crowded since the birth of his sister Emily in February, he would find his grandparent's home even more so. In addition to his grandparents; his aunts Charlotte, Susan, Anna, Henrietta, and Mary; Uncle Henry Miller; and half-a-dozen or more Hartwick students were boarded there at any given moment. Despite being crowded, the Miller home was most assuredly endowed with love, devotion, and culture.<sup>9</sup>

At 53, George Miller was wiser and more patient than when he first came to the seminary, but he continued to exhibit the same unbounded energy and enthusiasm for intellectual and religious pursuits that he had shown a dozen years before. The ebullience that emanated from his diminutive frame was complemented by mental faculties that were simultaneously perceptive and intuitive, comprehensive, and perpetually active. He taught, tutored, and conducted recitations for the greater part of each day and then tutored those who boarded with him in the evenings. Afterwards, he attended to his own educational and spiritual needs into the early morning hours. He preached on Sunday mornings and led prayer meetings on Sunday evenings. Miller never lacked for companions during work or leisure time and endeavored never to squander a minute. Should a free moment present itself, such as between classes, he would read whatever he could find. Even during his daily walks across the neighboring hills or while tending to his garden, he instructed and mentored those who always gathered around him. This man, for the next two years, was teacher, minister, disciplinarian, and loving father to his oldest grandson, and he would

continue to heavily influence the boy's daily life and education for another seven years. By nature and nurture, Miller contributed—significantly and positively—to George Sternberg's intellectual, religious, and personal development.<sup>10</sup>

Life in the Miller home was undoubtedly structured. If it were not, its very size and daily obligations would cause it to grind to a halt. Young George rose early, performed ablutions, recited prayers, ate breakfast, and had lessons with his grandfather before the sun had climbed very high. Although reading, writing, and arithmetic were enjoyable, and church history had to be learned, the study of Latin and German were a bane to him. George admitted he “detested languages,” an attitude he only overcame later in life with the help of his second wife, Martha.<sup>11</sup> The frustration this must have caused his grandfather—who was proficient in the ancient and modern languages—and his multilingual parents can only be imagined. George's education, however, was not derived solely from the classroom. Grandfather Miller was a wellspring of knowledge and experience that encompassed gardening, fishing, sailing, swimming, and various interesting activities to a young boy. With his neighborhood friends, George played among and explored the beautiful, wooded hills and valleys of Otsego County, where he developed a profound appreciation for nature and natural history.<sup>12</sup>

Although it is difficult to accurately follow George's adolescent development, it is fair to conclude that delicate family issues began to occupy his mind and complicate his life by 1851. The Buffalo mission had collapsed through lack of funding in 1849. Levi and Margaret accepted the first vacant pastoral position they could find in Middleburgh, New York. Three more children had been added to the family: Emily, on February 29, 1848; and twin boys, Charles Hazelius and Edward Endress, on June 15, 1850. At the same time, growing discontent emerged among the seminary trustees in regard to Miller's administration of the academy, and they called Levi to replace his father-in-law as principal. Although Miller encouraged Levi to accept the offer and the Sternbergs were happy to return to Hartwick, Levi was acutely aware of Miller's hurt feelings and very sensitive to the fact that the father would now be working for the son. Levi gave him control of the Theological School, and he and Margaret let the Millers remain in the principal's house.<sup>13</sup> What impact these events had on George is unknown, but he admits to being “restless” at 13.<sup>14</sup> Whether this represents difficulties adjusting to changes at home, at school, or an acceptable adolescent wanderlust is unclear, but a change of venue was apparently an appropriate treatment. In any event, Levi found a job for George at Elihu Phinney's Bookstore in Cooperstown.<sup>15</sup>

Cooperstown lies five miles north of Hartwick Seminary. It was a prosperous village in 1851 as businesses grew with the population. A telegraph linked Cooperstown with Fort Plain in November of that year, and soon after the first steam power press was installed for the local newspaper, *The Freeman's Journal*. The novels of James Fenimore Cooper, the town founder's son, had glorified the beauty of the area and captured the imagination of every schoolboy with adventures of its history. Cooper's works and almost any other book one could want had been sold in the establishment of Elihu and Henry Phinney since 1820. George

lived with his employer for a year, and this gave him plenty of leisure time to investigate the community at large. One of his greatest pleasures was reading the fictional works of Cooper or any other writer he could find.<sup>16</sup> Accordingly, George spent an inordinate amount of time lost in these adventures, the more perilous of which were his favorites.<sup>17</sup> His mother worried about how her son spent his free time. Although American society still considered an overindulgence in fictional literature a waste for a young and impressionable mind, greater vices and dangers existed in Cooperstown for an adolescent with too much unstructured time and the freedom to decide how to use it. George was 14, and his mother thought that he should return to his studies. Margaret asked him to come home, and George—never rebellious with his mother—returned to the seminary.<sup>18</sup>

George attended the academy in the summer of 1852 with his Uncle Henry Miller, aunts Henrietta and Mary Miller, younger brothers Theodore and Frederick, and cousins Charlotte and Mary Bray. Admitting women to the Classical School had been Reverend Hazelius' idea some 34 years earlier, but had not been acted on until October 1851 when Levi hired his sister-in-law, Charlotte Miller, as an assistant teacher and admitted 27 female students.<sup>19</sup> Levi instituted the "Science of Common School Teaching" that prepared students to instruct at district public schools, and he also expanded the science curriculum. The elder Sternberg's attitude toward science was a reflection of the new era of American science in which he was educated. American interest in the study of science beyond its practical usefulness began after 1815 and was largely in the purview of physicians. However, in a young, expanding nation with few resources and little leisure time for such endeavors, the new scientists had to demonstrate some practicality of science for society in general. Although this popular acceptance was achieved by declaring that the study of natural history and natural philosophy—the study of God's works—was enlightening from a moral and religious standpoint, the proposition cast scientists in the role of moral teachers, and thus placed them in competition with the clergy. As natural laws and phenomena were recognized, described, and defined by scientists, theologians feared that God would soon be calculated out of the life equation. The potential conflict created by this situation was averted as clergymen were encouraged to pursue the study of science, and scientists used their discoveries to illustrate the power, plans, and moral governance of God. As a theologian and academician, nothing pleased Levi more than to demonstrate the interrelationship of science and religion at his institution. To his current science curriculum of chemistry, physiology, astronomy, botany, and geology, he added lectures on electricity, hydrostatics, navigation, optics, and some civil engineering.<sup>20</sup>

George found his classes interesting and rewarding, particularly those in the natural sciences—chemistry, geology, botany, astronomy, and physiology—and mathematics. Under the tutelage of his father and grandfather, George's inclination toward and aptitude for scientific study were cultivated; the foundation for his future endeavors was firmly established.<sup>21</sup> As George matured academically, he also matured spiritually. In a letter to daughter Henrietta on December 27, 1853, George Miller noted that George had communed with the church for the first time

on Christmas Day. Miller also stated that, "George had been in town in Mr. Phinney's bookstore, and Margaret was anxious he should attend the meetings."<sup>22</sup> Obviously, the bookstore or something else in Cooperstown had a great attraction for the 15-year-old. Margaret's anxiety may have sprung from a fear that her son's religious awakening was being delayed by secular interests and that exposure to more revival meetings was needed to induce the required public conversion. If so, her worries were unfounded. George gladly attended the meeting. As Grandfather Miller told Henrietta, "...it was not long before he [young George] expressed a hope."<sup>23</sup>

George completed Hartwick's three-year classical curriculum in 1854. What he wanted to do with his life at this age is not altogether clear. Although he stated, "...I might have continued to attend school at Hartwick & live under the paternal roof..." this is the only definite reference found that George ever contemplated entering the ministry.<sup>24</sup> He felt obligated to get a job to assist in supporting the continually growing Sternberg clan. Margaret had given birth to William Augustus on March 14, 1853, for a total of eight children ranging in ages from 1 to 16. As George later recalled, "My father's small income & large family kept him poor & in debt. He confided in me... & I began to feel that I ought to do something for myself...I accordingly, at 16 years of age, took off my 'round about,' & put on a coat with tails and started out to find a school for the winter."<sup>25</sup> The school he found was "in an out-of-the-way place in the hills some ten or twelve miles from home."<sup>26</sup> It was undoubtedly one of the numerous common schools that provided rural children with the rudiments of reading, writing, and arithmetic in a highly disciplined environment. Although these basics satisfied parents of the era, the academic and moral qualities of the teachers were often highly questionable. Educational reformers in the state of New York attempted to establish standards for teachers and schools at this time. In George, even with his inexperience, they found an academic gem with character for \$10 per month plus board. George stated he "went home every Saturday, but the separation from my mother for a whole week was a great trial."<sup>27</sup>

The separation anxiety George endured had dissipated enough by the following winter, 1855–1856, for him to secure a teaching position—through the influence of friends—in New Jersey at \$20 per month. No Sternberg references state who these friends were or in which school George taught. Most likely they were acquaintances of his grandfather's or Ernest Hazelius, and he may have taught at the New Germantown academy established by Hazelius. George was capable and competent both in the classroom and as an administrator. He received praise from his supervisors and a raise in salary to \$100 per quarter. Regrettably for the school board, his sojourn in New Jersey was short-lived. George returned to Hartwick after his teaching obligations were fulfilled following his second term in the summer of 1856.<sup>28</sup>

George stated that he "saved money and returned to Hartwick to continue my studies & to teach in the Seminary."<sup>29</sup> He was hired at a salary of \$210 per year, almost a 50 percent reduction in salary from his New Jersey position if George's memory was correct. His father allowed him to teach the subjects he

liked, which included mathematics, chemistry, and natural philosophy. What George had saved for and was preparing to study, however, was not theology.<sup>30</sup>

Sternberg stated, “At this time [summer 1856] I decided to study medicine and commenced the study of Anatomy and Physiology under the direction of an excellent preceptor – Dr. Horace Lathrop, A.M., M.D., of Cooperstown.”<sup>31</sup> An alumnus of Hartwick Seminary (1844) and Hamilton College (1846) in Clinton, New York, the 32-year-old Lathrop established his practice in Cooperstown after graduation from Jefferson Medical College in Philadelphia in 1852. Lathrop was soon recognized as an inspiring leader in the community in regard to academic and religious matters. George’s interest in medicine may have originated with Lathrop, as he worked and lived just down the street from the physician’s office in 1852, and Lathrop was probably a well-known customer at Phinney’s.<sup>32</sup>

Why George chose to pursue a medical career, how long he pondered the idea, or what thoughts and comments his parents offered on the subject have not been preserved. At mid-century, the medical profession offered few prospects of prestige or financial security. It was considered by many to be an inferior profession, a waste of an intelligent man’s talents. It was not a decision to be made expeditiously by a young man of his limited financial resources. Preceptor fees were at least \$100 per year, and medical college tuition for two terms ranged from \$200 to \$400. If George took advantage of available pre-term sessions and other extracurricular medical opportunities, total costs could have reached \$1,000. In addition to these expenditures, he would have to pay for books, room, and board.<sup>33</sup> But, George was adamant on the issue. Theology, as a profession, held no interest for him, and a minister’s position and salary were tentative at best. Although Levi could not provide his son financial support, an enigmatic maternal uncle, Grandon Bray, who resided in San Francisco, California, would not allow his nephew’s dreams to be so easily destroyed. He offered to pay for George’s entire medical education. It was an offer that was accepted as a loan and repaid in full.<sup>34</sup>

When George Sternberg decided to become a physician in the mid-1850s, American medical education and practice were experiencing a period of reform and transition in the midst of the still prevalent Jacksonian democratic ideology. Practicality was the benchmark by which all pursuits were measured. Knowledge that had no obvious utility to the man on the street—or required special education to understand—was regarded with suspicion, as were those who had acquired it. Professionalism—with its flavor of class privilege—was an affront to the egalitarian ethos of the masses and became the antithesis of this cultural philosophy. Great confidence was placed in the skills of apprentice-trained physicians, the products of the burgeoning country medical schools, and the increasing number of irregular practitioners. Standards for degrees and licensing became almost nonexistent, the definition of a qualified medical practitioner became obscure, and quackery proliferated.

Academic leaders in the medical profession attempted to reform the structure and content of medical education, but the old apprenticeship system, whereby a student was apprenticed to a physician–preceptor for two to three years, remained the primary path by which a young man became a physician. Originally, American

medical schools had supplemented apprentice training, but after 1840, by their sheer weight of numbers and not educational quality, they were beginning to replace the older system. The two methods of instruction developed an agreeable symbiosis by mid-century, in which preceptors taught their charges various subjects from the clinical perspective and then referred them to a medical school where the faculty provided the scientific basis for these subjects. In general, a formal medical education consisted of two four-month courses of lectures, evidence of a three-year apprenticeship, and a final private oral examination by the faculty. Some schools also required a graduation thesis. The curriculum covered three broad fields: (1) basic sciences consisting of anatomy, physiology, chemistry, botany, physics, mineralogy, and zoology; (2) theory and diagnosis of disease consisting of pathology and the theory of medicine; and (3) treatment of disease. However, the second four-month session was identical to the first; a graded curriculum of increasing difficulty was unknown. Hospitals and dispensaries were not routinely associated with medical schools and, therefore, clinical instruction beyond apprenticeship was relatively uncommon. Major deficiencies of the apprenticeship system were the questionable quality of instructors; low entrance requirements; absence of a standardized, systematic, and progressive course of instruction; and absence of hospital training. The American Medical Association recognized these flaws and worked to establish two six-month terms, three courses of study, a minimum of seven professors at each school, compulsory dissection, proof of apprenticeship, and attendance at a clinic or hospital as minimal graduation requirements.<sup>35</sup> This call for reform was met with lukewarm support or outright opposition at local, state, and federal levels. The medical profession at large defined a capable physician as a man of experience with a large practical knowledge base, sound judgment, and high moral character who interacted regularly with his patients. It was not imperative that the physician's knowledge of basic sciences was comprehensive, but rather that he was able to act decisively at the proper time. For many in the profession, the education and experience gained through an apprenticeship was considered sufficient for this purpose.

To gain greater clinical experience, postgraduate physicians who could afford it supplemented their medical education in Europe by the 1850s, particularly in France. Patient observation and examination were emphasized in France. The practical and theoretical aspects of science were dissociated as the hospital took center stage as the only worthwhile school for systematic clinical instruction in physical diagnosis, pathologic anatomy, and the early quantification of diseases. Americans relished the practical experience gained at the bedside, in the dissection room, and in many private courses offered in Paris. The egalitarian nature of French empiricism with its skepticism, disdain of basic sciences, and distrust of laboratory-based, investigational medicine appealed mightily to the disposition of antebellum America and influenced the philosophy of American medical education and practice until after the Civil War.

Many of the medical professors who taught Sternberg received postgraduate training in European cities or were trained by professors who had experienced

the French clinics. Upon returning to the United States, these physicians became part of the medical elite and influenced the profession in both the clinical and academic arenas. The profound effect of the French experience became manifest in their classrooms and, when combined with their own originality and ingenuity, profoundly affected Sternberg and his peers.

The majority of medical students of this era only had an elementary education. In the words of Charles Eliot, president of Harvard University, “an American physician or surgeon may be, and often is, a coarse and uncultivated person, devoid of intellectual interests outside of his calling, and quite unable to either speak or write his mother tongue with accuracy.”<sup>36</sup> Obtaining a sound classical education in the mid-19th century was difficult. Although preceptors commonly required an apprentice to have a basic proficiency in mathematics, English grammar, and natural history, and to be knowledgeable in Latin, these requirements were often waived. In this atmosphere, Sternberg was significantly more prepared and accomplished than most of his contemporaries. He had been raised in a home where higher education and social cultivation were valued. Early working and teaching experiences had developed his maturity, poise, and confidence beyond his 18 years. All of these attributes contributed to a high recommendation to Dr. Lathrop.

Sternberg began the first phase of his apprenticeship, called “reading medicine with the doctor,” at Horace Lathrop’s office on the corner of First and Chestnut Streets in the summer of 1856.<sup>37</sup> This didactic phase included not only anatomy and physiology, but also chemistry, botany, materia medica (pharmacy), and clinical medicine. Lathrop was highly qualified academically, as well as by character, age, and disposition, to responsibly discharge his duties as preceptor and mentor. His ability to teach and inspire students came from an inherent ability and the influence of his own mentors at Jefferson Medical College. Two of Lathrop’s instructors had been Doctors Robley Dunglison and John K. Mitchell. One of America’s earliest experimental physiologists and microscopists, Dunglison gained some renown by assisting with experiments, preparing material for microscopic observations, and performing chemical analyses of gastric juice provided by Army Surgeon William Beaumont during his studies on digestion in 1833.<sup>38</sup> Dunglison continually preached to his students that physiology “is the real foundation of medical knowledge.”<sup>39</sup> Mitchell was also an avid microscopist and used microscopic evidence to construct a theory of epidemic disease based on fungal origin. He wrote on many diverse subjects such as infectious disease, osmosis, and liquefaction, and told his students “to improve their minds by going beyond the boundaries of the dissecting room and didactic education.”<sup>40</sup> Dunglison and Mitchell believed that to be a good physician one must also be a good naturalist, an idea that found fertile ground in Sternberg’s mind. Both professors thought beyond the limits of the accepted medical training and practice, and clearly discerned the relationship of science to medicine. Through Lathrop, Sternberg received Dunglison’s and Mitchell’s knowledge, wisdom, and philosophy.

Sternberg read with his preceptor for nearly 24 months. The standard time period for an apprentice to complete this portion of his work was 18 to 20 months, but teaching duties at Hartwick may have precluded him from full-time study, and

required him to extend this instruction an extra four to six months. In the fall of 1858, he traveled to Buffalo, New York, for his first formal medical lectures.<sup>41</sup>

He reported to the dean, Dr. Thomas F. Rochester, as directed by the annual announcement, to secure “good board, with room, fuel, and lights” for \$3 per week.<sup>42</sup> Where these accommodations were located is unknown, but it may be presumed that they were near the medical school building that stood on the corner of Main and Virginia Streets. This large stone structure was “constructed with express reference to medical instruction, containing airy and spacious apartments for dissection, museum, etc; and is exclusively devoted to the medical department...”<sup>43</sup> Adjacent to the college was the Sisters of Charity Hospital that accommodated approximately 1,000 patients a year. A quarter of a mile away, on the corner of High and Goodrich Streets, stood the completed west wing of the new Buffalo Hospital with a 150-bed capacity. According to the annual announcement for 1856–1857, in these facilities particular attention was “paid to the subject of physical exploration; and opportunities will be afforded for becoming acquainted practically with the important physical signs of pulmonary and cardiac diseases...pointed out at the bedside by the professor of clinical medicine or the clinical assistant. Patients...at the college are examined and prescribed for before the class; and surgical operations are frequently performed in the college amphitheater.”<sup>44</sup> Also close was a lying-in hospital where the students were “instructed and practiced in foetal auscultation,... in the conduct of labors, both natural and artificial, and in all the minutiae pertaining to the care of the parturient female.”<sup>45</sup> The annual announcement went on to proudly proclaim, “it is believed that few institutions, if any, in the country, afford better facilities for the acquisition of practical knowledge in the departments of surgery, medicine, and midwifery.”<sup>46</sup>

The 12-year-old Medical Department of Buffalo University was proud of the school’s physical plant, faculty, and quality of education. Undeniably, it was a leader among American medical schools in establishing clinical sciences based on the French model. Doctor Sanford Hunt, a professor at the college and editor of the *Buffalo Medical Journal* from 1852 to 1858, declared the institution “offered the best in clinical advantages of any school in the United States,”<sup>47</sup> and the close proximity of the clinics ensured that “no student can urge the excuse of inconvenience for absenting himself from them...”<sup>48</sup> The journal also praised the Sisters of Charity Hospital for providing these advantages. The Medical Department had a stable faculty composed of 13 professors, in an era when many faculties were considered large with six to eight members. Extremely capable, experienced, and—at times—controversial, these practitioners had an eye for educational reform. Austin Flint, Sr., although no longer professor of pathology and clinical medicine when Sternberg began his classes, left an enduring legacy as an excellent physical diagnostician and champion of conservative medicine in his son, Austin Flint, Jr. Auscultation and percussion were routinely performed on patients in the medical clinics and taught to the students just as when Flint senior had been on the faculty. Frank H. Hamilton, professor of surgery, became nationally known for his general and orthopaedic surgical skills, pioneering work in plastic surgery and



surgical instrument inventions and modifications, and for being a medical educator and author. Hamilton published the first of his well-known fracture tables in 1849 that summarized fracture treatment, methods, and results. James P. White, chairman of obstetrics and diseases of women and children, received a liberal European postgraduate education in London, Paris, and Vienna. He brought various teaching techniques to western New York that included the use of manikins to instruct students in forceps-assisted deliveries. In 1850, he established the first clinical course in demonstrative midwifery at Buffalo in an era when many physicians graduated without observing a live birth.<sup>49</sup> Sternberg also had his first introduction to an outstanding physiologist, John C. Dalton, Jr. at Buffalo. More accurately, he was introduced to Dalton's teaching methods. Dalton resigned his position as professor of physiology and anatomical microscopy at Buffalo in 1854 to teach at the College of Physicians and Surgeons in New York City, but his brilliant lecture style continued in the classroom of Dr. Austin W. Nichols. Dalton had studied with the eminent French physician and pioneer physiologist, Claude Bernard, who emphasized the role of experimentation in medical science and the independence of physiological science. Dalton became the first American to devote himself entirely to experimental physiology. He established the first physiology laboratory in the country at the Buffalo school, and he was also the first to use vivisectional demonstrations and practical demonstrations with the microscope as classroom teaching techniques.<sup>50</sup>

Sternberg began the regular 16-week school term at the beginning of November with an introductory lecture from Theophilus Mack, professor of materia medica and therapeutics. He had attended preliminary lectures in anatomy, given by Benjamin H. Lemon, and those in clinical medicine and surgery, given by Doctors Austin Flint, Jr. and Frank H. Hamilton, in October. Passage of the Anatomical Bill in 1854 had helped alleviate the difficulty in obtaining cadaveric specimens. The college catalog noted the "supply of anatomic material is ample," and anatomical dissections continued throughout the regular term.<sup>51</sup> Students also had the option of receiving instruction in practical and analytical chemistry, physiology, and microscopy. Lectures, clinics, dissections, and individual study easily consumed the daylight hours of any given day to include Saturdays. Whether Sternberg availed himself of the optional classes is unknown; however, his serious, studious nature would lead one to believe that he did.<sup>52</sup>

In the spring of 1859, Sternberg returned to Cooperstown to complete his second phase of apprenticeship, known as "riding with the doctor." Equipped with a sound foundation in the basic sciences and experience in medical, surgical, and obstetrical clinics, Sternberg accompanied Lathrop on house calls and assisted him with surgeries. With his preceptor's encouragement, Sternberg set his sights on the College of Physicians and Surgeons in New York City for his second lecture term. His application was accepted, and by summer's end Sternberg was settled in New York City anticipating his second medical school term.<sup>53</sup>

The College of Physicians and Surgeons was located at 23rd Street and 4th Avenue. Situated near Bellevue Hospital and two blocks from the Demilt Dispensary, the

four-story, brick and brownstone building was only three years old when Sternberg ascended its stone steps that fronted on 23rd Street. The ground floor contained shops and the upper three floors were devoted to the college. A large lecture room, chemistry laboratory, and private offices occupied the second floor; an anatomical amphitheater that accommodated 300, an anatomical museum and patient waiting and examination rooms filled the second floor; and the third floor contained a 25-table dissecting room.<sup>54</sup>

As in Buffalo, Sternberg attended four weeks of preliminary lectures and then began the regular term of 18 weeks in late October. The longer term was an innovation of Alexander H. Stevens, president of the college from 1844 to 1857, which “resulted in increased efficiency and a material advance in the standard of professional education.”<sup>55</sup> Also under Stevens’ stewardship three clinics—in surgery, medicine, and obstetrics—were held weekly throughout the academic year rather than just during the regular term. By the time of Sternberg’s matriculation, the number of clinics each week had increased to four: surgical clinics on Mondays and Wednesdays; a medical clinic on Thursdays; and a clinic for females on Friday afternoons, which were conducted at the college, the Demilt, Northern, and New York dispensaries, and at Bellevue Hospital. In addition, clinics were also held at the eye and ear infirmary, and many physicians offered instruction at private dispensaries. However, student attendance at the clinics was not mandatory, and no practical examinations were conducted to test their clinical skills.<sup>56</sup>

The college faculty of 16 included three professors emeritus: Alexander H. Stevens, Edward Delafield, and John Torrey; seven professors: Joseph M. Smith, Robert Watts, Willard Parker, Chandler R. Gilman, Alonzo Clark, John C. Dalton, Jr., and Samuel St. John; and six adjunct lecturers and assistants. Although it is true that they presented essentially the same material, Sternberg heard more of it during the longer term, encountered more clinical cases, and benefited from the personal experiences, techniques, and philosophies of another accomplished group of physicians. Willard Parker, professor of surgery, made an enduring impact on Sternberg. Physically robust, enthusiastic, and energetic, Parker was the epitome of the competent diagnostician and surgeon. He inspired confidence in his students and patients alike. Whereas he trusted the healing powers of nature, he was also a pioneer in the performance of several surgical procedures, and Parker never let his students forget the value of disease prevention over the limited methods for cure available to practitioners. Doctors William L. Detmold and Henry B. Sands provided able assistance during surgical lectures and in clinic. Detmold, previously a surgeon in the Royal Hanoverian Guards, was an entertaining teacher who taught general and orthopaedic surgery and is given credit for introducing orthopaedics as a surgical specialty in the United States in 1841. Detmold also established the first public clinic for crippled children in New York. His military experience flavored his lectures and proved valuable to many of his students in the near future. Alonzo Clark, professor of practical medicine, was not only an able classroom instructor, but also a competent clinician and author who verified the principles of percussion through postmortem observations and wrote about the

management of typhoid and cholera. The highly conservative Chandler Gilman, professor of obstetrics, captivated his students with his lively style and humorous delivery in the lecture room and obstetrical clinic. The professor whose influence embraced both the Medical Department at Buffalo and the College of Physicians and Surgeons in New York City was John C. Dalton. Sternberg was familiar with Dalton's classroom techniques, but was now able to see them practiced by the master firsthand. These are the men who honed and polished the knowledge that Sternberg had acquired over the past three years.<sup>57</sup>

No sources survive to indicate the quality of work that Sternberg performed, his class ranking, or what impression he made on his instructors. He sat for, and passed, the required graduation examinations in early March 1860. A graduation thesis on some aspect of medical science was also required. Sternberg wrote a paper on cynanche trachealis, or what physicians today would diagnose as croup, which was accepted. With these last academic hurdles successfully negotiated, Sternberg anxiously awaited graduation. He received his medical degree with 50 other classmates in late March 1860.<sup>58</sup>

By sending Sternberg to lectures first at the Medical Department at Buffalo University and then to the College of Physicians and Surgeons, Lathrop conformed to a common late antebellum educational practice among preceptors. Students were encouraged to attend their first lectures at a smaller, less rigorous, and less expensive medical college, and then sit for their second term at a larger institution. This strategy provided experience and added some variety to the otherwise dull and repetitive second term. At Buffalo, Sternberg received an excellent educational experience. It prepared him intellectually for the challenges and opportunities of the lengthier, more intense, and rapid-paced curriculum found at the College of Physicians and Surgeons. The faculties at both schools comprised some of the most outstanding physicians in America during that era—men who were not only well trained and innovative in the clinical arts, but also who were progressive educators who appreciated the value and relationship of science to medicine. A diploma and the professional and social connections from the older, more prestigious College of Physicians and Surgeons, however, would potentially greatly benefit Sternberg when he began his own practice, presumably in his native New York.<sup>59</sup>

Considering the state of medical knowledge and practice in mid-19th century America, and assuming he truly attended classes and clinics as he indicated, Sternberg received a medical education that was as comprehensive and complete as could be obtained anywhere in the country. But what did that mean in 1860? What knowledge base and medical philosophy did Sternberg take with him as he departed the College of Physicians and Surgeons? He had benefited from the progressive clinical orientation of his professors—observed more disease, touched more patients, and learned more diagnostic techniques than students did a generation earlier. However, there was very little he could do to cure what he found. Although the concept of a distinct natural history for a disease was slowly being accepted, specific disease etiologies and symptomatology—as known today—for the most part did not exist. Some diseases—it was believed—could transform from one into

another, and illness was still considered to be dependent on the environment and a person's physical, emotional, and moral states. Diseases generated disequilibrium in the body, and the physician's role was to reestablish the usual balance by regulating secretions by bleeding and increasing perspiration, urination, or defecation. Such interventions, whether mechanical or drug induced, facilitated the body's natural healing processes cure itself. Sternberg understood this philosophy and these procedures very well.

Sternberg would comment years later that the surgical training he received from Doctors Parker and Sands had been outstanding. Although this is undeniable, the advent of ether and chloroform anesthesia in the 1840s had made surgical intervention more practicable. Furthermore, Sternberg put these surgical skills to use in combat a little more than a year after graduation, an experience that probably made these men and their lessons more prominent in his memory than those of Flint, White, Clark, or Gilman. Collectively, the deep and enduring impact made on him by Horace Lathrop and the professors in Buffalo and New York City can be more widely appreciated in Sternberg's approach to the developing science of medicine and in the realm of medical literature, education, and professional leadership.<sup>60</sup>

Sternberg had been raised in an atmosphere of selfless dedication, responsibility, and service to family, church, and community. He entered the medical profession with an inherent appreciation for science, in general, and a mind that had been trained to observe and study science and scientific progress not merely for its own sake, but as a duty to God and a means for understanding the Creator's plans and purposes. Intellectually, he was prepared to accept the challenges and advancements in medical science that confronted him during his college years and beyond. Moreover, Sternberg simply derived pure pleasure and enjoyment from scientific discovery and the technical, hands-on aspects of experimentation. Unfortunately, investigational research was considered impractical for a physician in private practice and was uncommon in the medical profession for at least another 15 years.

Laboratory instruction also continued to be resisted in the United States because it consumed time from a very busy schedule for no practical purpose. Although Sternberg wholeheartedly embraced the concept of laboratory-based scientific medicine that was of practical value to the profession later in his career, this idea was still in the embryonic stages of development in Germany when he was a student. He was exposed to American laboratory-based science at mid-century at both medical colleges; however, Dalton was a showman in the manner in which he used his experiments and demonstrations and never considered hands-on laboratory instruction a useful or practical pursuit for his students. The passion for microscopical endeavors that Sternberg exhibited throughout his career may have sprouted in Lathrop's office and under the Nichols' instruction in Buffalo, but probably took root through the training of Dalton, Clark, and Gilman at the College of Physicians and Surgeons. These men had used state-of-the-art microscopes in their classes routinely since 1848. Although Sternberg learned to use the microscope for examining anatomical and botanical preparations, it gave him an understanding for the potential of this instrument—for example, when combined

with photography—and prepared him for the role it would play in his later researches in bacteriology.<sup>61</sup>

Professors such as Flint, Hamilton, White, Dalton, Rochester, Clark, and Gilman demonstrated the value and necessity of putting new medical knowledge in print for the benefit of the medical profession. Sternberg began contributing to the medical literature with field reports during the Civil War.<sup>62</sup> Often judiciously critical as a medical author, Sternberg's pen would pick up speed in the late 1870s and continue into the 20th century. Finally, the majority of professors in Buffalo and New York demonstrated a responsibility to contribute to the education, growth, and development of their profession through participation in its organizations. Many were at least active members—if not leaders—in local and national medical organizations, such as county medical societies, the American Medical Association, and the New York Academy of Medicine, as well as in the government and economy of the communities within which they lived. Throughout his career, Sternberg was actively involved in the communities where he was posted, and he contributed—as an officer or general member—to a large number of medical, scientific, and social organizations.

Sternberg was an able student who—in retrospect—extracted the most from his four years of medical study. Regrettably, what he could not extract from the lecture rooms and clinics and what he was in greatest need of was maturity and experience. Time would mature him, but the experience that nurtured self-confidence and poise in the treatment room could only be derived from seeing patients in volume. In 1860, no paid internship or residency programs existed. To obtain clinical experience, a new physician in New York City had three options: (1) go to Europe, (2) apply for one of the postgraduate hospital appointments available in the city, or (3) attempt to establish one's own private practice. A European excursion was only a pipe dream for Sternberg—if he considered it at all—because the cost was prohibitive. House-officer positions also required a fee. By 1866, house-staff positions in New York City were awarded to immediate postgraduates on a competitive basis, but social standing rather than academic distinction often directed the selection process for these positions. It is doubtful that a minister's son from a rural community in upstate New York could realistically compete with classmates who were sons of New York City physicians or who had studied under such prominent local physicians as Gurdon Buck, Willard Parker, and Stephen Smith. If Sternberg applied for a postgraduate position, he was not selected. Therefore, he entered into the uncertain world of private practice, where he could not earn a living and from which he was rescued when shells fell on Fort Sumter in 1861.<sup>63</sup>



## *Chapter Two*

# From First Bull Run to Hospital Command

“**W**hen I graduated in medicine in the College of Physicians and Surgeons...my ambition did not extend beyond the hope of securing a living practice in the country,” the 64-year-old Sternberg said at a retirement dinner given in his honor in New York City in June 1902.<sup>1</sup> To that end, he moved to a small village on Long Island where the death of a local physician provided him a professional opportunity. Sternberg also remembered on that same June evening that, “I was not able to fill this vacancy for my professional shingle was displayed for several months and I did not receive a single professional call.”<sup>2</sup> This may not be an exaggeration nor was it an unusual circumstance for a new medical graduate in 1860. The increasing number of regular and eclectic practitioners generated fierce competition for a finite number of patients. When an obituary announced a physician’s death, others scrambled to replace the shingle of the deceased with their own. Sternberg may not have been the only doctor attempting to fill the vacancy in the Long Island community; however, it was a conservative town that was very unreceptive to an inexperienced stranger assuming the role of a long-trusted physician.<sup>3</sup>

Discouraged, he relocated to Elizabeth City, New Jersey, in late 1860 or very early 1861. There, he was “getting a little practice,” as he recalled it, “when the war tocsin sounded.”<sup>4</sup> This passage gives the impression that his practice was beginning to improve, and only the national crisis overwhelming the country interrupted his continued success. In reality, by the second week of April 1861, Sternberg was once again residing at Hartwick Seminary. Apparently, the little practice he had received was not enough to secure a living. In a letter to Secretary of War Simon Cameron on April 14, he stated his desire to become a medical officer in the army and enclosed with this letter a character reference from family friend and U.S. Supreme Court Justice Samuel Nelson. He left no indication why he decided to apply for a position in the army. Whether the bombardment of Fort Sumter on April 12 influenced his decision to enter military service or it was temporarily

coincidental is unknown. However, the fact that he enclosed a letter of recommendation with his April 14 request suggests that he had been contemplating military service well before this date and before President Lincoln's call for troops.<sup>5</sup>

The War Department responded to Sternberg's request by April 22 and directed him to report to the Army Examination Board in New York City on May 1. Sternberg, however, did not receive this instruction until May 3. The apparent result was that he sat for the examination board, composed of surgeons Clement A. Finley, Charles McDougall, and William Sloan, on May 13. Although the government needed medical officers, it clearly recognized the low quality of medical education received by the majority of American physicians. To protect itself from incompetent practitioners, the U.S. Army required each candidate to pass a 700-point examination covering subjects such as literature and scientific qualification; anatomy and physiology; and the principles and practice of medicine, surgery, obstetrics, materia medica, chemistry, and medical jurisprudence. The exam also evaluated the general aptitude of each candidate. Kenneth Ludmerer said that medical education was so deficient at the time that the examination "...could be passed by only a quarter of the country's medical graduates who took the exam, even those with degrees fresh in hand."<sup>6</sup> If this is true, then Sternberg's examination class was extraordinary in its composition. Of the 28 candidates examined, three withdrew and three were disqualified for medical reasons. When the final grades were released, all 22 of the remaining candidates were accepted into the army. Although he stood dead last in the class, Sternberg's performance was not as shabby as his ranking indicated. He had scored 629 of the possible 700 points; his lowest score, 81, was in literature and scientific qualifications, and he scored only 83 on general aptitude. In all other subjects, he scored 90 percent or greater. Sternberg entered into a contract with the U.S. Government on May 20, 1861, which paid him \$100 per month for an unspecified time period, and 11 days later he was commissioned a first lieutenant in the U.S. Army Medical Corps. This was the beginning of his military career.<sup>7</sup>

When the war began, the only hospital in the capital was the Washington Infirmary on E Street. Ten additional military hospitals were established by the end of 1861. Sternberg spent his first two weeks of active duty at the C Street Hospital—actually two residences, Nos. 360 and 364—on the north side of C Street between 4½ and 6th streets, Northwest. In late June, he was reassigned to the Regular Infantry Battalion, which was commanded by newly promoted Major George Sykes and headquartered on 21st Street.<sup>8</sup>

In the spring of 1861, the U.S. Army was awakening from 13 years of peaceful slumber. After the war with Mexico, the army had been reduced to just below 11,000 men and scattered across the expanding western frontier to contend with the native tribes as required. Since then, only the Corps of Engineers gained a modicum of renown mapping the trans-Mississippi West, raising the national Capitol building, and assisting in bringing clean water into the city via the Washington Aqueduct. The remainder of the army sat—ignored for the most part—in small, dreary little posts awaiting slow pay increases and promotions amid the



mind-numbing monotony of each new day. A small increase in pay, a modest increase in size to 16,000, and the adoption of the rifled musket were about the only significant changes the Regular Army could boast of over the past 13 years until President Abraham Lincoln enlarged its ranks by 22,714 men in early May.<sup>9</sup>

The Army Medical Department remained relatively unchanged during these years. Colonel Thomas Lawson, the surgeon general, spent a long career attempting to increase the size and prestige of his department. He reported to the Secretary of War in November 1855 that the required contingent of surgeons did not “depend upon the numerical force of the army, but upon the manner in which it is employed; that is upon the divisions and subdivisions it has to undergo, and the particular service in which it is engaged.”<sup>10</sup> Although Lawson’s statement can be considered an enduring maxim for military medicine, he was essentially ignored. Between 1848 and 1860, the Medical Corps grew by only 29 physicians for a total of 123 to serve 89 forts, various expeditions, the Soldiers Home, and staff positions. The perennial shortage of medical officers lowered morale as it precluded Lawson from granting them leave, except in emergencies; when leave was permitted, the surgeon had to find and pay for his own replacement. It also mandated that a large chunk of the surgeon general’s budget paid for civilian contract physicians. Lawson improved the status of medical officers within the army. As of February 1847, medical officers were given official rank, housing, and allowances commensurate with line officers. However, the rank they wore carried no weight with their peers in the line, and with Congress giving little attention to the issue, many medical officers felt the pre-1847 status quo continued unchanged. In 1856, Lawson convinced Congress to create permanent positions for hospital stewards because previously hospital stewards came from the rank and file of the regiment often without the aptitude or desire for medical duties. Even if a surgeon was fortunate to obtain a competent man for the job, the commander could relieve him from medical duties at will. Although the new law eliminated these problems, Lawson failed to take advantage of it and did not aggressively develop a trained corps of hospital stewards. The paucity of innovation and creative foresight displayed by Lawson with regard to hospital stewards was also evident in his management of medical facilities and logistics. Hospitals at many permanent western posts were inadequate and, to keep purchasing costs at a minimum, their medical supply system was based out of New York City rather than a more locally situated depot. Combat medical care—the collection, triage, treatment, and evacuation of sick and wounded soldiers—was equally deficient. No organized ambulance corps existed, and no blueprint for combat medical support existed. Estimated requirements for conveying casualties from battlefield to field hospital and permanent rear-area treatment facilities were based on Indian campaign presumptions, notably that there would be few injured to begin with and that the terrain would accommodate at most a two-wheeled vehicle and preferably a horse litter. Medical facilities, logistics, and the intricacies of combat medical support were not priority issues for Lawson and the army he served nor were they for his successor, Clement Finley, who would inherit an unprepared Medical Department only a few weeks before the first major engagement of the Civil War.<sup>11</sup>

“In the eyes of the North,” Margaret Leech wrote, “Washington was a cherished symbol of the nation’s power, to be held and defended at all costs.”<sup>12</sup> Lincoln’s plea for volunteers to defend the capital was answered immediately. Almost overnight Washington became an armed camp. Soldiers were quartered in and around the city until late May when General J. F. K. Mansfield, commander of the Department of Washington, directed the seizure of Alexandria and Arlington in Virginia. Afterward, national forces—now designated the Department of Northeastern Virginia—were bivouacked on Arlington Heights. Sternberg moved with his regiment to the heights on July 4, 1861. The commander of this new department was Brigadier General Irvin McDowell.<sup>13</sup>

On June 24, McDowell’s plans to strike the Confederate forces at Manassas Junction were approved. Although he had a clear vision for dealing with the secessionist army, his medical director, Surgeon William S. King, had none for the medical organization of the army or the enormous casualties the battle would create. After all, King was a 24-year veteran of Lawson’s Medical Department who had returned from a New Mexico post only a few weeks before marching off to war. His after-action report on the Bull Run Campaign indicates that he was cognizant of the importance of field sanitation and hygiene, but unaware of how to coordinate combat medical support for such a large army. King, who thought in terms of Indian campaigns, had no general plan for managing and evacuating combat casualties; no secure rear-area hospital was initially established, and Finley denied his request for more ambulances. Only 48 of these vehicles supported the Union army at Bull Run, but few had trained ambulance attendants and only hired civilian drivers. King ordered additional medical supplies, but they never arrived. Although a major battle was expected, King, like many others in the army, believed that after a brief, sharp skirmish, the Confederates would simply run away.<sup>14</sup>

First Lieutenant Sternberg, with little experience as a physician and none as a soldier, marched east out of the capital toward Manassas on July 16. The Regular Battalion was a composite unit of eight regular army companies commanded by Major George Sykes, which formed part of Colonel Andrew Porter’s Second Brigade in Colonel David Hunter’s Second Division. The line-of-march for the Second Division went through the Fairfax Courthouse and on into Centreville, where it remained for 2 days awaiting a supply train to bring rations and ammunition. A skirmish just south of Centreville at Blackburn’s Ford early on July 18 was a poorly coordinated and bloody action. It disabused the federals of the notion that Confederate forces would disperse at their approach, and it had a sobering and demoralizing effect on volunteers in McDowell’s army. Sternberg was fortunate to be surrounded by experienced soldiers as he contemplated the coming conflict, and he inspected his medical equipment and personal kit one last time. As a Regular Army surgeon, he was also more fortunate than other volunteers because he had an orderly, a hospital steward, and ambulances (the two-wheeled type) with attendants. Finley and Assistant Surgeon R. H. Coolidge deemed the two-wheeled ambulances, which were not as sturdy as the four-wheeled models offered to the Medical Department, as the best conveyance for casualties in 1859. Given

the shortage of ambulances and the light marching order, Sternberg had to ensure all medical supplies were packed into available ambulances—eight according to regulations—and in the two or three transport carts allocated to his battalion.<sup>15</sup>

The sound of drums broke the early morning stillness of July 21. Sternberg, like many of his comrades, probably had not slept well that night. McDowell would attack this day, and discussion of the coming conflict had continued late into the evening. Sternberg hastily prepared breakfast and two days of rations in the moonlight, and readied his mount. Camp was broken, and the army was put in marching order. Speed was critical, but darkness and inexperience generated confusion among the green troops and delays occurred. Sternberg's unit, which was bivouacked one mile to the east of town and directed to begin precisely at 2:00, did not march through Centreville until almost daybreak. Then the better part of an hour was consumed in reaching a road just beyond Cub Run that meandered northwest through a tract of woods. Colonels David Hunter and Samuel P. Heintzelman turned their units onto this road to begin their flank march to Sudley Ford while General Tyler proceeded down the Warrenton Turnpike.<sup>16</sup>

Although advertised as a road, the lead elements of the Second Division, commanded by Colonel Ambrose E. Burnside, marched on nothing more than a glorified cow path through dense woods. In their retreat from Alexandria, the rebels had cluttered the path with trees that now impeded the Union advance. Ax, pick, and spade-wielding soldiers cleared the way, but the work sapped their strength needed in the ensuing battle. As the burning July sun rose, the day became intolerably hot, and the dust was stifling. Although the thick woods gave some protection from the sun, it precluded any breeze that might have relieved the suffocating atmosphere. Blankets, oilcloths, and haversacks were discarded. Medical Director King warned McDowell that the pace would exhaust the army, but officers urged their fatigued and dehydrated men to close ranks and compensate for earlier delays. To make matters worse, the flank march, which had been estimated at three to four miles, had to be extended to nearly six miles to keep beyond the range of Confederate artillery along Bull Run.<sup>17</sup>

The Regular Infantry Battalion, in the rear of the formation, broke out of the woods into the clearing a mile north of Sudley Ford to the sound of cannon fire at about 10:00. Colonel Nathan G. Evans' batteries on Matthews Hill, which was the extreme Confederate left flank, had been alerted to McDowell's tactics by the large dust cloud generated by the marching column. Hunter led Burnside's brigade down the Manassas-Sudley Road into Confederate artillery fire, which rapidly became a maelstrom. Hunter was wounded, and Burnside's troops, which did not have the strength to overwhelm the rebel batteries, stalled on the northern slope of Matthews Hill. Sykes' Regular Battalion was immediately ordered to support Burnside. As Sternberg moved forward with his unit, Surgeon Charles C. Keeney, medical director for Hunter's Division, intercepted him. Keeney related that Hunter had been seriously wounded and directed Sternberg and his attendants to assist him. Sternberg rushed to Hunter and found him "... leaning against a tree with a wound in his neck, which proved not to be serious. I saw that I could be of no use

to him as there were plenty of Surgeons around him; I, therefore, hastened with my attendants to find our regiment.”<sup>18</sup>

Amid the smoke and increasing noise of battle, Sternberg discovered his battalion “just entering into the action, and some distance in advance of all others in our Division.”<sup>19</sup> The Regular Battalion bolstered Burnside’s troops and sustained a concentrated fire from rebel batteries and regiments for more than an hour. Casualties mounted rapidly on both sides. Medical care consisted of simple dressings in the majority of cases. Those more seriously wounded were loaded into ambulances for transport to the rear where hospitals had been set up in the Sudley Church and some of the nearby farmhouses. During this time Sternberg found himself under direct battery and small arms fire. He later reported, “Thinking it useless to remain in such a dangerous position, I called to my Steward and attendants to come to one side with me out of the range of the battery.”<sup>20</sup>

The establishment of Sudley Church and local farmhouses as hospitals was an afterthought of Medical Director King. Originally believing he could personally register all casualties in a notebook as he rode about the field with McDowell, King soon realized the magnitude of casualties that were being generated from the fierce action on Matthews Hill. It proved to be the most intelligent decision he made on that dreadful day. He dispatched Assistant Surgeon D. L. Magruder to find and prepare buildings suitable for treating the wounded. Magruder selected Sudley Church, beyond an unfinished railroad embankment near Sudley Ford, where he had pews removed, operating tables improvised, water and instruments positioned for convenient use, and blankets and straw placed on the floor for bedding. Two hours after the first ambulance arrived the church was full, and Magruder secured three other abandoned buildings for the same purpose.<sup>21</sup>

The intense fire under which Sternberg and his attendants labored resulted from Confederate reinforcements thrown onto Matthews Hill, but by noon both rebel flanks were being enveloped by the weight of the Union drive. They gathered both Federal and Confederate wounded as the Union ranks slowly pushed south toward the Warrenton Turnpike. The 4th Alabama Regiment was one of the last regiments to give way on Matthews Hill. The commander of the 4th Alabama, 36-year-old Colonel Egbert J. Jones, sat imperturbable on his horse giving orders until a solid shot struck his thigh and knocked him from his mount. With a white handkerchief tied to the hilt of his saber, Jones awaited his fate, defiantly telling his captors, “Gentlemen, you have got me, but a hundred thousand more await you!”<sup>22</sup> Sternberg found the still irascible colonel drinking from a proffered canteen and examined the “severe wound in [his] thigh.”<sup>23</sup> He undoubtedly realized that the shattered leg would require amputation, and the Colonel had lost a considerable amount of blood. With the battlefield too fluid for an operation of this caliber, Sternberg had Jones taken to Sudley Church and then continued with the advance.<sup>24</sup>

The Confederate left fell back across Warrenton Turnpike and Young’s Branch to the slope of the Henry House Hill, and victory seemed assured for McDowell. But the Confederates held firm. McDowell threw one fatigued regiment after another at Beauregard’s line, but by mid-afternoon this piecemeal support caused

the Union drive to stall. Now reinforced, the Confederates attempted to flank the Union right from Bald Hill and Chinn's Ridge, and panicked Federal troops began to waiver.<sup>25</sup>

From the bottom of the hill, Sykes recognized the impending disaster and tried in vain to rally his fleeing countrymen. He maneuvered his battalion down the Warrenton Turnpike to the extreme Union right and formed it into square on Chinn's Ridge. The formidable square formation delivered controlled and concentrated fire, and kept cavalry at bay. Inside the square, Sternberg and his attendants watched as the disciplined volleys of the battalion repulsed the Confederate horsemen and bought time for the fleeing Union volunteers. Soon, however, the Regulars found themselves alone with rebels closing in on three sides and their batteries ripping holes in the blue ranks. Sykes determined that it was time to join the withdrawal. Just as he had advanced in the thick of battle with his unit, Sternberg now slowly retreated with it back up the Manassas-Sudley Road under harassing artillery fire. The road back to the ford became choked with cannons and caissons as horses were cut from their traces; haversacks, coats, blankets, and any other piece of equipment that might impede the headlong flight from the battlefield were scattered in every direction. Sternberg echoed McDowell's opinion of the retreat when he later wrote, "...they [the soldiers] became so panic stricken that the retreat was a complete rout. The men would make no attempt to rally, and many of them threw away their muskets and cartridge boxes, each one seeming to think of nothing but his personal safety."<sup>26</sup> Trudging up the road, Sternberg searched in vain for the horse he had left tied up at a farmhouse earlier in the day. He continued on foot up the road until he arrived at the Sudley Church where he "... found 280 of our wounded, without any attention. I at once resolved to remain with them and do what I could to relieve their suffering. Some 6 or 7 surgeons of different volunteer regiments also remained."<sup>27</sup>

Just as King had no plan to coordinate and implement medical care during the battle, he now had none to evacuate as many of the wounded as possible during the inglorious retreat back to Washington. Many of the ambulances that had been on the field were abandoned by their contract drivers and appropriated by nonmedical personnel to carry them away from the advancing Confederates. After the retreat began, the severely wounded laid down on the ground where they fell. Those capable dragged themselves to a field hospital or to some shelter hidden from rebel eyes. Apparently King and numerous other surgeons — to include William W. Keen, Henry R. Silliman, and Keeney — considered duty and fidelity to their comrades fulfilled when simple dressings had been applied, the remaining ambulances filled, and capture became imminent. As evening approached, the Confederate cavalry drove all but a large handful of medical officers from the church. Assistant Surgeon Charles C. Gray went forward to surrender and explain their situation. He met Lieutenant Cameron, who, in Gray's words, was an "unreasonable man," because he would not guarantee protection for the hospital or allow Gray to return to his work.<sup>28</sup> Cameron informed the surgeons they were prisoners of war and ordered Gray to accompany him to Manassas. To a man, the Union surgeons were outraged.

Although the Geneva Convention articles that would protect medical personnel from being treated as prisoners of war were three years in the future, the concept was understood and had been regularly practiced in Europe since the days of Frederick the Great. Regrettably, Confederate cavalry officers were ignorant of the laws and customs of war in Europe. Sternberg and 14 of his colleagues gave themselves up to a Confederate prison rather than desert the helpless soldiers on the Manassas battlefield.<sup>29</sup>

With the confusion, noise, fear, and urgency of the battle over, the agonized cries of horribly maimed soldiers had no competition. Their pleas for help filled the air and echoed from woods and battlefield. Although Gray had difficulty with Cameron, Sternberg appears to have dealt with the captain commanding elements of the 1st Virginia Cavalry bivouacked near them. This captain allowed each surgeon to select one aide from the captured soldiers being driven along the Manassas-Sudley Road. The wounded completely filled the main floor and gallery of the church and overflowed into three other buildings and the churchyard. Nothing could have prepared these physicians for the onerous duties in which they became engaged. Musket ball and shell fragment extractions and amputations of mangled limbs comprised the majority of surgical procedures performed. Arms, legs, hands, and feet were tossed in a common heap; a visitor recalled that the dead were in “piles of three and four.”<sup>30</sup> Sternberg recounted that “a number of capital operations were performed at the church, but, owing to the want of food and stimulants, and to the unfavorable circumstances under which the men were placed, most of these cases terminated fatally within twenty-four hours.”<sup>31</sup> Not only were food and stimulants needed, but also medical supplies of all varieties.

Dark, overcast skies covered northern Virginia on Monday morning, and a heavy rain fell. Although a relief from the intense heat of the past few days, a temperature drop accompanied the precipitation and chilled the rain-drenched casualties lying around the church. Sternberg asked for—and was granted by the cavalry captain—a detail of Confederate soldiers to construct a 20-foot by 30-foot shelter from small trees and rubber blankets that littered the path of the retreating army. Once complete, as many of the wounded as possible were placed underneath and given a cup of cornmeal gruel, their first nourishment in more than 24 hours.<sup>32</sup>

Late on Monday evening, the captain informed Sternberg and his colleagues that they were to be taken to Manassas. Most of the surgeons were loaded into an ambulance for the journey, but the captain provided Sternberg with a horse. This may have been a kind gesture to spare him a jolting ride to the railroad junction, but because it was still raining, and according to Sternberg very cold, it made for a miserable trip. The weary surgeons proceeded eight miles down the Manassas-Sudley Road and arrived at the Confederate headquarters about midnight. They waited in the rain for nearly two hours while someone determined who had sent for them and why. There was no answer for the tired, hungry, and now furious medical officers. Sternberg was so angry at this barbaric treatment he could not be civil when crackers and coffee were put before them at the headquarters. Once they had downed this repast, they were herded into a barn that served as a guardhouse with some 40 other prisoners.

Soaked to the skin and wrapped in an army blanket, fury gave way to exhaustion and Sternberg slept.<sup>33</sup>

The following morning the Union surgeons were offered a parole: "We the undersigned do hereby give our unqualified parole of honor, that we will not, during the existing hostilities between the United States and the Confederate States of America, aid or abet the enemies of the said Confederate States of America by arms, information, or otherwise until released or exchanged."<sup>34</sup> In return they would be sent back to Sudley Church to treat the wounded. About half of the surgeons took advantage of this offer and were immediately returned to the church. Sternberg and three others remained obstinate and declared not only their desire, but also their right to treat the wounded without the approval of their captors. For reasons unknown, the Confederates shortly thereafter offered another parole that only required them not to escape or give information to the enemy for five days. If the surgeons signed it, then they could take care of their wounded and move about Manassas on their own recognizance. These more reasonable terms were acceptable and readily signed.<sup>35</sup>

More Union casualties were placed in a building at the railroad yard. Sternberg remarked that some had just been brought in from the battlefield, having lain in the rain for nearly two days without care. Although this may have been true for some soldiers, Assistant Surgeons Gray and James M. Lewis had been doing their best to locate those still on the field, stabilize them at Sudley Church and the Lewis House, and then transport them to the Manassas railhead. On Tuesday afternoon, Confederate surgeons instructed Sternberg and his colleagues to dress wounds and load as many of the men onto the floors of the waiting railcars as possible. Working until after sunset, they were assured the train would depart momentarily for Culpeper and Charlotte. But when the Union surgeons arrived at the railyard the next morning, the same loaded train they had left the evening before greeted them. The wounded had received no food, water, or any attention since the surgeons had departed, and they remained there until Wednesday night.<sup>36</sup>

Since taking their parole, all of the Union surgeons had been treated well and were allowed to dine with the Confederate surgeons and talk freely among themselves. Sternberg and fellow captive Dr. Edward Taylor had discussed the possibility of escape in their free moments. Medical supplies were being consumed rapidly, and the Confederate Medical Department loathed sharing their valuable supplies with soldiers bound for prison. With each passing day, there were fewer ways a surgeon could alleviate a prisoner's suffering and no indication that the government in Richmond would agree to an exchange of medical officers. Both men continually watched for an opportunity to escape, and, on the evening of July 25, their captors provided one. Sternberg and Taylor were sent to attend wounded from the skirmish at Blackburn's Ford who still remained at Centreville. In Centreville they were quartered in the home of Dr. Alexander, a local physician. Attracted to Alexander's bookshelves, Sternberg found an atlas that contained what he considered a fine map of northern Virginia and tore it from the book. "From this I ascertained that Washington was about East of Centerville."<sup>37</sup> Sternberg later

wrote, "I told the Doctor [Taylor] that our best plan was to go North for about 15 miles and then East until we struck the Potomac. By doing so I thought we should evade pursuit and leave the Secession troops all to the South of us."<sup>38</sup>

Both physicians were prepared to depart as soon as the wounded at Centreville were on their way to Manassas. However, early on Sunday morning, July 28, Taylor returned to Manassas, apparently to catch the train for Richmond. Taylor's departure was an ominous sign because it was Sternberg's parole that was up at noon that day; Taylor still had two days remaining on his gentleman's agreement. Sternberg must have believed that it was really him they were after when Taylor was taken. If so, and the mistake was discovered, the next rider down the Warrenton Turnpike may be coming after him. After a noon meal with Dr. Alexander, Sternberg made his last rounds on the remaining patients, stuffed half a dozen crackers in his pocket, lit a cigar, and casually strolled out to one of the sentries. He inquired of the sentry where he might find some red oak trees as he needed the bark for a wound poultice. The sentry promptly directed him to the woods about a half a mile north of town where there was an abundance of oak trees. Leisurely, Sternberg made his way into the woods where, once among the protective cover of the trees, he bolted north to freedom.<sup>39</sup>

Sternberg traveled a northerly course, in general, but fatigue, his unfamiliarity with the Virginia countryside, the less-than-detailed map he had taken from Alexander's library, and the weather all combined to make his trek frustrating. He crossed a stream he believed to be Bull Run—actually Rocky Run—after walking what he estimated to be about two miles. Entering a thick forest of second growth pine, he found the trek slow and difficult, and a late afternoon thunderstorm only complicated his journey by obliterating the sun. Sternberg took refuge in a deserted cabin. Just before sunset, as the sky cleared, he realized he had been backtracking under overcast skies. Determined not to travel unless he could see the sun, moon, or North Star, he stretched out on the cabin floor, smoked his last cigar, and fell asleep.<sup>40</sup>

A few hours later, Sternberg was awakened by a voice. Someone was calling him; he distinctly heard his name. He sprang from his pallet with his heart pounding to find himself alone. It had only been a dream. He gazed outside to find the sky clear and a bright moon rising. Sternberg pushed on, avoiding houses and open fields and sustained himself with the crackers he brought and blackberries he found along the way. He continued on through thick woodland until very early on the morning of July 29 when cloudy skies and exhaustion demanded he rest again until sunrise. Near noon, he came across a man working in a field. Sternberg realized that making himself known to this man might be imprudent, but he suspected he might be lost again. He had to determine his location. Wet and filthy, with his uniform in tatters, but trying not to appear desperate, he boldly approached the man and asked where he was. The farmer informed him the Potomac was one and a half miles farther east and Washington was only 12 miles up the road, but added that a large number of South Carolina troops were patrolling that thoroughfare. Cautiously, he continued his cross-country journey east until he struck the Potomac.



As he proceeded south along the river, good fortune and a prosperous Potomac fishing industry provided him with an abandoned boat. He paddled down the river until he reached a dam about five miles above Washington, landed on the Maryland side, and continued on by foot. Whether emboldened by his encounter with the farmer or from some obvious sign that the inhabitants had Union sentiments, Sternberg stopped at the first house he found. The owner was a generous Irishman who fed him bread and butter, and milk. He told his hungry guest the capital was five miles farther down the road. Refreshed and confident, Sternberg once again took up the road to Washington. He met up with couple of soldiers from the 6th Maine Regiment camped near Chain Bridge who eagerly assured him that their commander would assist in returning him to his unit.<sup>41</sup>

Once in camp, Sternberg met with Colonel Abner Knowles and described to him the events of the past few days. Knowles promised to return him to Washington expeditiously. Before being dismissed, however, another soldier entered the tent. In the dim light, he studied the weary physician sitting in tattered uniform and asked if he had not been in the guardhouse the previous evening. Sternberg assured all present that a mistake had been made, but the soldier immediately produced four of his comrades who verified his accusation. Rising from his chair in agitation, Sternberg reiterated to those present that he had spent the night hungry and alone in the Virginia woods and not in their jail. When he did so, one of the verifying soldiers recanted saying that the accused was a head shorter than the man they sought. Knowles' promise to send him to Washington, however, failed to materialize, and Sternberg spent an uncomfortable night in the 6th Maine camp. His escape had been accompanied by good fortune, which the accusing soldier in Knowles' tent may have brought to an end. Rising at 5:00 a.m., Sternberg proceeded to the capital on foot. He reported to Commanding General Winfield Scott and the surgeon general the same day, and he was reunited with his unit on Arlington Heights where he gave his report to McDowell.<sup>42</sup>

General George B. McClellan replaced McDowell 10 days after the Bull Run battle. McClellan surveyed the post-Bull Run army and found it lacking discipline and organization. One of the ways in which this would be corrected was to establish martial law in the city. The drowsy little city with its pretentious, partially completed buildings, unpaved streets, and stinking canal was deluged by an unending flow of men and materiel as the new commander began building the Army of the Potomac.<sup>43</sup>

The Regular Battalion was ordered back into Washington in August as part of the provost guard for the capital. Sternberg spent the winter of 1861–1862 contending with the injuries and diseases of a regular regiment garrisoned in a city lacking in hygiene and brimming with night life. If his experience was anything like that of garrison surgeons before and since, he saw primarily gonorrhea, syphilis, respiratory disease, and diarrhea. Washington teemed with houses of prostitution—some 67 if the Provost Marshall's record was correct—and a third of them were concentrated in the quadrangle formed by 15th Street West and Pennsylvania, Louisiana, and Ohio Avenues.<sup>46</sup> Typhoid fever made a significant impact on the army

in general, but acute bronchitis and pneumonia were the most common maladies encountered, followed by acute diarrhea and dysentery. Sykes, now a brigadier general, had one of the healthier brigades around the capital that winter if the early January 1862 report of 10 percent total sickness among his command can be considered representative.<sup>44</sup> When the army broke camp in March, most of the soldiers were immune to the childhood infectious diseases and the majority had been vaccinated against smallpox. Although the seriously ill remained in camp, a significant number of those deployed formed the nidus of infections that would plague the forthcoming operations in the swamps of southeastern Virginia.<sup>45</sup>

Lincoln approved McClellan's "Urbana Plan" in mid-winter—a waterborne flanking movement staged from Annapolis that would land his army at the tobacco port of Urbana on the Rappahannock River. From this base of operations, McClellan intended to seize Richmond before General Joseph Johnston's forces at Manassas could reinforce the Confederate capital. But the Confederate government, fully expecting McClellan to assume the offensive in the spring, pulled back its out-matched forces near Washington to defensive positions around Richmond in early March just before the Union general initiated his plan. With his plans now obsolete, McClellan shifted the staging area to Alexandria, Virginia, and his forward base to Fort Monroe. Lincoln approved the change on the condition that Washington and Manassas remained secure. By mid-March 1862, the port of Alexandria became a loud, bustling center of military activity. Cattle, horses, wagons, cannons, caissons, ammunition, pontoon bridges, and various supplies required to sustain an army of 135,000 men were collected and moved to the wharves for loading onto transport vessels.<sup>46</sup>

Major Charles Tripler had directed medical arrangements for the Army of the Potomac since August 1861. A 56-year-old veteran, Tripler was an intelligent, competent medical officer and experienced campaigner. Abhorred by the Medical Department's poor showing at First Bull Run, Tripler worked methodically to preclude a repeat performance. Medical personnel, supply, patient regulating, land and water evacuation, unit sanitation, and hospital organization were all addressed for the coming campaign. Experienced regular officers were assigned as brigade surgeons, and Tripler impressed upon them the importance of sanitation in the regiments. He requested an experienced quartermaster officer and subsistence officer for his staff to ensure medical supplies, transportation, and hospital rations were more easily obtained. Tripler discouraged evacuation to general hospitals because, in his view, the care was worse and it was a drain on manpower.<sup>47</sup> However, he recognized that an army on the move could not be encumbered with sick soldiers. Evacuating them from the front to the 1,000-bed facility being created at Fort Monroe obviated the need for an intermediate level of care between the regimental and general hospitals. Tripler had brigade hospitals established and in working order before deploying. To move these patients, he estimated that 250 four-wheeled ambulances would be required and, while he recognized the need for a dedicated ambulance corps, the organization and training of such a corps required more than time and current regulations allowed. As for water evacuation,

he had to rely on Quartermaster Department transports and the services of the U.S. Sanitary Commission.<sup>48</sup>

Tripler's medical campaign plan—although thorough and sound—required a higher echelon of support for success. Those responsible for that support failed him. At the direction of the Secretary of War Edwin Stanton, the surgeon general took personal control of all general hospitals and ordered Tripler to leave his purveyor in Alexandria and a portion of his supplies. The Quartermaster and Subsistence Departments also denied him the special staff officers requested. To cap it off, only 177 four-wheeled ambulances were dispatched, supplemented by the frail two-wheeled type that Tripler despised.<sup>49</sup>

On March 17, the largest waterborne operation in American history began and with it the Peninsular Campaign. Sternberg watched these events from the confines of a hospital bed in the U.S. General Hospital in Alexandria. Three days earlier, he had been hospitalized with orchitis, a painful inflammation of the testicles. His hospital record gives no hint of the etiology of his condition. Mumps, the most common cause of orchitis in adult males, was present among the soldiers in the capital area that spring, but a traumatic injury could have also produced his discomfort. Sternberg's unit, now a Regular Infantry Brigade, departed Alexandria on March 26. He recovered sufficiently to join his regiment engaged in the siege of Yorktown by the first week of April.<sup>50</sup>

From his arrival on April 2 until May 4, McClellan was plagued with problems. Naval support had not materialized, transportation was insufficient, his maps were misleading, Lincoln had removed forces in northern Virginia from McClellan's control as well as his base of operations at Fort Monroe, and incessant rain had turned roads into bogs of thick, sticky goo. In mid-May, he reorganized his forces to add a Fifth and Sixth Corps. The Fifth Corps, commanded by General Fitz-John Porter at Cumberland Landing, included Sykes' Division. Sternberg served with the 3rd U.S. Infantry in Lieutenant Colonel Robert C. Buchanan's 1st Brigade.<sup>51</sup>

Tripler also faced mounting problems. Chickahominy fever—probably typhoid and/or malaria—was filling the regimental hospitals and draining resources. Tripler's solution was to evacuate these patients immediately. But, without the direct quartermaster support he had requested, a dearth of ambulances and hospital transports, and limited support at Fort Monroe, his evacuation chain became a sluggish nightmare and patients suffered. Tripler begged the surgeon general for more doctors, more supplies, and more of everything, and he predicted disaster if they were not received. Regrettably, he also managed to alienate the U.S. Sanitary Commission, the only organization with the resources to provide him some relief. William A. Hammond, the new surgeon general who had replaced Finley in April, reassured Tripler that his office was doing all it could to support him. He gave Tripler the authority to solve problems and urged him to work more closely with McClellan. But as May turned into June, Tripler became frantic and his control slipped further away.<sup>52</sup>

Sternberg saw his first combat action in the Peninsula Campaign when Confederate forces fell upon the Union right at Gaines' Mill on June 27. The 3rd Infantry

was positioned on the far right of Sykes' Division. A strenuous Confederate morning attack was followed by a short respite and then a determined afternoon assault. By late afternoon, under intense small arms and battery fire, the 3rd Infantry found itself in an exposed position receiving fire from front, right, and rear as the Confederates endeavored to crumple the Union right. The volume of fire was of such magnitude on the right that men fell in heaps. Thick, acrid smoke choked one and all, and the noise made verbal communication impossible. Throughout the conflict, Sternberg remembered, he "kept as near my regiment as possible, giving my attention to the removal of the wounded from the field, operating only in urgent cases."<sup>53</sup> He felt such urgent cases were few, but admitted he had "amputated on the field with none but my hospital steward to assist me."<sup>54</sup>

Amputations could be performed rapidly under chloroform anesthesia, which all surgeons carried as part of their medical kit, but dangers existed to the patient, surgeon, and assistants conducting surgery under intense direct fire. As Sternberg indicated, and his colleagues on the field affirmed, there was little reason to perform operations under fire when a well-stocked and staffed hospital was close and litter-bearers and ambulances were available to clear the wounded from danger. The Adams house in the center of Porter's position some 600 yards behind the firing line served as the main division hospital. The McGhehee house, which was nearest to Sternberg on the field, and outbuildings surrounding both houses were also filled with the wounded. Once treated, these patients—stable or not—were transferred by ambulance across the Chickahominy to the hospital at Savage Station.<sup>55</sup>

By 6:00 the Federal left and center began to give way. The McGhehee house, its outbuildings, and orchard became the last defensive bastion of the Union right. Now untenable as a hospital, Sternberg, Goddard, other surgeons, and their attendants rapidly cleared these buildings of wounded. Without panic or confusion and under the continued protective cover of regular artillery batteries, Porter withdrew from battle. Sternberg and the exhausted regulars received only a short respite at the Grapevine Bridge over the Chickahominy. Fearing a continued Confederate advance, they crossed the river soon after midnight, burned the bridges behind them, and halted on a hillcrest in the rain till dawn before pushing on to Savage Station. While the soldiers rested at Savage Station for some hours, the entire contingent of surgeons in Porter's Fifth Corps assisted those already at the station in attending to the 2,500 to 3,000 sick and injured who occupied every available building and tent, and the rain-soaked grounds surrounding them. Hospital stewards and orderlies quickly loaded ambulances and sent as many of them as possible to floating hospitals on the James River.<sup>56</sup>

What could not be removed quickly from Savage Station was torched. Sykes' Division resumed its retreat in the evening of June 28. Pelted by rain, the regulars slugged their way through heavy forest over roads made uncertain by the darkness. At dawn they crossed White Oak Swamp at Brackett's Ford and assumed temporary positions while the last of McClellan's army groped its way out of White Oak Swamp on June 29. Once again at the rear of the army, Sykes' Division began another fatiguing night march. The regulars reached the plateau at Malvern at

mid-morning on the following day. Sternberg and the 3rd Infantry collapsed under a coppice of pines on the far right of Sykes' position for their first sleep in four days. From this commanding position, Union artillery repelled the Confederate advance in the afternoon and continued the following day. Sternberg again participated in heavy fighting on July 1. Although the Malvern Hill Battle had been a tactical victory for the Union, McClellan continued his withdrawal to Harrison's Landing to rest and refit his army.<sup>57</sup>

In his report of the Seven Days Battles, Sykes remarked that "the medical officers...were prompt and faithful in their onerous duties," and mentioned them all by name.<sup>58</sup> In addition, he stated that "Dr. Sternberg added largely to the reputation already acquired on the disastrous field of Bull Run."<sup>59</sup> In an era devoid of battlefield citations for intrepid gallantry in combat, a brave soldier could only hope to be recognized by his commander in dispatches and reports. This was the second time in 12 months that Sykes commented on the dedication and valor of Sternberg in his official dispatches.<sup>60</sup>

The army had marched and fought for an entire week in impossible weather on little sleep and scanty rations. Sustained by the excitement of the campaign, it now slumped, exhausted on the banks of the James River. The Seven Days Battles had exacted a severe toll on the soldiers and the ability of the Medical Department to provide adequate transportation, supplies, and care. There were fewer than 90 ambulances, suffering from hard use on muddy roads, engagements, and mismanagement, thereby compromising field evacuation after Gaines' Mill and Savage Station. Large numbers of sick and wounded had been forsaken to the Confederates. Although reports from the surgeons present during the campaign conflict on the adequacy of medical supplies before the Seven Days Battles, it appears that Tripler vigorously pushed all medical officers to ensure that their medical stocks and surgical kits were full and complete. In the Second Division, Assistant Surgeons Sternberg, W. C. Spencer, J. V. D. Middleton, and Edwin Bentley all agreed that medical and hospital supplies and ambulances were sufficient to meet their needs until after the action at Gaines' Mill. However, the rapid retrograde movements following that battle—and especially after the Savage Station engagement—had necessitated that medical and hospital supplies and tents be destroyed or abandoned. Diseases such as malaria, typhoid, and other diarrheal disorders, and scurvy—as well as respiratory infections that had taken their toll from the early weeks of the campaign—now blossomed. The disaster Tripler predicted crashed down on him at Harrison's Landing. Although sympathetic, Hammond had no recourse but to make a change to prevent further mismanagement.<sup>61</sup>

On July 1, Major Jonathan Letterman, also a veteran of the pre-Civil War army, relieved Tripler. However, unlike his predecessor, Letterman was endowed with organizational and administrative talents that allowed him to approach this medical dilemma with patience and creativity. He built on the trust he had established with McClellan earlier in the war in campaigns in western Virginia and rebuilt the bridges, which were burned earlier by Tripler, with the U.S. Sanitary Commission.<sup>62</sup>

In the rain and mud, chaos soon began to give way to order with the arrival of

food, tents, and many well-stocked and well-manned steamer transports on July 2. The U.S. Sanitary Commission fitted out two of these ships, which could accommodate 250 to 1,000 patients, with supplies and personnel, and the Medical Department renovated others. Medical officers worked in shifts around the clock treating and preparing patients for evacuation. By July 15, 7,000 wounded had been evacuated to Fort Monroe. Letterman's request for more tents and ambulances was answered over the next 4 weeks, and his systematic reorganization of the Medical Department—for which he would become so well known—was begun.<sup>63</sup>

There was little rest for the medical officers at Harrison's Landing. Enteric infections comprised the majority of illness encountered at Harrison's Landing. There were nearly 49,000 cases of acute and chronic diarrhea and dysentery, of which 40 percent occurred in July. Typhoid struck 2,805 soldiers, and 10 percent of them died. Probably resulting from hepatitis A infections, jaundice affected 1,161 soldiers, and intermittent fevers accounted for 7,715 cases of illness. The stress and fatigue of the past weeks, the care required by the sick and wounded, and the turmoil in the medical director's office demoralized the already exhausted medical officers.<sup>64</sup>

Whether Sternberg was more fatigued and depressed than his colleagues, or perhaps had realized his own mortality among the dead at Gaines' Mill and Malvern Hill, he sent a request, not through Medical Director Letterman, but directly to the surgeon general to be "relieved from duty in the field and ordered to some general hospital."<sup>65</sup> In direct, concise language that would become a Sternberg trademark in future correspondence with his superiors, he stated: "I have been on duty with the Third Infantry since the 20th of May 1861. Last summer during the retreat of the army from Bull Run I lost my horse, equipment, clothing, etc. This summer I have again lost my horse & nearly all my personal effects & it will be very difficult for me to replace them in the field. I feel very much exhausted by the arduous duties which have devolved upon me during the present campaign but should not shrink from continuing to do my best if this application should not meet with a favorable response."<sup>66</sup> With medical operations as they were at this time, Letterman would have flatly disapproved the request, an outcome that Sternberg probably anticipated. Although the surgeon general's office controlled assignments, it recognized the disastrous effect circumventing the local medical director's authority would have on departmental operations. Sternberg was informed that his application was being referred to Surgeon Letterman and that it "should have been sent through him [Letterman]" originally.<sup>67</sup> He routed the document to Letterman and then inventoried his medical supplies and equipment on July 19. This appears to be his last official act for the Army of the Potomac. A severe case of typhoid fever put Sternberg aboard a steamer bound for Washington. It is unknown in which hospital he convalesced, but by the last week in August he had recovered sufficiently to perform light duty. On August 29, a letter from the surgeon general's office directed him to report to Dr. Lewis A. Edwards at the U.S. General Hospital in Portsmouth Grove, Rhode Island. As if he feared the surgeon general would change his mind, Sternberg hastily packed and departed the capital that evening.<sup>68</sup>

Portsmouth Grove Hospital stood on the low ground of Narragansett Bay's eastern shore, which was eight miles from Newport to the north and 23 miles from Providence to the south. To the east of the 12-acre grounds ran the Old Colony and Newport railroad, and an adequate wharf was on the bayside that required lengthening before it could properly accommodate hospital steamers. The administration building and officer's quarters, which was previously a hotel, stood in the center of the grounds with 14 new wooden pavilions on either side placed obliquely in a herringbone pattern. Each pavilion contained 56 beds and had a bathroom, lavatory, and watercloset on one end. Running the length of the avenue in between the two rows of wards was a covered walkway. When Sternberg arrived at the 2,200-bed hospital on September 2, he became the facility's executive officer, where he was essentially the hospital adjutant as well as the second-in-command. He was responsible for all reports and orders generated by the hospital and the maintenance of hospital records, supervised all clerks and orderlies in completing these tasks, and made appropriate distribution of patients received.<sup>69</sup>

Sternberg was also in charge of the surgical wards. "Comparatively few are wounded men – less than a tenth of the whole number," the editor of the *Boston Medical and Surgical Journal* commented, and the majority were "suffering from diseases contracted by imprudence, bad air, exposure, hardship, and insufficient food."<sup>70</sup> That cohort, however, represented anywhere from 170 to 220 patients. In the fall of 1862, when an epidemic of hospital gangrene—probably streptococcal wound infection—developed among these soldiers, the surgeons found that comparatively few patients could cause an epidemic. Sternberg was in charge of the surgical wards when the epidemic bloomed. Thirty-one years later, he recorded the events for another group of young military surgeons: "A considerable proportion of the cases were simple flesh wounds, progressing favorably to a cure by granulation and cicatrization. Others were of a more serious character and were attended with profuse suppuration...supplies of all kinds were abundant; nurses were in sufficient number and attentive, but the medical officer in charge [Sternberg] was young and inexperienced. Under his direction the wounds were systematically cleansed and dressed with absorbent lint, etc. Nature seemed to be fully equal to the work of repair, except in those cases where a mistaken conservatism at the field hospital had left compound fractures to her unaided efforts. In such cases profuse suppuration, and septic toxemia sapped the strength of strong men.... Doubtless it was from one or more initial cases that the infection was carried by the sponges of willing but ignorant attendants to a considerable number of wounds which up to this time were progressing rapidly towards cicatrization.... Wounds previously healthy became inflamed, painful, and angry looking, and within two or three days the cause of this change was apparent. The area of inflammation...rapidly extended and sloughs formed, sometimes as large as a man's hand and extending deeply among the muscles and along the planes of cellular tissue. Fortunately the infectious nature of the malady was quickly recognized and the measures adopted arrested its progress...these measures included the removal of those not yet infected from the overcrowded surgical wards, a general cleaning up, whitewashing

of walls, etc., and the necessary precautions relating to the conveyance of infection by sponges, etc. The treatment of the gangrenous wounds consisted of deep cauterization by means of nitric acid applied with a swab, the removal of necrosed tissue as soon as practicable, and the application of charcoal poultices.<sup>71</sup>

Sternberg's tour at Lovell proved to be only an 11-week sabbatical from field service. On November 15, the Surgeon General's Office directed him to report to Major General Nathaniel P. Banks at his headquarters in the Astor House in New York City. Sternberg had been appointed deputy medical director for an expedition Banks was organizing into the Department of the Gulf. Foiled in his attempts to keep a hospital assignment, he dejectedly put his office and affairs in order and packed for the field once again. Although his selection for this tasking was probably based on the needs of the army at the time—or may have been purely serendipitous—it may also have come as a subtle rebuke from the Surgeon General's Office indicating higher command displeasure at the tactics he initially used to obtain a general hospital assignment. However, Sternberg had served admirably at the regimental level in two major campaigns and was now familiar with the operations and administration of a large general hospital. Logically, these experiences made Sternberg an excellent choice for the role of deputy medical director.<sup>72</sup>

The Southern Expedition, which Banks had been organizing only since late October, entailed opening up the Mississippi River and gaining control of Mobile Bay. Surgeon Richard H. Alexander, the medical director for the expedition, sent Sternberg to Fort Monroe, where troops were assembling for the expedition to oversee medical logistics operations. On December 14, Banks' flotilla steamed up the Mississippi and docked at New Orleans. Orders issued that same day gave medical control of the city over to Alexander and his staff.<sup>73</sup>

Banks and the Southern Expedition failed to meet any of Lincoln's expectations. Dilatory to the extreme, Banks' half-hearted attempts to support General Ulysses Grant's investiture of Vicksburg only led to high casualties in two botched attacks on Port Hudson. During Alexander's two-month absence in support of Port Hudson operations, the medical director's office had been turned over to Sternberg's stewardship. As acting medical director for the department, this gave Sternberg his first independent experience in medical command and directing a large public health organization. It also acquainted him for the first time with yellow fever, a disease that struck hard at the Union vessels that plied the Mississippi River and blockaded the river delta. Cases from these ships were treated at the Naval Hospital near the river levee, but never extended into New Orleans proper to any significant extent. These circumstances generated considerable debate between local physicians and their northern colleagues as to whether yellow fever was imported or derived locally and whether the quarantine procedures were as effective as claimed. Sternberg did not deviate an inch from the sanitary and quarantine directives of his commander, and, observing actions later in his career, he was a strong advocate of a robust quarantine policy.<sup>74</sup>

After 14 months in Louisiana, Sternberg requested and was granted 40 days of leave to go home to Hartwick at the end of January 1864. He took the opportunity



once again to submit a written request for a hospital assignment in the north to now Acting Surgeon General, Colonel Joseph K. Barnes. As before, he stated, "I feel it to be highly important for my professional advancement, that I have an opportunity for hospital practice," but the tone of the letter lacked the edge of his similar missal from Harrison's Landing 18 months earlier.<sup>75</sup> He received orders to report to Major General Heintzelman, commander of the Department of the North, headquartered in Columbus, Ohio, upon the expiration of his leave.<sup>76</sup>

Sternberg reported on March 5 and was temporarily assigned to duty in the office of Lieutenant Colonel Charles Tripler, now medical director for the northern department. Among other duties, he traveled around Ohio examining discharged soldiers to verify their unfitness for duty. In early May, he was ordered to Camp Cleveland to examine recruits for the Ohio Volunteer Militia and find a suitable location for an officer's hospital. Established as Camp Taylor in 1861, the post served as a rendezvous, organization, and drill camp for northern Ohio volunteers, and the camp's one-story, wooden, pavilion-style general hospital had opened on January 12, 1863. Tripler found merit in Sternberg's work and assigned him as the new hospital commander in May. At last, he could enjoy hospital practice and build on the medical career he so cherished.<sup>77</sup>

Sternberg had been in command less than three months when he requested 10 days leave. These 10 days turned into a 13-week absence at Hartwick Seminary. Cleveland hospital was Sternberg's dream assignment of the war, and he had made an extended home visit only 5 months before. For him to leave his new command so precipitously—and for such a long period—suggests some significant problem existed at home that he felt required his immediate and personal attention. In reality, it was more than a problem; it was a family crisis of such magnitude that it would be denied and remain hidden in the Hartwick archives for a century. A schism, generated by personalities and church politics, had developed between the two men Sternberg loved most in the world: his father and grandfather Miller. Sternberg had always been his father's confidante, and he was aware that the rift between Levi and George Miller had originated directly from Levi's zealous and rigid evangelical stance on political church issues.<sup>78</sup>

Whatever advice or consolation Sternberg offered apparently had little influence. In late November after he had returned to Cleveland, the festering tensions between his father and grandfather over teaching methods and control of the curriculum burst dramatically to the surface. Levi informed Miller that as principal of the institution his decision on such matters was final, and he expected Miller to assent. Miller bluntly told him that such would not be the case. However, at chapel two days later, Miller acknowledged before the entire school and Sternberg that he "had been excited & used harder language than I ought," and, "if I had offended him I begged his pardon..."<sup>79</sup> But Reverend Sternberg was in no mood for conciliation. To Miller's surprise, embarrassment, and personal hurt, his son-in-law launched into a diatribe of the burden he had borne over the past 13 years, how he had given up the use of the principal's house to Miller, and how he had treated him with great deference. He declared that he considered Miller's position at the seminary

as subordinate to his own and that at the end of the term he would resign. Hartwick trustees conferred in mid-December, ignored Sternberg's threat, gave sole charge of the theological students to Miller, and placed Sternberg in charge of the classical school. Reverend Sternberg immediately tendered his resignation. Sternberg returned to Cleveland with a heavy heart. Fortunately, his duties kept him busy and on the move. Temporary duty at the general hospital in Louisville, Kentucky, consumed part of December and in early 1865, professional staffing issues required his attention as well as disability determinations for patients and their discharge from the service.<sup>80</sup>

In April, the war ended and the Federal government began to disband the army. On July 4, 1865, Sternberg received instructions to dismantle the Cleveland hospital. Patients still requiring treatment were transferred to Camp Dennison, Ohio; female nurses were discharged, and contracts with male nurses were terminated; and hospital records, property, and stores were packed for shipping. He prepared and sent his last report as hospital commander to the surgeon general. Orders dated July 17, 1864 relieved him of duty at Cleveland and assigned him to duty at Camp Dennison.<sup>81</sup>

Camp Dennison, which was situated 16 miles north of Cincinnati, now served as the rendezvous and training depot for the 13th U.S. Infantry. By the time Sternberg arrived on July 27, the hospital at Dennison was also being dismantled, and the regiment was preparing to move to its new home at Jefferson Barracks, Missouri. Assigned as Attending Surgeon to Headquarters, 13th U.S. Infantry on August 8, Sternberg selected the hospital and medical equipment he wanted to take to Jefferson Barracks. He then boarded the *Lady Franklin*, bound for St. Louis and his first peacetime assignment.<sup>82</sup>

## *Chapter Three*

# The Kansas Plains

George Sternberg apparently transitioned from the heart-pounding urgency of combat casualty care to the slow-paced routine of postwar army medicine in garrison with ease and grace. No official or private records suggest that he even contemplated resigning his commission after the war to return to the uncertain prospects in the civilian medical world of New York. At \$100 per month, his army salary was more secure and in some ways easier to earn than those of his civilian peers. Demonstrating fiscal responsibility and security to certain parties in Cooperstown was now of primary importance. A long-distance relationship with Louisa Russell had withstood his discouraging days on Long Island and the anxiety and separation of war. Sternberg yearned for the domestic tranquility of marriage to Louisa, but the memories of his own economically insecure childhood probably continued to lurk in his mind. It was imperative that the proposal be cloaked with the promise of financial security, and the Army Medical Department provided it.

Louisa married George Sternberg in Cooperstown on October 19, 1865, presumably in the Russell family home on south Chestnut Street. The Russells were Presbyterians, but Levi Sternberg assisted the minister, Charles K. McHarg. After a short honeymoon to an unknown location, the couple returned to Jefferson Barracks where they began housekeeping in early November.<sup>1</sup>

Jefferson Barracks sat on a plateau overlooking the Mississippi River 3 miles southwest of St. Louis. A relatively old post, it had been the focal point for many western expeditions since 1827 and was converted into a large hospital during the war. In 1865, the post was once again reconfigured to accommodate infantry troops moving to western stations. Service on the western frontier became the focus of the army's postwar mission, specifically the protection of railroad construction parties and settlers as they traveled west. Commanded by Major General William T. Sherman, the Military Division of the Missouri stretched from Canada to Texas and from the Mississippi River to the Rocky Mountains. This vast area

encompassed the Great Plains, over which many emigrants were moving west and brought small towns, fences, stagecoach lines, railroads, and a culture that would never understand the Indian way of life. The Plains tribes—afraid and angry—realized that they would have to fight to safeguard their independence, culture, and way of life for the future. Army strategy to provide protection for this westward advance was to dot the major emigration arteries with forts. In Kansas, on the southern plains, these arteries were the Smoky Hill and Santa Fe trails. Along the Smoky Hill route to Denver, Fort Riley, Fort Ellsworth (later Harker), Fort Hays, and Fort Wallace were established.<sup>2</sup>

An Army Medical Department constrained by post-Civil War reductions in manpower and funding provided medical services to these forts. The medical department had a fixed strength of 210 medical officers in the rank of major and below available for assignment, and more than 280 forts required routine medical services in garrison and medical support while on campaign. Physicians who remained in uniform after the war frequently found themselves moving west to support these operations. Since Sternberg arrived in Missouri, he had been the acting post surgeon and sole physician at Jefferson Barracks. In January 1866, Major and Surgeon Richard H. Alexander, Sternberg's former boss in New Orleans, assumed duties as post surgeon. Alexander's arrival made the junior-ranking Sternberg a free agent and heralded an imminent change of station for him. The tranquil, domestic life that he and Louisa briefly enjoyed ended in mid-April when he received orders to accompany elements of the 3rd U.S. Infantry from Fort Leavenworth to Fort Ellsworth, Kansas. Upon arrival, he would assume duties as post surgeon. By the end of April, he was on his way, and one month later he was promoted to captain.<sup>3</sup>

Fort Ellsworth stood on the flood plain of the Smoky Hill River 93 miles southwest of Fort Riley. In the spring of 1866, the garrison, composed of two companies of the 2nd Cavalry and two of the 3rd Infantry, protected laborers constructing the Eastern Division of the Union Pacific Railroad and many new stations west of the post, and also provided escort details for stage companies. Construction of the new Fort Ellsworth, one mile to the northeast, would begin in the summer. Once the new fort was completed, it would also serve as a quartermaster and commissary depot for posts on the Arkansas River and in Colorado and New Mexico. But the dilapidated collection of sod and log huts that greeted Sternberg at the end of the trail was a fort in name only. Barely high enough for a man to stand in, these shanties quartered both officers and enlisted soldiers. Prairie winds blew through them, mud dripped in congealed masses from the roofs during thunderstorms, and rats and mice scurried throughout them. The post hospital consisted of one tent. No quartermaster or commissary storehouses existed, leaving supplies at the mercy of the elements and marauding animals. Horses and mules were sheltered behind dirt and brush embankments because no stables had been built. Sternberg looked forward to a trying winter, but he would not have exposed Louisa to such rough and uncomfortable accommodations. She returned to Cooperstown until new quarters were ready in the spring of 1867.<sup>4</sup>

Although “lonely and disconsolate” for Louisa, Sternberg found his time completely occupied with the duties of a frontier soldier and physician.<sup>5</sup> Professionally sterile and generally monotonous, daily duties centered around sick call; inspections of living areas, water supplies, stables, and kitchens; and medical department paperwork. Occasionally, work details or military operations away from post required medical support. The routine clinical fare for a post surgeon consisted of venereal diseases, which were brought west from eastern stations or contracted through liaisons with post laundresses or frontier prostitutes; respiratory and diarrheal diseases; and scurvy, secondary to the nutritionally poor army rations. Army wives and children, as well as the local population, provided some obstetrical, pediatric, and psychiatric variety to this bland medical diet. The frontier army doctor who took an interest in the health of families on post became an invaluable pillar of support when the men were in the field. Surgeons were encouraged by the medical department to provide such care, but even if they had not been, necessity demanded it. Sternberg was assisted in these responsibilities by civilian contract surgeon, also referred to as Acting Assistant Surgeon J. A. Sabine, Hospital Steward John Lamb, and enlisted soldiers temporarily detailed as medics from line companies on post. In July, he became the sole medical provider for the post when Sabine departed, and Hospital Steward John Lamb was arrested and confined. His burden would not lighten until the fall when a new civilian contract surgeon, Dr. Thomas B. Chase, arrived and Charles Miller, a replacement hospital steward, were assigned.<sup>6</sup>

During the summer of 1866, construction activities increased dramatically and the new post began to take shape. Sternberg and Chase anxiously watched construction of the new hospital 200 yards south of the main garrison. When completed, it would be a substantial structure of dressed sandstone with two 20-bed wards, a bath, dispensary, medicine storeroom, kitchen, dining room, and its own well. Fort Ellsworth was renamed Fort Harker on November 11, and in January 1867 part of the new post was occupied.<sup>7</sup>

The construction of a large permanent army post and the Union Pacific Railroad, which by the fall of 1866 had reached Junction City, created many jobs for recently discharged Civil War veterans. Businessmen in Ellsworth County saw this as the beginning of a great opportunity for lucrative land development and commercial ventures. The potential for the town, to be named Ellsworth, to grow into a prosperous agricultural center was great. An epidemic of land speculation fever swept over the county, and Sternberg was not immune. Initially, he filed a homestead claim for a quarter section of rich bottomland on the wooded banks of the Smoky Hill River two and one-half miles south of the fort. Impressed with the area and its potential and having additional funds from a 33 percent pay raise, he shrewdly amassed 320 fertile acres by purchasing land adjoining his claim from other officers. One of these parcels supposedly included a large farmhouse, but Reverend Sternberg and son, Charles, commented that it was a single room log house with a 20 foot by 14 foot cottonwood stockade building roofed with sod behind it that served as a kitchen. Such enthusiasm for permanency in an area,

suggested by these purchases, seems incongruous in an army officer whose life by definition is nomadic. Jennie Barnitz, wife of Captain Albert Barnitz, 7th U.S. Cavalry, Fort Harker, and friends of Sternberg, remarked to her husband that, “he [Sternberg] is more certain of remaining here than others and can surround himself with all those things.”<sup>8</sup> Mrs. Barnitz’s comment notwithstanding, army officers had a long history of buying land near frontier posts and properly timed ventures into the land market could be financially rewarding. Sternberg’s intentions appear to go beyond supplementing his income. Although never stated, he may have been seriously contemplating resigning from the army and settling in Kansas. Establishing a medical practice in this booming area would have been relatively simple, and a farm would provide additional income and security for a growing family. However, Sternberg had another motive. Although Sternberg biographers disagree on this issue, his father stated clearly that his oldest son was so taken with Ellsworth County that “he had formed the project of getting the family settled there.”<sup>9</sup>

Reverend Sternberg had become principal of the Iowa Lutheran College in Albion, Iowa, in 1866. At his son’s urging, he visited Ellsworth County and although he “was rather pleased with the country,” he was “not as enthusiastic as George was.”<sup>10</sup> Reverend Sternberg’s eldest son was persistent and persuasive in discussing the development and future possibilities of central Kansas for his parents and nine siblings. He had also been successfully coaxing his brother Theodore, an attorney in St. Louis, to join them. Obligations in Iowa precluded the elder Sternberg from any move until late spring when his teaching and administrative duties were completed. With his father’s approval, Sternberg recruited three other brothers, Frederick and 17-year-old twins Charles and Edward—all anxious to see the wild west—to precede the family to Ellsworth and begin working the ranch. With Theodore as ranch foreman, Sternberg purchased chickens, some horses, and the beginning of a dairy cattle herd; fields were plowed and planted. By the summer of 1867, Charles was delivering fresh milk, eggs, butter, and vegetables to the soldiers at Fort Harker.<sup>11</sup>

As the harsh Kansas winter of 1866–1867 gave way to spring, the U.S. Army’s presence in Kansas continued to grow, but the Little Arkansas treaties of 1865 and the Bluff Creek Council held in early 1866, which kept the southern plains generally peaceful through 1866, were tenuous. Sporadic fighting between whites and Indians continued throughout the winter. General Sherman’s response to this situation was to conduct total war on the northern and southern plains until the Indians submitted to life on a reservation or were exterminated. He had developed plans for such operations against the northern and southern plains tribes by March 1867. The U.S. Congress, however, favored a negotiated resolution. While a peace commission delayed Colonel John Gibbon’s expedition to the northern plains, Sherman launched General Winfield Hancock on an expedition to harass and intimidate the southern plains Indians in April.<sup>12</sup>

Louisa Sternberg arrived on the afternoon of May 26 after a tiring, 36-mile journey from the new Salina railway station in an army ambulance. Elated to have his darling “Puss” with him again, Sternberg proudly showed her their almost completed

quarters on post and then took a trip to the ranch. The four Sternberg farmers gave her a complete tour, but whether her eastern urban upbringing could capture her husband's future vision of the ranch as she surveyed the one-room log hut is unknown. It mattered little for the moment because the change in Sternberg's gloomy spirits was immediate, and Jennie Barnitz had commented on it to Louisa. Upon hearing this, Louisa vowed, "I will never leave George alone again, under any circumstances. I did not know he missed me so."<sup>13</sup> Louisa's pleasant, kind-hearted nature and "high moral principle" rapidly gained her warm acceptance by the small contingent of army wives at Fort Harker, diligently working to make their spartan existence more comfortable.<sup>14</sup> The Sternbergs occupied their new one-story frame quarters on the parade ground in mid-June. Jennie Barnitz told her husband in a letter that Louisa had "five spacious rooms—very handsomely furnished" and "china and silver for her table."<sup>15</sup> They also employed an Irish cook named Bridget. According to Mrs. Barnitz, the Sternberg home was "the pleasanter one I have ever seen in the Army..."<sup>16</sup> Their table, which was spread with the fruits of Sternberg's well-cultivated garden, became a happy gathering place for junior officers and their wives.<sup>17</sup>

Louisa's introduction to the pleasantries of frontier army life was accompanied by the anxieties of a post preparing for war. Hancock's expedition failed miserably and initiated Cheyenne, Arapaho, and Sioux aggression along the Smoky Hill route in June, particularly in the vicinity of Fort Harker, and slowed railroad construction considerably. Fort Harker bustled with activity, and the post commander, Colonel A. J. Smith, intensified efforts to guard railroad workers and settlers in the area, which included a 10-man detail to the Sternberg ranch. In addition, 500 to 800 quartermaster employees labored feverishly not only to construct the new post and supply depots, but also to resupply and outfit troops arriving from Fort Riley. Elements of the 10th Cavalry; the 3rd, 37th, and 38th Infantry Regiments; and a regiment of 18th Kansas Volunteers camped in and around the post.<sup>18</sup>

This large and increasing military and civilian population living in less than ideal conditions generated an immense sanitation problem. Compounding the problem were heavy spring rains and flooding during the first week of June that made the fort and Ellsworth a muddy quagmire. Sanitation and personal hygiene techniques of the day were primitive, and the Civil War experience of the average line officer did nothing to bolster his faith in the preventive measures advocated by the medical department. Post surgeons issued directives for the proper disposal of animal refuse from the slaughter pens, human waste, and garbage, but often the most basic recommendations were ignored. The Smoky Hill River and other streams—used for bathing and washing clothes—became convenient dumping sites for refuse of all varieties. The single water source for the post, a spring located two miles from Harker at old Fort Ellsworth, was inadequate and too inconvenient for the large number of people it supplied. Consequently, drinking water was obtained from the polluted streams. These crowded, unsanitary conditions primed Fort Harker for a gastrointestinal disease outbreak. All that was required was a virulent organism that could be easily transmitted in this environment.<sup>19</sup>

One such organism, *Vibrio cholerae*, struck North America for the third time in 1866. This bacterium, transmitted primarily by water or food that has been in contact with contaminated water, produces a toxin that is responsible for the profuse watery diarrhea, rapid dehydration, and physical collapse associated with the disease. Before the advent of intravenous fluid replacement and antibiotics, no effective treatment existed for cholera. The U.S. Army suffered 2,813 cases and 1,269 deaths in 1866. Although few physicians believed that a microorganism was responsible for the disease, many acknowledged that human excreta were involved with disseminating cholera. Practical-minded American physicians embraced the recommendations of Dr. Max von Pettenkofer to boil water and disinfect clothing and bed linens. Circular #5, *Report on Epidemic Cholera in the Army of the United States, During the Year 1866*, which was issued to all medical officers, reviewed the epidemic and provided guidance for preventing and controlling the disease to prepare physicians for an outbreak in 1867. The report stressed the value of quarantine measures and hygienic precautions, particularly water purification, disinfection of patient discharges, ventilation, and adequate air space in barracks.<sup>20</sup>

In June 1867, cholera made its first appearance among civilians in New Orleans, Vicksburg, and St. Louis. Late in the month, Fort Riley had its first cases. Although the source is unknown, the victims were civilians. Through the energetic efforts of Post Surgeon Bernard J. D. Irwin, the disease did not become epidemic, and no cases were reported in soldiers assigned to Fort Riley or in those soldiers passing through the post on their way west. These facts have led historians to believe that cholera was introduced at Fort Harker by civilians, from Fort Riley or points south and east, whose movements were uncontrolled by the military.<sup>21</sup>

On June 28, George W. Keeton, a herder and butcher, and Private George Groom, Company H, 38th Infantry, became the first victims of cholera at Fort Harker. How conscientious Doctors Sternberg and Chase had been in urging sanitary recommendations on commanders and how well their advice was heeded before cholera struck are questionable. Sternberg admitted in his report "...the police of the camps was not good when cholera made its appearance. Some of the company sinks were in wretched condition, and there were several offensive holes about the post where slops and garbage from the kitchen had been thrown. Measures were at once taken to remedy these evils; a strict system of policing was inaugurated; the camps were all moved to new grounds, and disinfectants [solutions of permanganate of potash, carbolic acid, quicklime, and chlorine] were procured and freely used."<sup>22</sup> These statements do not necessarily indicate a lack of proper medical recommendations as much as they do a lack of command support in their implementation.

On June 30, with the cholera epidemic 2 days old, Sternberg apparently had the cooperation of the post and line commanders as he stated, "I made a thorough sanitary inspection of the post... and all my recommendations in regard to policing have been carried out by the post commander. The camps.... of the 38th Infantry have been moved to better and higher grounds. The old sinks have been filled up and new ones dug."<sup>23</sup> Sternberg also isolated cholera cases from other patients in hospital tents "pitched for the sick in the quarters of each company"



and “pitched 50 yards in the rear of the hospital.”<sup>24</sup> In essence, he was following the quarantine and hygienic guidance provided in Circular #5. Cases of cholera and Indian activity increased through the first week of July.<sup>25</sup>

Sternberg again made recommendations concerning the movement of transient and garrison troops about post, the location of cantonment areas, and sanitary policing of these camps on July 9, but he met resistance from the quartermaster depot in their implementation. The “Remarks” Sternberg added to this letter overflow with frustration and barely controlled anger: “The above recommendations in so as they relate to the movement of troops & to the employees of the Q.M. [Quartermaster] Dept. were not fully carried out. My efforts to secure a systematic & efficient method of policing in the camps of the Q.M. Employees were only partially successful, in consequence of the tardy and incomplete manner in which the Depot Q.M. assisted them.”<sup>26</sup> Four days later, he requested a “permanent police party” be designated to report to him, and stated that “New cases of cholera are occurring everyday & we may anticipate a severe epidemic, unless every precaution is taken—constant policing and constant disinfection of privy vaults, etc. is essential....”<sup>27</sup> Following these recommendations, he provided a plan approved by the post commander for a cholera hospital to be established north of the railroad depot, but “nothing was done in regard to it by the Depot QM, who was charged with the execution of it.”<sup>28</sup> Records provide no reason for the quartermaster’s disregard of medical recommendations in an expanding epidemic. However, Madison Mills, Medical Director, Department of the Missouri, stated in his report of August 5 that, “Large details have been made from the command, and from the employees of the quartermaster’s department, to thoroughly police the grounds, move tents, and disinfect privies and latrines, etc. Tents are being put up for the accommodation of cholera patients on the opposite side of the garrison from the hospital now occupied.”<sup>29</sup> Exactly when these details were formed is obscure. The side of the garrison opposite the hospital was the north side, where Sternberg had recommended a cholera hospital be established on July 17.

Sternberg and Chase were not the only surgeons at Fort Harker. Captain and Assistant Surgeon Ely McClellan, Assistant Surgeon George McGill, and Acting Assistant Surgeon Ira Perry served with the 38th Infantry. Acting Assistant Surgeon Algernon Squier, new to the army and the plains, attended to the Kansas Volunteers. These officers ensured their unit areas were appropriately positioned and policed. When cholera broke out, they tended to their sick in camp, and only the severe cases were admitted to the post hospital.<sup>30</sup>

Unfortunately for the medical efforts at Harker, troop movements and the appearance of cholera at Fort Zarah took surgeons McGill, Squier, and Perry away from Fort Harker. Military dependents and civilian employees were fleeing Ellsworth County rapidly and, by the end of July, Ellsworth was little more than a ghost town. Elizabeth Custer, wife of Lieutenant Colonel George A. Custer, remembered the post as “the most absolutely dismal and melancholy spot I remember ever to have seen.”<sup>31</sup> The remaining medical staff and many of the women who had not fled the fort intensified their efforts to control the epidemic and succor the

sick. True to her word, Louisa refused to leave her husband. Side by side with the Sisters of Charity, she nursed the sick until she “was marked by that terrible finger which bade her go alone into the valley of death.”<sup>32</sup> Once marked, Louisa succumbed rapidly. Albert Barnitz stated to his wife that Louisa died six hours after contracting cholera. Sternberg stoically reported to Surgeon General Barnes, “One of the ladies of the garrison died of cholera on the 15th of July,” but he was utterly devastated.<sup>33</sup> Bridget, the Sternberg’s cook, died the next day.<sup>34</sup>

The growing cholera epidemic at Fort Harker soon received command attention. Surgeon Madison Mills arrived late in the evening of July 22 with Major and Surgeon Ebenezer Swift, Captain and Assistant Surgeon John Brewer, and Acting Assistant Surgeons Augustus Wiggins and William Renick to appraise the situation and ascertain what assistance was required. The post had had 88 cholera cases and 42 deaths. Sanitation was in a miserable state. The surgeons were physically and psychologically distraught. Chase, who had been ill since July 18, lost his wife to puerperal convulsions only a few hours before the medical party arrived. Although Louisa had been dead only three days, Sternberg assumed Chase’s duties with his own. When Medical Director Mills arrived, he found Sternberg depressed and prostrate in bed, and Chase “not in condition to do any kind of duty.”<sup>35</sup> Brewer immediately relieved the post surgeon of his medical duties.<sup>36</sup>

With the exception of Renick, all of the surgeons involved with the epidemic prepared after-action reports. Troop movements, poor drinking water, and unsanitary conditions were all implicated as causes of the epidemic. Of all the physicians, only Brewer used his report to glorify his own actions, and, through the omission of Sternberg’s efforts, cast the post surgeon in a culpatory light. Brewer stated his immediate and continuing actions redundantly in positive, forceful terms: “I was at once assigned to duty...”; “immediately went on duty and visited the cholera wards...”; and “I took personal charge of the cholera wards.”<sup>37</sup> Clearly, Brewer wanted the medical command—and posterity—to know he was the man of the hour. He remarked: “The most recent and approved methods of treatment were adopted, and every known means resorted to for the cure or alleviation of the disease.”<sup>38</sup>

The weary surgeons at Fort Harker were not ignorant of the current therapies recommended for cholera. Assistant Surgeons McClellan and McGill had experienced the cholera epidemic of 1866. Joseph J. Woodward’s *Report on Epidemic Cholera in the Army of the United States, During the Year 1866*, which was issued in the spring of 1867, provided treatment guidance and stated that no “new light has been shed upon the existing obscurity of the subject.”<sup>39</sup> References in the post medical library, such as George B. Wood’s *Treatise on the Practice of Medicine*, also offered recommendations and guidance. Therapy included oral dosing with opiates (Squibb’s Mixture) and the inhalation of chloroform for early cramping, diarrhea, and vomiting. Although large doses of mercurial compounds (calomel), camphor, and cayenne pepper were given to patients with severe manifestations of disease, by 1866, reliance on enormous doses of opiates, mercurial compounds, and alkaloids had declined dramatically. The medical profession was discouraged and pessimistic not only about any treatment for cholera, but also about therapeutics in general.

Although progress had been made in other areas of medical science, specific disease therapy lagged behind. Sternberg commented in his report that chloroform treatments were first used upon McClellan's recommendation, but later calomel was adopted and proved more efficacious. Brewer continued to use these regimens, with the addition of quinine, without much success. His report continued: "A large majority of the cases were not seen until the stage of collapse had ensued..."<sup>40</sup> This is not true. From the beginning of the epidemic, Sternberg had mandated that command surgeons treat as many cases as possible in their unit areas and only send the worst cases to the post hospital. Brewer was seeing the most severe cases, but this does not mean these cases received prior medical attention.

Brewer admitted that the origin of the epidemic was uncertain and that the evidence for the importation of cholera was "meager," but he did not wholly preclude this possibility.<sup>41</sup> He was emphatic about the possibility of a local origin of the epidemic. He used three contemporary studies of cholera—one study stated that without a "peculiar cause" of cholera no amount of filth will generate it, and the other two studies supported filth as the cause of the disease—to support his contention that poor sanitation at Fort Harker, which he described in detail, caused the epidemic.<sup>42</sup> Brewer's comments reflect the most current thoughts and ideas of cholera causation and epidemiology. These made sense given that medical science had no knowledge of a bacteriologic basis of disease and that the sanitation on and around the post was poor prior to the epidemic.

In his concluding paragraph, Brewer stated, "...as soon as I reached the post I put in operation every means available for correcting the deplorable condition of affairs."<sup>43</sup> This included removing filth, weeding and policing areas, moving sinks regularly, and using disinfectants liberally. Although Fort Harker's surgeons had been using disinfectants and Sternberg had requisitioned more, Brewer took pride in stating, "To the free use of disinfectants in the cholera tents and sinks, I attribute the immunity from the disease enjoyed by the nurses and attendants. No case of cholera occurred among them after I took charge."<sup>44</sup> To add insult to injury, he lauded Renick, Chase, Swift, and Hospital Steward C. S. Darling as men who "did their duty" while ignoring the efforts of the post surgeon.<sup>45</sup>

As the chief medical officer, Sternberg was responsible for providing appropriate sanitary recommendations to the commander at Fort Harker. However, Sternberg possessed no command authority in his own right. Whatever the conditions were at the post before cholera struck, he had command support in implementing appropriate sanitary measures during the epidemic's initial stage. As the situation became critical, however, command support apparently faded. With cases mounting, his medical staff shrinking, and personal tragedy overwhelming him, Sternberg found it impossible to ensure his recommendations were being enforced. He and those assisting him failed in their sanitary mission not because of wanton neglect or ignorance, but because they did not receive command support, did not have authority over the civilians around the post, and were eventually overcome by events requiring more time and medical officers than were available.

Sternberg was granted a leave of absence at the end of July. Although he found solace and comfort in the arms of his family, his future hopes and dreams had been shattered. He had watched—helpless—as his heart's dearest was rapidly torn from him and buried in a crude wooden box. If only he had sent her away to the ranch, to Iowa, or to Cooperstown when the first case was found, she might still be alive. Pursued by this specter, his life had little zest and the ranch became just another piece of land. All that was left was the army. Sternberg was relieved of duty at Fort Harker in August, replaced by Assistant Surgeon Blencoe E. Fryer, and assigned to Fort Riley.<sup>46</sup>

While Sternberg became acquainted with Fort Riley, a peace commission met with the southern plains Indians at Medicine Lodge Creek, Kansas, in October 1867. The resulting treaty gave all rights to land between the Arkansas and Platte rivers to the United States; placed the signatory tribes on two reservations and offered them material support, arms, and ammunition; and guaranteed no unauthorized trespassing by whites. But congressional funding was slow and the younger, more volatile tribal factions, who were extremely displeased with the terms, seethed with hostility during the winter. General Philip H. Sheridan, who had replaced General Hancock as department commander in August, feared that Indian aggression would increase when the buffalo returned to their feeding grounds. In the spring of 1868, Sheridan sent the 7th and 10th Cavalry Regiments on campaign across Kansas to safeguard settlers and laborers working on the Union Pacific Railroad.<sup>47</sup>

The 10th U.S. Colored Cavalry Regiment, commanded by Colonel Benjamin H. Grierson, was a relatively new unit on the plains. Most of the 10th U.S. Colored Cavalry Regiment was stationed at Fort Riley during the winter of 1867–1868. When orders arrived for the unit to move west in late March 1868, Sternberg and Acting Assistant Surgeon Henry S. Kilbourne were assigned as medical staff to this regiment. Sternberg's orders directed him to prepare medical supplies, equipment, and transportation and to be ready to accompany Major Merideth H. Kidd and six troops from Fort Riley to Fort Hays. With Buffalo Bill Cody as hunter and scout, the expedition arrived at Fort Hays on April 24 and camped on Big Creek near the head of the Union Pacific Railway. Companies from the 7th Cavalry were camped one mile away on the other side of the same stream. Indian activity was minimal. Soldiers from both regiments settled into a quiet daily routine; they socialized, hunted, fished, and enjoyed fresh rations from Fort Hays daily. The command was generally healthy, and while nonbattle injuries were apparently infrequent, they could have serious results. Private Michael Mitchell of K Troop accidentally shot himself and a few weeks later Sergeant Ewing Smith of C Troop died in the same way.<sup>48</sup>

Sternberg was fascinated with the natural beauty of undeveloped western Kansas, with its abundance of flora and fauna, on the seemingly interminable marches. His inherent scientific curiosity led him far afield to gather fossils and animal remains, but he kept a particularly watchful eye out for Indian artifacts for the Army Medical Museum. The museum, established by Surgeon General William A. Hammond

in 1862, began building a collection of pathological specimens during the Civil War. In January 1868, Dr. George A. Otis, who was in charge of the anatomical section of the museum, decided to take advantage of the western expansion and sent letters to all post surgeons requesting that they contribute Native American curiosities, crania, and skeletons for anthropological study. Sternberg contributed significantly to this collection and that of the Smithsonian over the years, but in 1868 he ranged so far afield that officers in the command feared that he might fall prey to the Indians on these excursions. Apparently unconcerned for his safety, Sternberg continued his explorations throughout the campaign.<sup>49</sup>

Sheridan's hope that the Indians would remain quiescent was short-lived. In late May, Cheyenne dog soldiers attacked Coyote Station and Fort Wallace, Kansas. The 10th Cavalry was dispatched to the fort and from its base camp on Rose Creek companies searched in vain for the elusive Indians in the Smoky Hill, Saline, and Solomon River valleys during June and July. Indian encampments near Fort Dodge began to break up in July, but the tribes moved north rather than south to the reservations. Cheyenne raids continued, prompting Indian Superintendent Thomas Murphy to withhold all weapons from the tribes, but tribal elders managed to convince Lieutenant Colonel Alfred Sully, commander of the District of the Arkansas, that no trouble would ensue if arms were distributed. Sully consented, and Indian war parties struck settlements immediately along the Saline and Solomon rivers north of Fort Harker. The 10th Cavalry gave chase, but the Indians eluded them for the remainder of the month. Frustrated, the 10th Cavalry was directed by Sheridan to turn in all excess equipment in preparation for a rapid pursuit of the Indians.<sup>50</sup>

Wild Bill Hickok and Buffalo Bill Cody guided the cavalry southwest to the headwaters of Walnut Creek. On September 4, the expedition followed a fresh Indian trail located by Hickok and discovered an Indian burial party, which had just placed the remains of one of their tribe, wrapped in buffalo robes, in the notch of a walnut tree. According to Captain George Armes, Sternberg was "very anxious" to have this trophy for the Smithsonian Institution, although "picking up dead Indians was not considered in the program."<sup>51</sup> The moment the burial party departed, Sternberg commandeered a wagon to the tree, secured his prize, and shipped it off to Washington via Hays City.<sup>52</sup>

Sheridan was now determined to strike the Indians in their winter camps, when ponies would be at their weakest, supplies would be limited, and movement would be difficult. He developed a three-pronged attack on the Indians in the Canadian and Washita river valleys. One column would proceed from Fort Bascom, New Mexico, up the South Canadian River; another column would proceed from Fort Lyon, Colorado, and would move toward the Antelope Hills and Red River; the third, and strongest column would march south from Fort Dodge into Indian Territory and establish a supply depot there. At Fort Dodge, Sternberg was relieved of duty with the 10th Cavalry and appointed chief surgeon for the third column of Sheridan's forces under Sully's command. Sternberg readied enough medical supplies and equipment to support 1,100 men for the winter. Three other medical officers—

Captain Elias J. Marsh with the infantry battalion, Captain Henry Lippincott, and Acting Assistant Surgeon William Renick with the 7th Cavalry—were assigned to the expedition. However, Sternberg felt they would be insufficient support to the troops and supply trains that would be moving between Sully's base of operations and the rear area supply depot at Fort Dodge. He lobbied for two more physicians, but was granted only one, Acting Assistant Surgeon William S. Forwood, and an extra hospital steward.<sup>53</sup>

On November 12, 1868, Sully's troops and 450 wagons departed their camp near Fort Dodge. Six days and 100 miles later, Sully established Camp Supply at the confluence of Wolf and Beaver creeks just south of the North Canadian River. This camp served as a supply point for winter operations. Infantrymen immediately began constructing a stockade, winter quarters, and storehouses, and digging wells. Sheridan and his staff, which included army surgeon Morris Asch, arrived on the evening of November 21 in a severe snowstorm. As Sheridan's party approached Camp Supply, they had spied Indians moving along a trail toward the Washita River, and the general immediately dispatched Custer to the valley of the Washita. Under Sternberg's direction, the medical staff prepared for the wounded soon to come. A hospital "consisting of four hospital tents arranged as two wards with a double chimney of stone between them, one hospital tent as dispensary, and two wall tents for [a] kitchen" were erected quickly.<sup>54</sup>

Custer found the village of Chief Black Kettle on the Washita River late on the evening of November 26. Under cover of darkness, his troops surrounded the village and just before dawn they launched a lightning attack that reduced it to ashes. However, when the 7th Cavalry arrived at Camp Supply on the afternoon of December 1, it brought plenty of grist for the medical mill. Two officers and 17 men had been killed, and three officers and 11 men were wounded. Most severely wounded was Sternberg's friend, Captain Albert Barnitz. Shot through the flank at close range, Barnitz was pronounced in mortal condition on the field by Doctors Lippincott and Renick, who assumed his intestine had been pierced. Once in the hospital at Camp Supply, Sternberg carefully examined Barnitz and "found him very much fatigued by the journey, but having a good pulse, and presenting no bad symptoms."<sup>55</sup> The bullet had entered just below the twelfth rib, traveled obliquely toward the spine, and exited close to the hip bone. From the entry wound bulged a large mass of omentum. Sternberg reported, "On the 8th I removed the protruding mass of omentum. I commenced the operation with a wire ecraseur, but before it was completed the loop of wire broke, and I severed a small portion which was not yet cut through, with scissors ... December 12th the [Brevet] Colonel is able to sit up an hour or two at a time, has a good appetite, sleeps well, and may be considered out of all danger."<sup>56</sup> On December 8, Albert reported to Jennie that he was "doing exceedingly well" under Sternberg's attentive care.<sup>57</sup> By Christmas Eve, Barnitz wanted to return home, but Sternberg prudently kept him under observation for another two weeks. Sternberg and his colleagues also treated many of the 53 Indian captives—mostly women and children—who had been wounded during the battle.<sup>58</sup>

Sternberg was relieved from duty with the expedition and assigned as post surgeon on December 7 at Camp Supply. He spent the winter administering medical activities at the depot. In good weather and without Indian activity, he collected specimens of animals, birds, and Indian paraphernalia for the Smithsonian Institution and the Army Medical Museum. In March he reported to Medical Director Madison Mills at Fort Hays for reassignment. Mills did not have a position immediately available, and Sternberg spent a month working his ranch before replacing Assistant Surgeon Leonard Y. Loring as post surgeon at Fort Riley. This 14-month tour proved to be a stable one, uninterrupted by epidemics or field service. Professional interests that had remained dormant while he was in the field were once again explored, including hobbies such as photography, botany, and gardening.<sup>59</sup>

Sternberg's interest in paleontology and ethnology continued unabated. He had collected Indian artifacts and fossils before 1868 in and around Fort Harker, but the summer campaign that year introduced him to new paleontological delights. The 10th Cavalry marched—more or less—directly west across Russell, Ellis, Trego, Gove, Logan, and Wallace counties. During the Cretaceous Era, some 65,000,000 to 140,000,000 years ago, this area had been a great inland sea. The sand and gravel crust Sternberg rode across had been deposited only 10 to 24 million years before, but over the millenia the Smoky Hill River and its tributaries had carved their way down into the Niobrara Chalk formation. What were then chalk bluffs had been the floor of the ancient sea and partially embedded within them were the remains of long extinct species of marine life. These were the treasures Sternberg rode extensively to find, examine, and collect. Although he gathered specimens all along the Smoky Hill River that summer, the two-month encampment on Rose Creek was Sternberg's most productive time as a paleontologist. Not only did he conduct numerous excursions, but also he assisted Captain and Assistant Surgeon Theophilus H. Turner, who was a post surgeon at Wallace and also an amateur paleontologist. By the end of the first week in July, Sternberg had found many vertebrate fossil specimens, but before they could be appropriately labeled and securely packed he was on the march again. Sternberg was aware of the value of his work and his driving desire to organize this collection induced him to request relief from duty with Sheridan in November at a critical juncture in the campaign. Sternberg, who was completely cognizant of the strategic and tactical medical requirements of the expedition, suggested that he be ordered to Washington to unpack these specimens and then two days later asked for more medical assistance. Surgeon General Barnes politely denied this odd request. The majority of specimens were given to Joseph Henry and Spencer Baird at the Smithsonian Institution and described by paleontologists Joseph Leidy, Edward D. Cope, and Othniel Marsh. Sternberg had found the remains of various species of *Mosasaurus*, a large marine reptile, that were abundant in the Cretaceous formations in the United States. Joseph Henry commented in more than one letter to Sternberg how valuable the collection truly was, and in 1873 Leidy described Sternberg's discoveries in detail in "Contributions to the Extinct Vertebrate Fauna of the Western Territories."<sup>60</sup>

In the spring of 1869, Sternberg's dream of establishing his parents in Ellsworth became a reality. Reverend Sternberg and his sons added a second story and a

kitchen to the log house and finished it with clapboards and plaster, and the Sternbergs had accumulated substantial land holdings on both sides of the Smoky Hill River. With his family happily settled relatively close and financially secure, Sternberg felt a sense of accomplishment and relief. His attention now turned to his own future happiness with the petite and attractive Martha L. Pattison of Indianapolis. It is uncertain where the couple met or when their courtship began, but it intensified in the summer of 1869, and they were wed on September 1 in Indianapolis. Mrs. Sternberg stated they had a short honeymoon that included a trip to Washington, DC, and a final visit with her family and friends before departing for Fort Riley in mid-October.<sup>61</sup>

Upon her arrival at Fort Riley, Martha admitted being “charmed with the fine substantial stone buildings and the general appearance of stability at the post.”<sup>62</sup> The ambulance carrying the Sternbergs pulled up in front of a large frame home situated on an elevation apart from the other officer’s quarters. Now that he was married, Sternberg was entitled to main post quarters; however, he expected his tour at Fort Riley to be short, as he had been in the Department of the Missouri since April 1866 and housing was at a premium on post. Sternberg gave his quarters to a line officer who was in poor health and accepted the old Sutlers’ house in exchange. This home was much larger than he and Martha required, but it provided rooms for a laboratory and workshop.<sup>63</sup>

Mrs. Sternberg found that the man she married was much like the home in which they lived: a solid, dependable, and valuable part of the army, yet in many ways segregated and different from the whole. Capable of participating in and enjoying the camaraderie of his fellow officers in the field, Sternberg was a homebody while in garrison. He particularly enjoyed horseback riding, fossil hunting, and gardening with Martha, and often donned an apron to assist with kitchen duties. Never aloof or pretentious, he enjoyed small dinner parties among friends as he had at Fort Harker. But “grand blow-outs,” as he called them, left him uncomfortable and bored.<sup>64</sup> “I don’t like Army parties,” he once wrote Martha, “because one meets so many silly, flirting married women and because the officers generally have to drink too much whiskey to make them pleasant companions for those who do not drink with them.”<sup>65</sup> He avoided these gatherings, especially if Martha was visiting in Indianapolis, because he preferred the company of his laboratory, workshop, and books.

Martha’s presence, like Louisa’s, also made a great difference in Sternberg’s disposition and outlook on the world. She shared his appreciation of nature and the outdoors, and understood his profound interest in science and developing dedication to the army. He had been very much in love with Louisa, and he realized that finding another woman with whom he could love with similar intensity—and have this love returned—was exceptional good fortune. Although Victorian America was tight-lipped in regard to recording marital intimacy, it appears that he was a very affectionate and attentive husband who much preferred the sole company of each of his wives to any other person.<sup>66</sup>

Sternberg continued to deluge the Army Medical Museum with anatomical specimens. Once again, he requested a microscope from the surgeon general “as



an aid in the diagnosis of disease and to enable me to pursue some investigations I am desirous of making.”<sup>67</sup> This entreaty apparently fell on deaf ears as he put in a second request in early July. The new post commander, Major John Hamilton, wrote a frank and engaging letter to Surgeon General Barnes in support of his surgeon. It is obvious from the letter that Hamilton and Sternberg had a close relationship based on respect and similar interests. Hamilton stated how pleased he was with Sternberg’s dedicated and hardworking attitude, and added that he, like Sternberg, was a “dabbler in natural science.”<sup>68</sup> The letter’s tone is one of respectful familiarity—a note from one mentor to another concerning a star pupil—and Hamilton gently prodded Barnes, “couldn’t you send him a microscope?”<sup>69</sup> Although the pragmatic and parsimonious Army Medical Department saw little gain in supporting laboratory-based research efforts of its medical officers, Hamilton’s letter appears to have had the desired effect. In mid-July, Sternberg received a Collins binocular microscope and a copy of Beale’s *On the Microscope*. His commander was also aware that his surgeon did not want to depart Kansas in the fall of 1869 and took the opportunity to plant the idea in Barnes’ mind. Hamilton’s correspondence suggests that Sternberg’s primary interest in a microscope was to make photomicrographs, presumably using botanical specimens as subjects, and that he was putting as much time and money into the effort as he could afford. Although Hamilton meant well, his description of Sternberg as a dabbler in science was a gross understatement. Equipped with an inquisitive, analytical mind, Sternberg found pleasure not only in medicine, but also in all scientific things. He read the scientific literature voraciously, and also digested its contents and applied it. As Martha noted, he had “a penchant for invention.”<sup>70</sup> Although he was—undoubtedly—aware of and interested in the photomicrographic work of brother officers, Captains Joseph J. Woodward and Edward Curtis at the Army Medical Museum from a description of their activities in Circular #6 dated November 1, 1865, this was not his main scientific focus for the moment.<sup>71</sup>

Since the reorganization of the Army Medical Department under Surgeon General Joseph Lovell in 1818, post surgeons had been ordered to observe and record weather, climatic, and topographic data to help predict and define the diseases that they encountered. The detailed and precise official reports prepared by these officers, as well as articles prepared for local newspapers on the impact of meteorological conditions in the area, indicate how seriously this labor was regarded. Loring and Sternberg were familiar with the rapidly changing and often harsh weather conditions encountered in Kansas. To make wind data collection more accurate and easier, Sternberg crafted an inexpensive, self-registering anemometer. His enthusiasm for his new invention motivated him to travel to Washington to apply for a patent. Unfortunately, he found that his anemometer worked on the same principle described by a Dutch inventor in 1720. In a letter to Martha from Washington, Sternberg glumly reported, “The old saying, ‘There is nothing new under the sun,’ certainly applies to my anemometer. Well, I am not greatly disappointed. It has been no great expense, has furnished me profitable employment, and I had not expected to make money out of it. It has at any rate helped to

develop and show my inventive powers.”<sup>72</sup> Although the patent application was rejected, it is Sternberg’s earliest existing technical scientific paper. The paper demonstrated a logical, lucid, and concise writing style and an above average drafting ability.

Sternberg then turned his attention to a much more complex issue: a temperature regulator automatically controlled by means of an electric circuit. The immediate benefit of such an invention was the stabilization and control of temperatures on the hospital wards at Fort Riley. However, he clearly saw that the application of the regulator extended not only to all buildings, but also to any process, such as the distillation of liquids or regulation of steam or gas pressure, that required precise temperature control over time. Elegant in its simplicity, his apparatus was powered by a 12-volt battery—probably a Fuller type as used with telegraphs—and used an electro-magnet, a thermometer, and a gear driven device to open and close the damper. Two wires connected the thermometer to the electro-magnet that was connected to the battery. One wire entered the mercury trough at the bottom of the thermometer and the other was placed at a pre-set temperature level. When the mercury rose to the pre-set level, it completed the electric circuit and the gear mechanism engaged to close the damper. When the temperature fell, the circuit was broken, and the damper reopened. Sternberg experimented with this device between October 1869 and April 1870. He applied for and was granted a patent on March 1, 1870.<sup>73</sup>

Before making his invention public, he had it reviewed by many scientists across the country. *Scientific American* magazine published its evaluation of his automatic regulator in the August 27 issue: “...It is obvious that this principle may be extended to a great variety of apparatus and operations in the industrial arts. In fact its possible and useful applications are almost beyond enumeration...its use would change uncertainty to precision, and render easy what are now oftentimes some of the most difficult and critical of industrial operations.... We have personally inspected the operation of this ingenious instrument in the operation of heating liquids for pharmaceutical purposes, and can vouch that in this respect it is all the inventor claims for it. We see no reason why it should not perform just as satisfactorily in regulating the heat of rooms and in other operations.”<sup>74</sup>

Although this original contribution to technology provided great self-satisfaction to Sternberg, it should not be viewed as an indication that he was bored with medicine or in search of new professional goals. To the contrary, the invention originated—as did that of the anemometer and his tinkering with photomicrographs—with a medical application in mind. His laboratory and workshop provided an outlet for creative energies that were kept continually in motion by a scientific mind that never seemed to rest and exhibited an insatiable appetite for scientific and medical literature. The hospital and post libraries at Forts Harker and Riley offered a remarkable selection of medical and surgical texts and subscribed to journals such as the *Medical Record*, *American Journal of the Medical Sciences*, *Medical and Surgical Reporter*, *Braithwaite’s Retrospect of Practical Medicine and Surgery*, and the *Half-Yearly Abstract of the Medical Sciences*. Whatever he

could not find there, he borrowed by mail from the Surgeon General's Library.<sup>75</sup> In this literature, Sternberg read about new developments in diagnosis using the microscope, ophthalmoscope, and clinical thermometer; kept up with the debate on what would soon be known as the germ theory; and read about Dr. Joseph Lister's recent work on the antiseptic treatment of fractures and abscesses. Lister's antiseptic method of treatment consisted of placing a cotton-lint pledget impregnated with carbolic acid directly on the wound and applying a dressing over it. He found that this treatment reduced secondary wound infections. Lister attributed the infections, which frequently developed in open fractures, "to minute particles suspended in it [the air], which are the germs of various low forms of life, long since revealed by the microscope, and...now shown by Pasteur to be its essential cause."<sup>76</sup> Sternberg realized that if Louis Pasteur's hypothesis was correct, and if disinfectants such as carbolic acid prohibited the growth of these germs, then the disinfecting efforts he and his colleagues had made at Fort Harker in the summer of 1867 might have been worthwhile. Furthermore, if germs in the air produced wound infections and could be seen through the microscope, then perhaps the germs or poison of cholera or various other epidemic diseases reside there as well, or possibly in the dejections of disease victims, and could also be seen microscopically. He was captivated by the possibility.

Sternberg continued to refine his photomicrographic skills and followed the opening debates of what would become known over the next decade as the germ theory of disease. But in 1869, the germ theory of disease was a confusing and nebulous concept. No precise terminology for or clearly articulated interpretation of the theory existed. A germ could be a discrete chemical poison or a living vegetable or animal agent variously termed algae, fungi, cryptogams, microzymes, or animalcula. These agents of disease could be described as toxic by-products of the body or environment, or free-living microorganisms. Pasteur's work on fermentation and the diseases of silkworms over the past 13 years reiterated the generation-old conclusions of Agostino Bassi, Theodor Schwann, Jakob Henle, and John K. Mitchell that fermentation and some diseases were caused by parasitic microorganisms, namely fungi. Although the popularity of the "fungus theory" had waned by the 1850s, Pasteur's experiments proved to be more scientifically acceptable and generated a revival of interest in this idea.<sup>77</sup>

Sternberg indicated in his first published medical paper that he was contemplating the germ theory. It has been suggested that Sternberg's experimental interest was in this direction, but Sternberg left no laboratory records, and his broad, veritably universal, interest in scientific subjects provided no clarification. His laboratory work probably consisted of reproducing the experiments he had read about in the literature, but without durable stains, oil-immersion lenses, or procedural guidelines, these efforts were rudimentary. The important point, however, is that in his last months in Kansas, Sternberg's professional focus and ambition shifted from one involving—predominantly—the physical sciences to one that addressed a totally new scientific frontier based on the recent experimental work of Pasteur and Lister. His attempts at preventing, controlling, and treating infectious diseases—

both in the Civil War and at Fort Harker—had left him frustrated and personally scarred. Sternberg thought these failures were not an acceptable status quo. He sought a logical scientific basis for disease causation, and he realized that it could only be elucidated in the laboratory.<sup>78</sup>

The only army laboratory at that time was located at the Army Medical Museum in Washington, DC. Sternberg was aware of the recent work there of Major Edward Curtis and Captain John S. Billings, requested by the Department of Agriculture, concerning the cryptogamic origin of Texas fever and pleuro-pneumonia in cattle. Although no evidence—microscopic or otherwise—for a fungal etiology of these diseases was found, the fact that the army laboratory engaged in research of this kind likely encouraged Sternberg that such research would continue. It may have been with the intention of obtaining a position there that he reversed his earlier decision to remain in Kansas and requested reassignment in March 1870.<sup>79</sup>

## Chapter Four

# A Career in Medical Science Begins

If Sternberg seriously entertained the idea of becoming part of the Army Medical Museum staff in the spring of 1870 so that he could pursue bench-work science in the laboratory, he was sorely disappointed. An alliance between military medicine and science—cooperatively striving to prevent disease and improve the health of the individual soldier—was an idea whose time had not yet arrived. Surgeon General Joseph K. Barnes had already gathered what he considered to be the best and brightest officers of the Army Medical Department—Joseph J. Woodward, John S. Billings, George A. Otis, and Edward Curtis—to staff the museum. They were heavily engaged in compiling the *Medical and Surgical History of the War of the Rebellion*, refining photomicrographic techniques, and testing field medical equipment; so, adding a fifth officer would mean that some field post would go without sufficient medical coverage. Barnes was aware of Sternberg's interests in medical science, but considered them unsupportable. He had approved Curtis and Billings to assist the Department of Agriculture's investigation of diseased cattle, but Congress was funding those research efforts because only healthy cattle turned a profit. The army was not receiving any research grants for any purpose and, furthermore, the results of Curtis and Billings' work only led to disillusionment for the entire idea of a germ theory. Barnes could not waste money or personnel on such unproductive endeavors when the army needed surgeons in field assignments. Therefore, the surgeon general ordered Sternberg to Fort Columbus on Governors Island in New York Harbor. Ironically, this assignment would focus Sternberg on a subject that would put him in the vanguard of the fledgling science of bacteriology for the next 31 years.<sup>1</sup>

On August 14, Sternberg encountered an unusual, yet severe disease in one of the married enlisted soldiers who lived in the tenement house in the northeast corner of the island. The malady swept with lethal rapidity through the barracks that housed the band, the laundress' quarters on the island's eastside, and the officer's

quarters on the north. Based on the signs and symptoms, Post Surgeon Major Charles Page and Sternberg believed they were dealing with a form of malignant malarial fever or perhaps a mild form of yellow fever modified by the northern climate. Page informed Lieutenant Colonel John M. Cuyler, Medical Director, Department of the East, about the crisis, but did not immediately inform the New York City and Brooklyn Boards of Health about the outbreak. On September 2, New York City residents attended the funeral of Private William Harrington, who had died of the enigmatic malady on the island the day before. Ten days later, all four of them were dead. The nature of their deaths was inconclusive, but yellow fever was suspected.

The New York City Board of Health initiated an inquiry into these deaths that led them to Governors Island for answers. The investigating team that consulted with Page and Sternberg on the island included Doctors Stephen Smith, G. Ceccarini, Moreau Morris, J. M. Carnochan, and Thomas Cottman. Of these physicians, only Cottman and Page had any practical experience with yellow fever, and, therefore, the board leaned heavily on their opinions for a reliable diagnosis. Diagnostic criteria for yellow fever consisted of observing characteristic signs and symptoms—such as continuous fever, head and flank pain, nausea, black vomit or other signs of bleeding, and a yellowing of the skin—at the bedside and finding albumin, a protein, in the urine. Apparently, none of the consultants discovered a sufficient amount of these characteristics to diagnose yellow fever. Although Page reiterated that it might be a mild form of yellow fever, it was not the malignant variety he had seen at his southern postings. He leaned toward a malarial fever diagnosis. The board's investigation was rapid but careful, according to board members, and they were happy to proclaim the disease malarial in nature as "... no good could be accomplished by letting the public know that such a dreaded visitation [as yellow fever] had reached their City."<sup>2</sup>

Not all of the board members were convinced that Page's diagnosis was accurate. It was well known that a few ships infected with yellow fever had arrived in the New York Harbor that summer, and not all of them had followed correct quarantine procedures. At the suggestion of Dr. Smith, local physician and nonboard member, Dr. Josiah Clark Nott, who had significant yellow fever experience in Alabama, was requested to reevaluate the matter. On September 28, Nott reviewed and examined cases. He declared it was a yellow fever outbreak. The board of health hastily reversed its original decision, but some of the military surgeons involved still doubted that yellow fever was running rampant on the island. Although Sternberg had agreed with the earlier diagnosis of malaria, Nott's consultation changed his mind. He would never again confuse the two fevers. A request was sent through Post Commander Lieutenant Colonel Thomas H. Neill and Medical Director Cuyler to General Irwin McDowell, commander of the Department of the East, to establish a quarantine of the island and remove the sick to the new quarantine hospital 10 miles down the harbor. This was readily agreed to, and Sternberg was detailed to accompany them. Sixty patients—some of them in a moribund condition—were quickly prepared. Medical orderlies carried patients,

iron beds, and all onto the waiting vessel. The last bed had hardly hit the deck before the steamer's captain—anxious to be rid of his lethal cargo—was ready to shove off. With but a few moments for good-byes, Sternberg embraced his wife. Both were afraid of what the very near future might hold, but neither would betray that emotion for now. “Be a brave little woman,” he encouraged hastily, “I will come soon to care for you.”<sup>3</sup>

Sternberg's stoicism on the Governors Island dock was merely a charade; in his heart he was terrified for Martha's life. As he waved to her from the steamer's bow, the memory of Louisa's wasted form lying prostrate at Fort Harker filled him with dread for Martha's safety. He had determined that this would not happen to her, even if he had to violate the quarantine. Sometime between the initiation of the quarantine on September 29 and the time he left for the quarantine hospital, Sternberg developed a clandestine plan to get Martha and their maid to safety. In this endeavor he had two accomplices, Neill and a cousin, a successful merchant named Watson, in Newark, New Jersey. Neill agreed to transport Martha and the maid in his personal barge, and Watson would meet the boat on the New York shore with his carriage after dark. Watson would then provide a refuge for the women until the first frost eliminated the disease from the island. Mrs. Sternberg, who was unaware of these events, was surprised when she returned home from tending to a very ill Mrs. Page, the post surgeon's wife, one afternoon late in September, to find Neill anxiously waiting on her porch. “There is a small boat just off our landing waiting for an answer from you,” he stated quietly. “Dr. Sternberg has communicated with a cousin of his, asking him to come and take you and your maid with him.”<sup>4</sup> It was Neill's turn to be surprised when Martha declined to go. The well-meaning conspirators had failed to anticipate that she would see her duty differently and resist abandoning her husband and home. She also reminded him that they could all be arrested for ignoring the quarantine. Perplexed, the frustrated Neill responded, “We have thought of all of that; my barge will take you and your maid over to New York at 11 o'clock tonight; your cousin will meet you at the Battery with a carriage; you will get immediately into the carriage and proceed out of New York state as quickly as possible.”<sup>5</sup> Martha perceived that the details of her flight had been carefully planned and her husband expected her to be on that barge. Neill's promise to watch their quarters removed Martha's last reservations about leaving. Later that night, she and her maid scurried quietly aboard the colonel's barge and escaped to the mainland.<sup>6</sup>

As these events transpired, Sternberg began a long and trying month at the Swinburne Island Hospital. Created on an artificial shoal near Fort Richmond, Staten Island, Swinburne Island Hospital had just been completed. There were ample quarters for physicians and nurses and six well-equipped, pavilion-style hospitals that accommodated 250 patients each. Hospital Steward David Robertson accompanied Sternberg to the quarantine station hospital, but as the epidemic grew, it became apparent that Sternberg's capabilities would soon be overwhelmed if he did not receive greater assistance. To relieve this situation, medical director Cuyler dispatched Lieutenant Colonel Thomas A. McParlin, surgeon at the U.S. Military

Academy, who had had experience with yellow fever during the war with Mexico, and another physician to assist in confirming and treating cases.<sup>7</sup>

By the end of the first week in October, eight of the 60 transferred patients had died, and an average of four new yellow fever cases per day had been received from Governors Island. The epidemic was not abating. The board of health recommended to Cuyler that the island be evacuated until the first frost could halt the disease. General McDowell refused. While he stated his medical director had already reported—although erroneously—the long-awaited frost, he had no safe or decent place to put the 500 men, women, and children that inhabited the post.<sup>8</sup>

At Swinburne Hospital, Sternberg received an education in yellow fever diagnosis and treatment. He wrote to Martha daily. His letters nearly always expressed his relief that she was safe, assurances that their separation would be short-lived, and a confirmation that he too was in the best of health. However, his letters were not pandering attempts to allay his wife's fears by putting a soothing patina over a trying situation. On the contrary, Sternberg shared in detail his daily toil and emotions with her in detail. The extremely long hours at the hospital fatigued him greatly, and the ebb and flow of patients recovering and dying kept his spirits in a constant state of flux. Post Chaplain Davidson, who had been on sick leave when the epidemic struck, returned to minister to the sick and rapidly succumbed as had the little drummer boy in the band; however, Sternberg's clinical efforts seemed to retrieve others from death's door. He hoped to make a short visit to see Martha, but the timing of the barge from Governors Island always frustrated his hopes for this rejuvenating respite.

As cases began to wane, he found a medically related opportunity to go to New York City that included a flying visit to Newark. The long-awaited homecoming was a joyous occasion, but Martha was shocked by her husband's appearance. The fatigue and depression she had only read about now stood before her in the pale, underweight form of her husband. She knew his dedication to patients and after-hours work habits consumed him to the detriment of his own well-being. Epidemic or no epidemic, she was determined to return to the West Bank with him, if only to ensure he was taking care of himself. Sternberg lacked the energy to resist.<sup>9</sup>

The anxiously awaited and much anticipated first frost stubbornly resisted making an appearance until late in October. As expected, the epidemic dried up rapidly, and the Sternbergs returned to their quarters on Governors Island. There had been 157 cases of yellow fever and 49 deaths. The epidemic had left the post shaken and subdued. Effects of the outbreak still lingered. Many buildings on the west side of post had been torn down, and although the quarters looked pretty much the same, every mattress, carpet, and item of bedding had been burned to ensure that the yellow fever poison had been eliminated. During the quiet winter of 1870–1871, officers and enlisted personnel convalesced and many were transferred to new assignments. In late April, Surgeon Madison Mills assumed duties as post surgeon at Fort Columbus, and Sternberg was transferred to Fort Hamilton at the entrance of New York Harbor. Although Mrs. Sternberg remembered the assignment as pleasant, it was extremely short-lived, and her husband spent half of his tour on



temporary duty at Fort Adams, Rhode Island. On June 20, orders transferred them once again, and this time to Fort Warren in Boston Harbor.<sup>10</sup>

The year the Sternbergs spent with the 5th Artillery on the 28-acre George's Island was tranquil, but uncomfortable. With only a weekly boat to Boston, Fort Warren added new meaning to isolation. The granite-arched, casemate-style fort was considered excellent for a strong defensive posture in the harbor, but it was less than accommodating as a residence. Little light penetrated any of the perpetually damp, cold rooms, and the occupants were obliged to keep stoves lit during all seasons. Condensation collected on ceilings, walls, and mirrors; metal objects rusted quickly and mildew spread rapidly on nearly everything else. These conditions and sudden temperature changes were believed to be responsible for the prevailing respiratory diseases and rheumatism on post. Sternberg, like previous surgeons, advised against using the casemates as living quarters, and, also like his predecessors, made little headway. A company-sized garrison made medical duties incredibly light, but their living arrangement was not suitable for a home laboratory. Although this was probably a trial for the semi-reclusive Sternberg, it appears that Martha, with only two other officers' wives with whom to converse on a daily basis, engaged more of her husband's attention and compelled him to socialize more frequently. Sailing and fishing, either from the wharf or rocky shore, were two of their favorite pastimes. Sternberg joined another officer in purchasing a small sailboat, and he enjoyed showing off the skills he had learned long ago on Otsego Lake for Martha. Dinner parties followed by music were the main diversions during the long winter. The garrison's musical ensemble included an officer on piano, Martha on Spanish guitar, and their surgeon on the flute, an instrument he played well, according to his wife.<sup>11</sup>

In July 1872, Sternberg was reassigned as acting medical director, Department of the Gulf, while Medical Director James Simons was on extended leave. The first issues he encountered were well known to him from the war: yellow fever, sanitation, and quarantine. By 1872, the effects of the declining value in state-issued paper currency and the oppression of radical reconstruction were taking their toll on the city's institutions, such as the Louisiana State Board of Health. The board had resumed its age-old struggle with epidemic disease after being returned to state control by the federal government in 1866. Although some health authorities worked diligently to maintain hygienic standards, quarantine and sanitary measures were not executed with the same rigor as they had been under martial law. Cholera and yellow fever had visited the city that year. Cholera claimed 1,200 lives, and yellow fever claimed another 185. In the following year, yellow jack returned with a vengeance and accounted for 3,000 deaths. Although an absolute quarantine with other cities was a sure fix to the problem, it was also a double-edged sword that had to be wielded carefully. Tight quarantine regulations might preclude yellow fever, but they also caused a decline in commerce that risked the city's economy. Public health officials had to be sensitive to both issues. Although local physicians and public health advocates, such as Dr. Stanford Chaille, recognized the need for sanitary reform in the "unsewered [sic] streets and the heaps of

decomposing garbage which rot unmolested in the sluggish gutters," they found it difficult to convince legislators to fund long-term programs.<sup>12</sup> It was, therefore, no surprise when yellow fever reappeared during the summer of 1872. Fortunately, yellow jack remained localized to the wharf district and a few other contiguous areas. More importantly for Sternberg, the outbreak provided the opportunity to meet local city physicians, such as Chaille, Joseph Holt, Edward H. Barton, Jean-Charles Faget, and Joseph Jones, and become actively involved with yellow fever again. The yellow fever epidemic at Fort Columbus had made a significant impact on Sternberg. It stimulated an interest that intensified over time and demanded description, analysis, explanation, and, hopefully, publication. Now he was in the proper venue to resume his literary work with colleagues who were interested and experienced with the disease.

With Dr. Simons' return in mid-October, Sternberg was reassigned to Fort Barrancas, nine miles from Pensacola on the Florida panhandle. The cultural, intellectual, and professional stimulation and excitement to which they had become accustomed over the past 18 months in New York, Boston, and New Orleans ended abruptly when the steamer docked them at the Barrancas wharf. Fort Barrancas, a small artillery post, sat on a sandy plateau overlooking Pensacola Bay. Warrington, the Navy Yard, was situated a mile to the east on the road to Pensacola, and the village of Woolsey was located just north of the yard. An increase in the size of the garrison the previous year had induced the government to renovate some of the older officer's quarters and construct three new units, as well as new quarters for the laundresses. However, in Mrs. Sternberg's words, "Fort Barrancas was not an attractive post. The officer's quarters were new frame buildings, neither well planned nor well built. We chose a set of quarters near the hospital; the house was surrounded by a wide porch which added to our comfort during the summer season."<sup>13</sup> Each set of quarters was elevated and surrounded by a picket fence and a boardwalk, built to keep the children out of the burr grass that grew in abundance, and connected all of the post houses. Except for this unattractive and irritating weed and a few fruit and magnolia trees, the sandy soil failed to grow anything of beauty.<sup>14</sup>

Although less than impressed with the new post and surroundings, the Sternbergs appreciated that condensation was not continually dripping from every wall, their world was not circumscribed by water, and field deployment was unlikely. Although Fort Barrancas was not a garden spot, they determined there was no reason why the confines of their picket fence could not become one. Gardening was a relaxing pleasure the Sternbergs had always enjoyed, but the soil of Fort Barrancas required a little creative reworking to become productive. Sternberg bought topsoil, which was brought in by schooner, and obtained a special bluegrass seed advertised to develop into a lush lawn with appropriate care. With a shovel, rake, and wheelbarrow, the Sternbergs landscaped their property, planted seed, and adorned their yard with several horticultural curiosities from the nearby Grand Bayou. A green oasis emerged among the otherwise desolate yards of the garrison.<sup>15</sup>

Martha helped relieve the tedium of garrison life by raising chickens—an activity

engaged in by many officers' wives at small army posts during this era—and making frequent trips to her family in Indianapolis, while her husband concentrated on his yellow fever manuscript after routine medical duties were completed. The long hours of study and contemplation now began to take shape, and Sternberg crafted a paper that supported his belief that the etiologic agent of yellow fever was a living microorganism. He began with the premise that the current theories of yellow fever causation—the “non-contagionist” or belief in a local origin and the “contagionist” or belief in an importation of the disease—were untenable because they did not “explain all of the well-attested facts” of yellow fever.<sup>16</sup> He acknowledged the three agents considered as likely etiologic candidates by the medical community:

1. a volatile inorganic matter;
2. a lifeless organic matter that catalyzes substances in the earth or atmosphere into the yellow fever poison; and
3. a living germ, which under favorable environmental conditions (heat, moisture, and so forth) will rapidly multiply and acting—directly or indirectly—on other substances convert them into “the efficient cause of disease.”<sup>17</sup> He then presented his hypothesis “the poison [of yellow fever] is of the latter nature, [and] is ... the only theory consistent with the observed facts in regard to the origin and propagation of the disease, and upon it all the otherwise contradictory facts are reconcilable.”<sup>18</sup> To support this hypothesis, Sternberg submitted six propositions with proofs based on the Governors Island epidemic:
  - a. *Transmission from person-to-person did not occur.* Individuals in Castle William, the arsenal, and Fort Columbus had free communication with infected persons during the early part of the epidemic, but only a few persons in Castle William and the arsenal became ill, and soldiers in the Fort Columbus garrison proper escaped entirely. Although many New York citizens who visited the island before the quarantine became ill, no new cases were reported in the city. Most significantly, none of the staff at the quarantine hospital became ill.
  - b. *Yellow fever is not an inorganic substance generated by atmospheric or telluric influences.* Varying atmospheric conditions had to exist on the island, in the harbor, and in the cities of New York and Brooklyn for this to be true, and a seasonal recurrence of the disease would be expected. Neither of these conditions was seen. If the agent were an inorganic substance generated from decomposing matter or other filth, it would need a source on the island. According to Sternberg, the island was in excellent sanitary condition.
  - c. *Yellow fever poison is portable in ships, goods, clothing, and so forth, and a minute quantity is capable of producing a large effect.* Importation of the disease was an accepted fact, and most epidemics began with a

few cases at a point of entry and then expanded. He also contended that an imported inorganic agent would produce only a limited effect. However, if the agent was “capable of self-multiplication, or, in other words, endowed with life, as in the case of the yeast plant, then its action is only limited by the supply of the material [human beings] acted upon...”<sup>19</sup> He also stated that “strong evidence”<sup>20</sup> exists to implicate any type of decaying timbers as a source of “preservation and increase of the germ.”<sup>21</sup> He concluded that the Governors Island epidemic appeared to have no point of entry, which was a surprising comment because numerous yellow fever-laden ships had entered the harbor in the summer of 1870. One can only surmise Sternberg was looking for—and could not find—a clearly identifiable single point of entry for the infection on the island.<sup>22</sup>

If these three propositions were true, Sternberg stated, “the necessary inference is that it is capable of self-multiplication which is a property of living matter,”<sup>23</sup> and that the argument was “reduced by exclusion to the supposition that a specific living germ is the cause of yellow fever.”<sup>24</sup> His last three propositions were evidence that the germ theory supported the facts in regard to the origin and transmission of the disease.

- d. *Yellow fever is completely destroyed by temperatures of 32° F or less, an admitted fact as evidenced by past history.*
- e. Yellow fever poison may remain dormant for an unknown length of time. In southern cities, sporadic and late-occurring cases of yellow fever that appeared to have milder manifestations could not be accounted for by importation or freezing temperatures. The concept of a dormant stage in the agent’s life cycle appealed to Sternberg as a viable explanation for these cases. He said it had a milder nature because the agent was not native to the United States, and its virulent character and reproductive abilities declined over time.
- f. *The risk and severity of disease depend upon age, sex, temperament, previous habits, acclimation, and the concentration of the poison to which one was exposed.* Although Sternberg did not doubt the importance of demographic factors, he was convinced a dose-response effect occurred. The first cases on Governors Island all came from the same house and were severe; whereas those cases among the bandsmen in the South Battery were milder. Sternberg also hypothesized that this same dose-response effect and individual susceptibility governed the acclimation process, and, therefore, acclimation (immunity) was not absolute after every case of yellow fever. For acclimation to occur, an individual had to be not only susceptible, but also exposed to a concentrated enough dose of poison to generate a protective effect. If the person was not sufficiently susceptible or the dose was too dilute, then exposure to a more concentrated dose of poison in the future could produce the disease.<sup>25</sup>

He summarized his conclusions: "Yellow fever is an infectious disease, produced by the action upon the human system (directly or indirectly) of a specific living germ, which finds the conditions essential to its multiplication, external to the human body. The germ is an exotic to the United States and is destroyed by a freezing temperature, but may sustain its vitality for an indefinite length of time at temperatures too low for it to increase, and will regain its reproductive power when subjected to a continued temperature of about 80°."<sup>26</sup> The article, "An Inquiry into the Nature of the Yellow Fever Poison, with an Account of the Disease as it Occurred at Governors Island, New York Harbor," was published in the *American Journal of the Medical Sciences* in April 1873. It was well received by the readership if the opinion of Dr. Herron, a Pensacola physician, that Sternberg's ideas were "well expressed" was representative of his medical colleagues.<sup>27</sup>

The significance of Sternberg's first contribution to the medical literature does not lie in the originality of its hypothesis or in its conclusion. The concept of a living organism—most probably a fungus—as the agent of yellow fever can be found in the references he used—LaRoche, Dowler, Reynolds—as well as others of the time, such as Dr. George Wood's *Treatise of Medicine* (1858 edition). With the exception of destruction by freezing temperatures, none of his propositions was beyond reproach. Although well thought out, they were based for the most part on Sternberg's opinions and not scientific proof. Even the most patently obvious point of the paper—that yellow fever is not transmitted from person-to-person—was challenged by Dr. Herron. However, Sternberg demonstrated an ability to put well-considered medical ideas on paper in a cogent manner for the first time in his career. His own experiences provided the basis to support a radical idea that was beginning to stimulate considerable debate in the medical centers of Europe and the United States. Just as he had been anxious to show his inventive powers in Kansas, he now desired to show his analytical powers to his medical colleagues and, simultaneously, took a stand on a contentious issue.<sup>28</sup>

On the morning of September 23, 1873, yellow fever became more than a hypothetical problem for Sternberg. Private Ferrell, who was a patient being treated in the Barrancas Hospital for anemia, had experienced a chill that was followed by fever, nausea, and head and flank pain. The following afternoon, Private King reported with the same symptoms. Sternberg believed them to be suffering with remittent fever—malaria—but, by the evening of September 25, the hoped-for remission in fever had not occurred. Doubting his original diagnosis, he thought that yellow fever was now at Barrancas. A rather simple and dependable examination of urine specimens for the presence of albumin soon verified that Ferrell and King had yellow fever. The next morning Mrs. Schwartz, an enlisted wife and the Sternbergs' cook, told him she had been up all night with two very sick children and asked for him to examine them. After doing so, he was convinced an outbreak had begun and that the post hospital was the center of infection.<sup>29</sup>

Yellow fever had been making its rounds along the Gulf coast since July. New Orleans had seen cases, and physicians at the Marine Hospital in Pensacola reported

their first case, a fatality, on August 14. Two days later, the commander of the Navy Yard established a quarantine to preclude any contact between those two cities and the military installations on the small peninsula in Pensacola Bay. All incoming mail was fumigated with sulfuric acid gas before it was distributed. New recruits arriving from Pensacola were stopped by marines guarding the bridge over the Grand Bayou, stripped bare, and washed down in a carbolic acid bath before proceeding on to Fort Barrancas. Sternberg was confident that all preventive measures had been taken, but as he stated later, "While thus keeping my eye on the outposts, the enemy by a strategic movement...got possession of my citadel."<sup>30</sup> According to Sternberg, the strategic movement was accomplished in a barrel of potatoes. At the direction of the Navy Yard commander, provisions from New Orleans were deposited on a flat boat in Pensacola Bay, a safe distance from the Warrington wharf, and secured later by merchants in the town. The potatoes had been brought into the hospital on August 15 and dumped onto the storeroom floor where they had been picked over. Rotten potatoes had been tossed over the fence surrounding the hospital in the direction of the Schwartz home. Sternberg therefore assumed, since the vegetables came from a known point of infection aboard a vessel most likely infected as well, that they too carried yellow fever germs. He reported to the surgeon general that, while another explanation may become evident in the future, he found "nothing improbable" with this chain of events.<sup>31</sup> He also reported the yellow fever to the post commander, Major John M. Brannan, and recommended the garrison move to Fort Pickens on Santa Rosa Island. Brannan's experience with the disease during the Mexican war left him in little doubt of its potential severity. Before the day ended, steam tugs and a sloop from the Navy Yard had transported the majority of the 144-man garrison to the island in Pensacola Bay. Brannan, the Sternbergs, the hospital staff, some enlisted personnel in the quartermaster's stables, eight hospital patients, and an officer recovering from typhoid fever remained on post. For the next week, the hospital was repeatedly fumigated with sulfuric acid gas and washed down with carbolic acid solution. Eleven soldiers, who were infected before the garrison was removed to Fort Pickens, were eventually brought back to the hospital as they became ill. There were a total of 28 cases of yellow fever—12 enlisted men and 16 civilians on post—of which 4 soldiers, including Private Ferrell, and the 2 Schwartz children died. The results could have been much worse. The expeditious move to Santa Rosa Island limited the attack rate to 11 percent among the command. The case-fatality rate was only 22 percent, a statistic Sternberg could be pleased about when he compared it to the nearly 37 percent suffered at Governors Island two years before.<sup>32</sup>

By the spring of 1874, Sternberg had been an assistant surgeon for 13 years and a captain for eight years. He had been entitled to and nominated for promotion to major and surgeon on February 22, 1869. However, the Senate did not take immediate action on the nomination, and two weeks later a new army appropriation bill was approved. The bill prohibited any new appointments or promotions in the Medical Corps and in many other staff corps until further legislation was enacted. The delay was frustrating professionally, but more significantly it meant no increase in pay. Sternberg was not alone in his frustration. Thirteen other medi-

cal officers, including Charles B. White and Joseph J. Woodward, had also been deprived of promotion by the neglect of the Senate, even though Surgeon General Barnes presented well-founded arguments for their promotions. Patiently, Sternberg, White, and Woodward waited, and two years later, in February 1871, their names were again submitted for promotion. In the nomination, President Ulysses Grant also stated it was only just that the promotions and pay that should be made retroactive to February 1869. This nomination was also made late in the Senate session and suffered the same fate as the earlier nomination. The next army staff corps reorganization was approved in June 1874. The act restored promotion in the Medical Corps, but all existing vacancies in the grade of surgeon were abolished. This was more bureaucratic frustration than the three medical officers could tolerate. Over the next six months, they successfully lobbied Surgeon General Barnes and the Secretary of War, William W. Belknap, for support in their petition of grievances for presentation to Congress. Sternberg's attention, however, was abruptly redirected to Florida by events that had transpired in Pensacola.<sup>33</sup>

The American bark, *Elmira Combs*, fresh from the Panamanian isthmus, entered the Pensacola Bay quarantine station in mid-August 1874. It anchored between the Spanish ship, *Virtuoso*, and the German bark, *Laura Maria*, both of which had crews devastated by yellow fever. Although the American crew suffered with malaria, they were—at that time—free from yellow fever. Presumably, the crew of the *Elmira Combs* had no direct contact with those of the other two ships, for she was permitted to continue to the Pensacola wharf after only five days at the station. During those days, the pernicious cargo brought from Cuba by the Spanish and German vessels easily found its way into the wardrooms, berths, and hold of the *Elmira Combs*. On August 21, her infected crew came ashore to the watering holes along the city's dock. Most of them obtained lodging at Kelley's boarding house for sailors, and it was there on the following day that the first tar (sailor) was taken ill with yellow fever.<sup>34</sup>

As the epidemic became established in the city, cases of yellow fever were also being seen at the Navy Yard. Captain James F. Baker, U.S. Marine Corps, had visited Pensacola and became ill on August 17. Eight days later, one of his men died and three more Marines fell ill. Diagnostic confusion, generated by the combination of malaria and yellow fever, among the navy surgeons there resulted in Navy Surgeon John B. Ackley asking Sternberg to consult with them in late August. After making rounds on all of the patients, Sternberg declared them ill with yellow fever and urged all well personnel be moved to safer ground. Although Ackley agreed, he anticipated difficulty in convincing the commander of the yard, 55-year-old Commodore Melancton B. Woolsey. The commodore received the surgeons courteously and listened to their concerns, recommendations, and Sternberg's repeated appeals to vacate the Navy Yard. But this traditional old sailor was not convinced of imminent disaster. Even if he were, Woolsey stated, he could "not give such an order, it would seem cowardly on my part, it would be equivalent to deserting the ship."<sup>35</sup> The commodore instituted the same strict military quarantine, as previously, but by then yellow jack had already gained a foothold in the Navy Yard.

One week later, Sternberg reported to Brannan after returning from the navy hospital: "I have reliable information that a death from yellow fever occurred at the navy yard last night, and that there are four more cases [one of which was Surgeon Ackley] reported by the surgeon-in-charge. Two of these cases I have seen, and I confirm the diagnosis. I...respectfully recommend...all intercourse with the naval reservation be discontinued, and...the garrison...be moved into camp on Santa Rosa Island, as an absolutely protective quarantine between army and navy reservations is practically impossible."<sup>36</sup> Brannan did not share his navy colleague's qualms about running from an enemy he could neither see nor control, and the garrison encamped once again at Fort Pickens. Only two personnel in the command became ill and both of them recovered.<sup>37</sup>

Fortunately for Sternberg, Martha was visiting her family in Indianapolis when the epidemic struck. On September 11, he wrote, "I cannot think of allowing you to come until all danger from yellow fever is over."<sup>38</sup> She did not hear from her husband until he telegraphed her some days later. Word of the epidemic spread like wildfire throughout the surrounding counties and neighboring states. People were fearful that the disease could be transported on or in almost any object, and Woolsey reported to G. M. Robeson, Secretary of the Navy, that railroad personnel were dumping mailbags gathered from the Navy Yard, Fort Barrancas, and Warrington at Pensacola Junction. Sternberg had continued for some days to send letters urging Martha to remain in Indiana, but they only accumulated at the junction nine miles from post. Her anxiety increased with no word from him, and her letters, which continued to arrive, were filled with pleadings for permission to come home.<sup>39</sup>

While Acting Assistant Surgeon B. J. Bymer attended to the troops at Pickens, Sternberg assisted the navy in a crisis of growing magnitude. On September 11, Surgeon Ackley died. One week later, Woolsey telegraphed Washington that the "fever [was] not abating."<sup>40</sup> One by one, his ships in the bay were becoming infected. But the commodore would not abandon the ship, nor would he allow anyone else to disgrace the service by such action. Acting Assistant Surgeon George B. Todd became ill and quickly succumbed, as did Sternberg's friend Captain Charles Franklin, along with his wife and two children. By the end of the month, Commodore Woolsey, Acting Assistant Surgeon Miller, Lieutenant Commanders Kellogg and Barclay, Captain Alexander A. Semmes, and every other commissioned officer at the Navy Yard, except for Paymaster William J. Thomsen, were either sick, dead, or convalescing.<sup>41</sup>

Sternberg, who was not immune to the disease, was fully cognizant of the risk he accepted every day at the Navy Yard. In a telegram to Martha, he insisted that she not return, even if he became sick: "In such a case, you must not think of coming here. I forbid it, my dear. I will have telegrams sent to you frequently and will conceal nothing from you... but you must stay at home. It is a disease of such short duration that I would be convalescent or beyond help before you could reach me and after a fatiguing journey you would be sure to have the disease.... I want to see you very much, my dear wife, but we must both exercise the



virtue of patience.”<sup>42</sup> Ever sensitive to her emotions, he softened the stark reality of those lines, “You can not think, my dear...how happy I will be when you are with me again.... It is now a whole month since we parted. A little more than a month must pass before I can let you come back, but that will soon pass away, and then...we will be as happy as possible. So let us look forward to the 1st of Nov. as the time when we are to meet.”<sup>43</sup>

Commodore Woolsey died with yellow fever on October 2, and Captain A. A. Semmes assumed command of the Navy Yard. Unlike his deceased predecessor, Semmes ordered all infected ships to remain at anchor while the rest of the fleet proceeded immediately to the Mississippi River quarantine station south of New Orleans. Ten days later, the epidemic was on the wane, and by the time Navy surgeon James Rufus Tryon arrived to take charge of the naval hospital, only the convalescent remained for care.<sup>44</sup>

This epidemic, like the one at Fort Barrancas the previous year, only solidified in Sternberg’s mind that the yellow fever poison “was capable of self-multiplication outside of the human body.... And that it is not a personal emanation from the bodies of those sick with the disease.”<sup>45</sup> He was also convinced the disease was an imported malady. In discussing the two outbreaks, he wrote: “...after careful consideration of the facts I have not been able to find any other source of infection as satisfactory to my mind, and that the disease did not originate at Barrancas seems almost certain for the following reason: Yellow fever has prevailed in Barrancas but six times in fifty-four years. Its appearance in every instance has been preceded by the arrival in the harbor of a vessel from an infected port.”<sup>46</sup> Sternberg believed in a strict quarantine procedure and proper disinfection of infected vessels as the best preventive methods available. He also noted that a weak link in the quarantine chain, such as the early release from the station by a lackadaisical quarantine officer, improper disinfection of vessels, or the presence of an inadequately controlled town, like Warrington, rendered any quarantine effort worthless. Although this conundrum frustrated Sternberg and his colleagues, he began to focus once again on the pathophysiology of yellow fever. As he studied the available texts and current literature and compared them with the disease’s symptoms and progression he had just observed, he conceived a new theory to explain the action of the yellow fever poison.<sup>47</sup>

Mrs. Sternberg’s return in November re-established the happiness and stability to their home that her husband had predicted. But, just as at Governors Island, she found the epidemic had caused changes that saddened her and intensified the bleak loneliness of the small post. Many of her friends and acquaintances, such as Mrs. Ackley and Mrs. Franklin, were dead, and others had traveled north to convalesce. Sternberg, too, was almost completely preoccupied with yellow fever and resolving his belated promotion. Although efforts to resolve the promotion issue provided a three-week hiatus in Washington in December, it was purely a business trip and did little to dispel her feelings of isolation. Martha understood and supported her husband’s professional endeavors, but her toleration had its limits, which had been reached by the following April. If he would not voluntarily

retreat from his professional labors, then he would have to be gently coerced. They had recently become aware of an Indian burial mound at a place known as Bear Point on the Alabama side of Perdido Bay, and Martha suggested they explore this area. Sternberg agreed because he had not indulged his love of anthropology and natural history since leaving Kansas.<sup>48</sup>

Two days of relaxation in camp and a few hours of digging in the dirt had the effect that Martha desired, but once they returned to Fort Barrancas her husband resumed his studies with renewed zeal. Sternberg had recently become a member of the fledgling American Public Health Association (APHA), and, in the epidemics of the past two years, he found grist for a paper to be submitted to the association. The paper was accepted, and he read it at the second annual meeting of the APHA held in Philadelphia in November.<sup>49</sup>

Sternberg's paper, "An Inquiry into the Modus Operandi of the Yellow Fever Poison," appeared as the lead article in the July 1875 issue of the *New Orleans Medical and Surgical Journal*. A long, and somewhat tedious paper, it still does not flow well in a lucid and logical fashion. Like his first article, the second begins with a challenge to the "opinion of the majority of the [medical] profession" that their theories on the pathophysiology of yellow fever needed revision.<sup>50</sup> The commonly held belief was that the yellow fever poison acted directly on the blood as a ferment (zymosis) and altered the composition of the blood, resulting in the clinical and pathological characteristics observed. This hypothesis led to therapies that either eliminated the poison via the excretory organs or destroyed the poison in the blood. Sternberg commented that the theory of zymosis was only a theory because it had no chemical or physical basis to confirm it, and the success of the common therapies had "never been sufficient to give much support to the theory."<sup>51</sup> He did not follow this challenge with another theory, but instead with a suggestion "that the first and essential effect of the yellow fever poison is to produce a disturbance of the functions of the sympathetic nervous system, and that the grave changes in the blood which occur in the course of the disease are secondary in their nature and result from the arrest of the vital processes (nutrition, excretion, secretion) presided over by the sympathetic [system]."<sup>52</sup>

Sternberg's suggestion came from a critical review of a recent article, "Constitution and Changes of the Blood in Yellow Fever," by Dr. Joseph Jones of New Orleans. Jones' investigations led him to conclude that the yellow fever poison acted directly on the components of the blood and induced continuous changes in them from the time of introduction until fatal termination, although he was unable to find this poison microscopically. Sternberg thought that Jones' observations, which were based on the zymotic theory, were unproven and his reasoning was incorrect. The abrupt onset of the disease without prodromal symptoms argued against the blood being the primary target of the poison (the ferment), and he disagreed that the poison acted on the blood in a progressive fashion. If such were the case, it would not follow that one could remain in good health while these systemic alterations proceeded. He also contended that in support of his belief in a dose-response relationship, if the poison acted as a

ferment in the circulation—capable of self-multiplication during this process—then a small amount of the poison would be sufficient to produce the same severe attacks as a large dose. This did not explain the variations in severity from one epidemic to another.<sup>53</sup>

Sternberg then laid the foundation for his suggestion that the primary target of the poison was the sympathetic nervous system. If Jones could not find the agent, then perhaps he was looking in the wrong place. That the specific agent of the disease was a living organism and probably of fungal origin, Sternberg stated “is now considered probable by many recent authorities.”<sup>54</sup> Fungi reproduce via sporulation. Spores freely circulating in the air could be inspired onto oral mucous membranes or directly into the upper airway; spores could also settle onto articles of food and drink and be directly ingested into the gastrointestinal tract. Once established upon lung or intestinal membranes, heat, oxygen, and moisture provided an excellent environment for growth. Sternberg believed—for reasons he does not make clear—that gastrointestinal ingestion was the most likely method of entry, and this determination would later direct some his investigations of yellow fever. The yellow fever agent was considered to have a variable incubation period, according to LaRoche, from 12 hours to months before symptoms became evident. Although Sternberg believed this period to be much shorter—from hours to a couple of days—it had to be accounted for pathophysiologically. Sternberg made his final hypothetical connection between cause and effect by demonstrating—via the literature—that all of yellow fever’s outward symptoms could be attributed to an irritation and subsequent paralysis of the sympathetic nervous system.<sup>55</sup>

Given that his dissertation was based on erroneous data is wholly inconsequential. The medical knowledge of the time was inadequate to permit anyone to arrive at correct conclusions about the pathophysiology of yellow fever. His ideas—and their synthesis—in this dissertation were well developed. Sternberg gathered the essential pieces of the yellow fever puzzle, analyzed them, joined them in a logical sequence of events, and concluded that they did not support his profession’s commonly held views. Although never shy about stating his opinions, he realized they were just as unproven as Jones’. He avoided being labeled a hypocrite by carefully couching his hypothesis as a suggestion to other investigators of the disease. As he worked through the article, some of the assumptions he would use in his future yellow fever research became solidified. A reflection of Sternberg’s medical experience, personality, and driving ambition to spar in the ring of medical science can be seen in this dissertation.

By the time his literary labors were in print, another epidemic of yellow fever had struck the Gulf coast and was ravaging Fort Barrancas. Quarantine operations had been placed under naval jurisdiction in early July. Commodore George Cooper, the new commander of the Navy Yard, was pleased with this action and believed his marines could maintain a vigilant and proper quarantine. Sternberg had established a reliable communication network between himself and the quarantine officers at New Orleans and Pensacola. Although it did not exactly give him real time information, it had been close enough in the past two seasons to allow him to take

action before yellow fever became established on post. The arrival of the German bark, *von Moltke*, into Pensacola Harbor from Havana on the evening of June 27 showed Sternberg that he had been living under a false sense of security. Anxious to return home, the vessel's pilot decided to avoid the quarantine station, anchored a short distance inside the bar between Santa Rosa Island and Fort Barrancas, and departed for the shore. The *von Moltke* had five cases of yellow fever on board, one of which died en route and another after arriving at the quarantine station.<sup>56</sup>

On July 18, Sternberg was called to see a laundress who had a fever and headache. The following day, the laundress' neighbor reported to the hospital with the same symptoms. On July 20, two more cases appeared. His anxiety rose as no remission of fever occurred in the first two cases, but he admitted it was not until sometime on July 21—a day that brought six more cases—that he was convinced it was yellow fever. Dr. Herron wrote later, "...the fever appeared almost simultaneously in nearly every house in [the] garrison."<sup>57</sup> This was only a small exaggeration. In the three days since the first case, cases had occurred in the company barracks and along officer's row. The report of the dreaded disease generated an immediate response from Brannan and Cooper. The garrison was moved forthwith to Santa Rosa Island. Before they had been encamped 24 hours, it became evident that the transfer had occurred too late. The next day, seven soldiers were returned to the post hospital with yellow fever, and over the following three days, 41 more cases appeared. The outbreak came without warning. No cases appeared in Pensacola or at the Navy Yard. It appeared to one and all that this epidemic would be of a very malignant nature. A strict quarantine was maintained against the post. Special orders issued by the post commander gave Sternberg authority to hire as many nurses and purchase whatever supplies he required, and they directed the post quartermaster to purchase as many coffins and hire as many laborers as necessary to dig graves and bury the dead. The post had become a pariah, shunned by the rest of the world. It would have to survive by its own resources and what supplies those willing to risk death would bring them.<sup>58</sup>

After informing his commander of the situation and telegraphing the medical director, Department of the Gulf, for more medical assistance, Sternberg scurried quickly to his quarters to tell Martha she would have to leave post. Protesting this declaration was futile, but as always she made the attempt. Sternberg remained adamant, and there was a heightened sense of anxiety in his tone as he told her, "I want the garrison to feel that my entire time is at their disposal, for undoubtedly we are to have an extensive epidemic."<sup>59</sup> Martha's sense of loyalty, however, would not allow her to accept the inevitable. The discussion continued until interrupted by an orderly from Brannan requesting Sternberg to report immediately.<sup>60</sup>

The commander had a personal problem similar to Sternberg's. A young friend was then visiting Mrs. Brannan. The girl was nonimmune and terrified to remain on post. Brannan asked if he procured a wagon and driver, would Mrs. Sternberg consent to take the girl with her? Sternberg agreed and told Martha she had to leave and take the nonimmune girl with her. It had also occurred to him that Martha could already be incubating the disease, for he said, "You cannot go north, and I am

not willing you should go far from me. If you are taken ill I will come to you..."<sup>61</sup> Martha capitulated and packed in a rush. The promised wagon, commandeered by an immune captain, arrived loaded with tents, camp equipment, and a month's worth of provisions. After tying Martha's pony to the rear of the wagon, he held her for a moment and then said, "Don't put any water between us."<sup>62</sup>

Although Navy Surgeon General Joseph Beale advised abandoning the yard "the moment the fever becomes threatening," Cooper maintained communications with Brannan.<sup>63</sup> He realized the Navy Yard was the only dependable lifeline that Fort Barrancas had, and he continued to receive and forward supplies to the neighboring post. Cooper's telegrams to the Secretary of the Navy during the last week of July chronicled the horrors transpiring at Fort Barrancas: "women and children stricken down at Barrancas,"<sup>64</sup> "keep strangers away from here, fever raging at Barrancas, sixty five cases, seven deaths,"<sup>65</sup> and "post commanding officer's wife sick, his duties providing for the sick are arduous...ladies and children of the post nearly all down, please inform the Secretary of War."<sup>66</sup>

With Martha out of harm's way, Sternberg devoted all of his energy and concentration to the expanding epidemic. His request for extra surgeons was answered on July 23 when Acting Assistant Surgeon William K. Mandeville arrived and attended to the laundresses and soldiers' families. Two days later, Doctors W. Carson and L. F. Salomon arrived from New Orleans. Carson took charge of the soldiers at Fort Pickens, and Salomon directed the soldiers in the hospital. This left Sternberg to attend to the officers and their families in their homes and supervise everyone else. The small hospital had a 25-bed ward and was expandable to 50 beds. By the evening of July 26, it was overflowing with patients. Civilian members on post were treated in their homes, which kept Mandeville and Sternberg continually on the run making patient rounds. Overworked but indefatigable, Sternberg demanded the same from his assisting surgeons. He also required the surgeons to keep notes as meticulously as possible on as many patients as they could. Nursing care, which was critical in the treatment and recovery of all patients, was the weak link in the medical chain at Fort Barrancas. Sternberg had no choice in those he hired. Exorbitant wages had to be offered to induce those he had to volunteer, many of whom he considered "ignorant and indifferent" about the care they rendered.<sup>67</sup> Hospital Steward Hill, chief nurse and wardmaster, was competent and efficient, but as cases mounted he could not ensure the adequacy of nursing care. Sternberg leaned heavily on him, however, and commented that Hill was "unremitting in his attention to the sick, until he was himself prostrated by the disease..."<sup>68</sup>

Sternberg and his colleagues at Fort Barrancas tried all of the standard therapeutic measures. Initially, cases received quinine to reduce fever, ergotine injections to reduce stomach irritability, and cold body baths. Patients were kept at complete rest, not even allowed to turn over in bed, and covered with blankets for fear that any small draft might jeopardize their recovery or induce a relapse. Brandy and champagne were administered in small repeated doses to stimulate the system. Complications, such as kidney failure, were treated with turpentine stupes, mustard plasters, dry cupping to the loins, and ice water enemas. Sternberg

treated, observed, and treated again, but as the epidemic progressed he was left unimpressed by the majority of their therapeutic efforts. Dr. Jean-Charles Faget of New Orleans had published an article in 1873 that indicated a rising temperature accompanied by a declining pulse rate could be considered almost pathognomonic for yellow fever. Sternberg watched and recorded pulse rates and temperatures carefully with a relatively new medical instrument, the clinical thermometer.<sup>69</sup>

Sternberg only found time to write to Martha twice during the early part of the week. A system for keeping in contact had been arranged before they parted. Martha's memoir is rather enigmatic on this point, but it apparently involved someone from Fort Barrancas, the Navy Yard, or Warrington as a relay. Martha's servant delivered letters to a predesignated dropoff point and retrieved letters from Barrancas. This system worked well for 2 days, until the Pensacola quarantine police discovered her whereabouts. Martha and her party had had a difficult time finding a refuge. It was widely known that yellow fever was at Fort Barrancas, and Martha's driver and her conveyance were obviously army property. Local residents soon realized the origin of the four refugees. They received a cold reception at many homes before they found one kind-hearted soul who took pity on the women and gave them shelter. Martha is unclear about exactly where this was, but it seems to have been about 25 miles, probably north or northeast, of Pensacola. Once their presence had been reported, quarantine officials surrounded the house with a cordon of police. The surveilling officers soon figured out her communication scheme and, although they interfered with it initially, on the fourth day she received a letter. The handwriting on the envelope was not that of her husband, but of his commander. In the brief note, Brannan informed her that Sternberg was seriously ill with yellow fever. He also made it clear that she was not—under any circumstances—to return to the fort, and guards had been posted to ensure she did not do so.<sup>70</sup>

Until July 28, the medical staff had remained untouched by yellow fever. But by noon on this day, both Hospital Steward Hill and the post surgeon were seized with fever. After three epidemics, Sternberg's luck had finally ended. Mandeville took charge of the hospital. Brannan immediately telegraphed Herron in Pensacola for assistance and sent another telegram to Surgeon General Barnes informing him of the situation. Herron arrived at Sternberg's bedside in the late afternoon, where he found him wrapped in blankets, febrile, nauseated, and experiencing intense head and low back pain. Therapy was initiated, but as the hours turned into days, Herron began to despair for Sternberg's life. The work and stress of the past 10 days had fatigued his body, and the high fever and persistent low pulse did not bode well for a favorable outcome. Herron did not sense improvement until August 1; by the end of the day Sternberg had begun to rally. Three days later, Herron wrote to Martha that her husband was "now out of danger" and "clear of the effects of yellow fever."<sup>71</sup> As Sternberg gained strength, Hospital Steward Hill lost his long struggle with the disease—a death Sternberg blamed directly on poor nursing care.<sup>72</sup> By mid-August, the epidemic was waning, but Fort Barrancas had suffered a total of 78 cases and 31 deaths, a case to fatality rate of nearly 40 percent.<sup>73</sup>

Sternberg's recovery proceeded without difficulty, but the residual weakness and

fatigue he experienced took weeks to resolve. He was granted three months of leave to convalesce. Instructions were sent to Martha for her to take the train from Pensacola to St. Louis where they would meet and go home to Kansas.<sup>74</sup>





## *Chapter Five*

# Return to the Field

The Sternbergs were finally reunited in St. Louis, and from there they took the train to Ellsworth. From existing pictures, it does not appear that Sternberg was a large man, and his illness had reduced him to less than 100 pounds. Mrs. Sternberg was shocked by his pale, drawn, and frail appearance, and the healing sores that had complicated his recovery, and she commented later that had they not met by appointment she would never have recognized him. Reverend Sternberg and his wife left no record of their eldest son's visit or of their reaction to his physical state, but the Smoky Hill Dairy had all of the essentials to return the meat to their son's nutritionally depleted frame. In the five years since Sternberg had left Kansas, his father had demonstrated a keen head not only as a dairyman, but also as a cattle rancher. Still disenchanted with Lutheran evangelicalism, the elder Sternberg became a Presbyterian and organized the First Presbyterian Church of Ellsworth in 1873.<sup>1</sup>

In the first week of November, Sternberg reported to the Assistant Surgeon General of the Army, Colonel Charles Crane, in Washington. Crane was glad to see he was recovering, but told him he was "in no condition to go on duty."<sup>2</sup> He suggested a recuperative tour of southern Europe and offered him six months of leave. Sternberg graciously accepted. Interestingly enough, his health was not so frail as to preclude him from presenting his report on the recent yellow fever epidemic at the American Public Health Association meeting in Baltimore during the second week in November. Sternberg did not lose the opportunity to state publicly his beliefs concerning the etiology of the disease: "We are...reduced to the necessity of supposing that the yellow fever germs were sowed broadcast, by the wind...or that they were floated ashore by infected articles thrown over from [the von Moltke], or that the disease originated at Barrancas de novo, independent of the Von Moltke or any other source of infection. This latter supposition has always been a favorite way of accounting for the origin of epidemics, both with the populace and with a certain

proportion of the medical profession. It is a supposition that does away with the necessity for laborious investigation and careful consideration of the facts. But the more carefully the facts are observed, and the more thoroughly they are sifted, the more improbable the supposition appears. That epidemics result simply from "a visitation of Providence," may satisfy the ignorant. That they result from certain unknown atmospheric or telluric influences, sounds more scientific, but is no more satisfactory. But a solution of the problem is gradually unfolding itself to our view, which explains and comprehends all the observed facts relating to the origin and spread of epidemics of non-contagious diseases. This is the theory of living disease germs, capable, under favorable circumstances, of self-multiplication independently of the human body."<sup>3</sup>

In a comfortable stateroom aboard the *S. S. City of Chester*, the Sternbergs sailed from New York City on November 27. In London they lodged on the Strand and did some sightseeing for three days before going to France. Their Atlantic crossing was uneventful, but the comparatively short crossing of the English Channel was a stormy and fatiguing trial. After four days in Paris, the Sternbergs were ready to resume their journey to Nice. Their accommodations in the Hotel des Anglais were excellent, and the warm, sunny climate of the southern France was great for his health. On Christmas Eve, the Sternbergs received a long-awaited telegram that added to the cheer of the season. Sternberg's promotion to Major and Surgeon had arrived at last.<sup>4</sup>

In January Sternberg was eager to see Italy and be on the move again. Martha, who was certain that he had not regained his full strength, was determined to set a slow pace to Rome, but his monthly reports to the surgeon general indicated that she was not very successful. In January they visited Genoa, Pisa, and Naples, where they remained for two weeks on their journey to the Eternal City. The first 2 weeks of February included stops in Florence, Venice, Milan, and Turin. By the middle of the month, they had returned to Paris. By the beginning of April, Sternberg had recovered his health, satiated his thirst for ancient monuments and ruins, and anticipated his next assignment.<sup>5</sup>

Sternberg reported to Colonel Crane once again in late April 1876. Crane gave the new major a choice of two assignments: the Department of the Dakotas or the Department of the Columbia. Sternberg discussed it with Martha, but their decision to accept the Department of the Columbia assignment was probably not difficult to make. The Dakotas offered desolate posts with relatively primitive accommodations, horribly rough winters, and a guarantee that he would be campaigning from spring to late summer. Although posts in the Department of the Columbia were far from luxurious, the climate was milder, and—for the moment anyway—the threat of Indian hostilities was not great.<sup>6</sup>

The journey from New York to Portland was a rough American adventure, memorable only for the magnificent buffalo herds observed on the western plains and the harsh conditions experienced over every mile of track. The transcontinental railroad had been operating for 7 years, but passenger comforts, such as dining and sleeping cars, did not exist. The seating was hard and desert dust filled the

drafty cars, almost to the point of suffocation. With the exception of Kansas City and Denver, lodging facilities were crude and inadequate at best, and as Martha recalled, most of the food encountered was “greasy, coarse, and badly cooked.”<sup>7</sup> On June 8, Sternberg’s 38th birthday, he reported for duty to Brigadier General Oliver O. Howard at headquarters, Department of the Columbia, and temporarily assumed duties as acting medical director for the department in the absence of Lieutenant Colonel and Surgeon Elisha J. Bailey.<sup>8</sup>

For the next 12 weeks, Sternberg became familiar with the department and, for a short period near the end of that time, was also attending surgeon at Fort Vancouver. Sternberg’s experience and expertise made him valuable not only to the command, but also to the local medical community. Frequently consulted in difficult cases, he enjoyed the professional stimulation afforded by interaction with his civilian colleagues. In pleasant lodgings, he and Martha explored and appreciated their new surroundings. Martha was particularly taken with the majestic scenery of Mounts Hood, Jefferson, and Rainier, and the robust beauty of the local flower gardens. On June 26, they had another reason to be thankful: they had decided to accept the northwestern posting. Telegraph wires hummed with the news of a terrible disaster in Montana Territory: Lieutenant Colonel George A. Custer and approximately 215 troopers of the 7th Cavalry had been attacked by overwhelming Sioux and Cheyenne forces near the Little Big Horn River. Sternberg remembered the flamboyant Custer from campaigns in Kansas and the winter at Camp Supply, and took consolation that at least his friend, Albert Barnitz, had been spared this gruesome end by a forced retirement. Mrs. Sternberg, undoubtedly, was relieved and offered a thankful prayer that they had decided not to go to the Dakotas.<sup>9</sup>

Her relief, however, was short-lived. Tensions mounted in the department between the Nez Percé tribes and the U.S. Government over ownership of the traditional Nez Percé homeland. This was not a new problem, and it was openly acknowledged as such by the government. From 1805, when the Nez Percé first met the white man, until 1853, when Congress created the Washington Territory, relations between these Indians and whites were relatively free from strife. The establishment of Presbyterian and Roman Catholic missions to the Nez Percé, however, resulted in a political and religious schism within the tribe that led to the murders of missionary schoolteachers Marcus Whitman, his wife, and 14 others in November 1847. Missions were closed, and the government sought to control the tribe through the use of reservations. This situation, and the advent of the mining industry in the northwest in the early 1850s, induced Territorial Governor Isaac I. Stevens to urge the Nez Percé chiefs to conclude a treaty or simply have their land stolen by settlers. The pro-white Christian Nez Percé leadership concluded a treaty at the Walla Walla Council in May 1855 that relinquished a third of its land and agreed to live on 3 million acres that included the Snake, Salmon, Clearwater, Grande Ronde, Wallowa, and Imnaha valleys. Congressional sloth in ratifying the treaty and the discovery of gold in the Clearwater Valley led fortune seekers to cross the boundary line, and Indian protests only resulted in the establishment of Fort Lapwai in 1862. In June 1863, Nez Percé leaders relinquished more of the reservation,

which resulted in the tribe being divided into “treaty” and “non-treaty” factions. Over the next decade, tensions escalated, and in June 1873, President Grant relegated the Nez Percé to a small and unarable tract of land in the highlands of the Wallowa country, which was completely inadequate for the tribes. Two years later, the Indian Bureau forced Grant to rescind this order, which—in effect—opened the entire Wallowa region to white settlement.<sup>10</sup>

The deeply religious General Howard arrived at this time with a bible and a strong belief that it was his divine mission to resolve the matter. Howard believed he could use the same diplomatic techniques as he had with Cochise and the Apaches in Arizona in 1872 to resolve the Nez Percé dilemma. He felt the government was wrong to just take the Wallowa Valley from the Indians; however, he did not believe the Indians should be allowed to remain there. He conceded that the Nez Percé owned the land and should receive compensation for it—by force if necessary—but considered President Grant’s order as binding. This line of thinking had become Howard’s policy position by early 1876, although he never made this clear to the Nez Percé chiefs. He requested a commission from Washington to settle the land dispute and directed Indian leaders to control their warriors until the commission could meet.<sup>11</sup>

Upon the return of Medical Director Bailey, Sternberg was given a choice of two posts within the department. Forts Vancouver and Walla Walla in Washington Territory both needed a surgeon, but Walla Walla offered a better climate and longer stability. He opted for the second post and reported on August 31, moving into a one-and-a-half story duplex on the parade ground. Fort Walla Walla was a relatively new post in that it had only been reoccupied by the army after the Modoc War in August 1873. In September, Captain Stephen G. Whipple assumed temporary command of the garrison until Colonel Cuvier Grover arrived, which consisted of E, H, and L troops; 1st Cavalry; and B and H companies of the 21st Infantry. Several buildings, including the barracks and officers’ quarters, showed signs of neglect and needed repair. The inadequate and badly planned 10-bed wooden hospital, which sat a couple hundred yards directly west of officers’ row, was turned over to Sternberg by outgoing surgeon Charles H. Alden. It, too, needed repair and renovation because it was poorly ventilated; lacked a lavatory, bathroom, and water-closet; and had too few storage rooms.<sup>12</sup>

As at other posts, Sternberg opened a private office off post for three reasons. The first—and most pertinent—reason was to supplement his income. Congressional appropriations for military funding declined through the 1870s. In 1877, there was no appropriation until the end of November and, hence, soldiers received no pay during the year. Second, while his duties on post were not wholly unremarkable—he dealt with a typhoid outbreak and a soldier with gastric cancer, among other things—sick call and sanitary inspections of kitchens, barracks, and laundress’ quarters did not provide the volume or variety of practice required to maintain his professional skills and keep him occupied. Third, private practice opened an avenue for introduction into the Walla Walla community, an opportunity that he and Martha welcomed—and fostered—for the social and cultural interactions it offered off post.<sup>13</sup>

The mother of one of Sternberg's patients was a well-educated and multilingual woman of French birth, and he inquired whether she gave private lessons because he thought it would be a nice diversion for his wife. The woman consented, but Martha perceived another opportunity to disengage her husband from his laboratory and agreed to lessons if he also would attend them. Whether Sternberg was sufficiently motivated to overcome his loathing of languages by maturity, their recent trip to France, or because he could not read the French medical literature remains a mystery, but he agreed. The woman was an excellent teacher. After three years of study, Martha noted he had "mastered every difficulty of the language, and could deliver lectures in French."<sup>14</sup>

Sternberg also met a civil engineer in town who shared his interest in paleontology. This man, who may have been J. L. "Jake" Wortman, showed Sternberg some fine specimens he found in the fossil field at Washtuckna Lake, which was some distance north of Walla Walla. This impressive collection whetted Sternberg's appetite to investigate the area. He obtained permission from his commander to accompany the next contingent of soldiers to Fort Colville and found a physician in town to take sick call for a few days.<sup>15</sup>

A two-day journey put the Sternbergs and their party at the ferry on the Snake River. As they prepared their camp, elders from a local tribe ran their canoes ashore and approached the camp. A few of the soldiers had made contact with these Indians to ensure they understood the party was passing through peaceably, and they informed them that the group leader was a physician. Mrs. Sternberg recalled the chief was not pleased and, through an interpreter, questioned them in detail about their destinations and plans. After a lengthy monologue, the chief came to the real point of his visit. He had a daughter who had been coughing for "two snows."<sup>16</sup> Could the white medicine man offer her any help? Sternberg realized that the chief's daughter was probably suffering from tuberculosis. Although his first instinct was to ask whether he could see the girl, he decided it may be a foolish act and quickly prepared a cough mixture from his medical kit to satisfy her father.<sup>17</sup>

The encounter with the Indians was unexpected, but neither Sternberg nor the soldiers were alarmed by it. Early the next morning, the soldiers parted company with the fossil hunters, and the Sternbergs and five enlisted men accompanying them crossed the deep and swift Snake River. Two days later, Sternberg was thrilled to gaze out over the Washtuckna Lake bed, untouched and unexplored except for the survey of his friend in Walla Walla. The specimens they found were clean, and the variety was astonishing. In the post-Pleistocene era, not only had horses, elk, and deer come to the lake to drink, but also camels and mammoths. In a few hours they had gathered and packed what Sternberg considered a sufficient quantity of prime specimens. Although they had planned to visit Shoshone Falls a short distance away, Sternberg was reluctant because of the Indians and decided to head for home instead.<sup>18</sup>

The commission Howard had lobbied for so strenuously became a reality in November 1876 at Fort Lapwai in Idaho Territory. The nontreaty chiefs, such as

Joseph, his brother, Ollikot, and others came to parley, but their arguments fell on deaf ears. The commissioners had already decided on their recommendations: the military occupation of the Wallowa Valley should commence immediately, nontreaty Indians should return to the Lapwai reservation within a reasonable time, and any acts of resistance or hostility would be met with force. On January 6, 1877, nontreaty Nez Percé leaders were notified to be on the reservation by April 1. A week later, General William Tecumseh Sherman ordered Howard to send troops into the Wallowa Valley. Joseph remained recalcitrant, but fearful. He sent Ollikot to meet with Howard at Walla Walla in April. Nothing was achieved at this council, and while Joseph's message was a stubborn refusal to leave the Wallowa Valley, it carried a plea to continue peaceful negotiations. Ollikot requested another meeting with all of the nontreaty chiefs at Fort Lapwai to which Howard agreed.<sup>19</sup>

A large hospital tent had been raised for the council on Friday morning in May 3. The council was merely a formality to allow the Nez Percé to present their grievances one last time, but it would not alter their future in the Wallowa Valley. Howard was in no mood to participate in lengthy, futile discussions as Chief Toohoolhoolzote rose to speak for the assembled chiefs. Although an eloquent orator, he despised all whites, and his long monologue contained no hint of conciliation. A few curt remarks from the general offended the chief and tempers flared to the point where an adjournment until Monday morning was agreed upon to allow passions to cool, but the tenor of the council had been set. When talks resumed, it was quickly apparent that neither Howard nor Toohoolhoolzote had softened their positions. The general's fury only mounted during the obstinate discourse of the Nez Percé chief. Insults once again filled the air. Then, in stunned silence, the audience watched as Howard abruptly seized Toohoolhoolzote and escorted him to the guardhouse. Howard then dictated an ultimatum to the nontreaty chiefs: they would be settled on their respective reservations by mid-June. Humiliated, and with one of their chiefs now captive, the remaining Nez Percé leaders had to submit to Howard's demands.<sup>20</sup>

On the morning of June 14, Captain David Perry, commanding officer at Fort Lapwai, met Howard and Colonel Watkins, Inspector of Indian Affairs, at Lewiston in Idaho Territory. This was the day the Nez Percé were to be settled on the Lapwai Reservation. Perry commented that the Indians were coming in as directed, but this encouraging news evaporated late in the afternoon, when couriers brought word that settlers had been murdered by Indian war parties in the village of Cottonwood. Howard directed Perry to march with companies of the 1st Cavalry to Cottonwood immediately. Perry's 99-man detachment reached the town early the following morning, then pushed on to Grangeville where they were informed the Nez Percé were camped in White Bird Canyon on the Salmon River. The column pushed on, but Perry did not need to rush into the canyon. The Cottonwood murders had been perpetrated without sanction by vengeful young warriors, and the various tribes had congregated in the defensive safety of White Bird Canyon. To avoid further bloodshed, they had to wait for Howard to come to them, but they were uncertain whether he would talk or fight. Sentries

guarded the approaches to the canyon and watched for the inevitable column of mounted soldiers.<sup>21</sup>

Just before dawn on June 17, Perry led his exhausted troopers down a long grassy draw into the deep canyon. The Nez Percé sent a small group under a flag of truce, but whatever this delegation might have hoped to accomplish was lost when a shot was abruptly fired at them. Warriors hidden among the hills and rocks immediately unleashed a barrage of fire into Perry's companies, costing him a third of his command before he could disengage. A messenger reached Howard at Lapwai later in the day with news of this second disaster. Assuming Chief Joseph was the instigator and leader of the rebellion, Howard sent a series of telegrams to nearly every post in the department that ordered soldiers to meet him at Lapwai by June 21 for an expedition against the Nez Percé. Surgeon Charles T. Alexander, attending surgeon at headquarters in Portland, was designated the chief surgeon for the expedition, and Assistant Surgeons William R. Hall at Fort Wrangel, Alaska, and Jenkins (John) A. Fitzgerald at Fort Lapwai, joined him.<sup>22</sup>

Early on June 19, the Sternbergs accompanied the last of the 21st Infantry Regiment—departing for Wallula, Washington—a short distance from post in their carriage to ensure last-minute messages to families and loved ones were delivered. At Wallula, transport steamers conveyed these soldiers to Lewiston on the Snake River in Idaho Territory, and from there they marched to Fort Lapwai, where Howard waited to consolidate his forces for the expedition against Chief Joseph. The Sternbergs arrived home shortly before noon and found an unexpected directive. Sternberg was to immediately gather ample medical supplies and accompany the soldiers—to whom he had so recently bid farewell—to Fort Lapwai. This was a shock, particularly to Mrs. Sternberg. Perhaps due to Sternberg's bout with yellow fever, Medical Director Bailey had promised that he would not deploy if hostilities ensued, but he might be called to duty in Portland to replace Alexander. The current situation, however, dictated that Bailey renege on his promise. He needed a medical officer immediately because as legal proceedings in Portland precluded Assistant Surgeon Fitzgerald from joining Howard's expedition. Mrs. Sternberg was frustrated and upset, but her husband was an experienced soldier and knew such promises can become null and void in a crisis. While his hospital steward prepared his medical supplies, Sternberg readied his field equipment and horse, Kitty, for the train ride to Wallula on the Columbia River, where he would take the steamer to Lewiston.<sup>23</sup>

Sternberg's primary role was to support the infantry, and it may be presumed he packed extremely light. Medical supplies and equipment had to fit on the back of a mule for this rugged, mountainous campaign. Late in the afternoon of June 19, Sternberg boarded the steamer *Tenino* with his friends in the 21st Infantry from Forts Vancouver and Walla Walla and the 4th Artillery from Fort Stevens. As the *Tenino* made its way down the Columbia and up the Snake River to Lewiston, Walla Walla officers discussed the military situation and probable plans of action with their comrades from the more distant posts. Sternberg wrote to Martha with the scant new information he had received. He believed "quite a strong force" would

be assembled at Fort Lapwai.<sup>24</sup> He sent her his love, a promise to be home as soon as he could, and a warning not to “allow yourself to be alarmed by sensational rumors.”<sup>25</sup> The soldiers disembarked at Lewiston, a small farming and mining community, which served as Howard’s supply base during the expedition, on the morning of June 21. Pack mules and supplies were hastily procured; horses and equipment were put in order. A sense of urgency spurred the column over the last 12 miles of the journey to Fort Lapwai. Worn and weary, it arrived at 1:00 the following morning.<sup>26</sup>

At the fort, rumors abounded of continued and extremely vicious Indian depredations. Companies E and L, 1st Cavalry, commanded by Captain Stephen G. Whipple, and a small contingent of civilian volunteers completed the force gathered at the small post. Although three companies of artillery and one of infantry, as well as medical officers Alexander and Hall, had not arrived, Howard was confident in his numbers and anxious to move against the Nez Percé. He dispatched this force, under the command of Captain Marcus P. Miller, 4th Artillery, down the trail to Craig Mountain at noon on June 22. The command covered 12 miles before making camp near Junction Trail and was on the move before dawn in cold, snowy weather. Captain Perry and the remnants of his command joined Howard that evening at Norton’s Ranch. Sternberg reported to Martha that they were “getting pretty close to hostile Indians,” and he expected the column would be reinforced, including medical officers, very soon.<sup>27</sup> Indeed, four companies of the 4th Artillery, armed as infantry, and one company of the 21st Infantry, were en route with medical officers. As the possibility of Indian contact increased, so did anxiety within the command, and it intensified when Howard ordered a reconnaissance into White Bird Canyon early on June 26. While the reconnaissance party located Indians on the hills overlooking the far side of the Salmon River, Perry led a burial detachment, which included Sternberg, into the canyon. It was a gruesome task. Only the blackened, bloated corpses of F and H Companies remained to mark the extent of the battlefield. Exposed to the heat and rain for 10 days, the bodies were in an advanced state of decomposition, and portions of the remains had been scattered by scavenging animals. In the overpowering stench and incessant rain, the troops dug shallow graves as close to the bodies as possible and then rolled in the remains. Sternberg and the soldiers “returned [to Johnson’s Ranch] at dark tired, wet, and hungry.”<sup>28</sup>

The expected reinforcements caught up with the command on Wednesday, June 27 at White Bird Canyon. In his diary, Captain Wood indicated that rain, poor shelter and food, and the fear of Indian attack had reduced morale and put everyone’s nerves on edge, including his. At midnight that evening, he mistakenly shot one of the pickets, Private Reed, E Troop, 1st Cavalry, killing him instantly. Sternberg had seen these mishaps before during campaigns in Kansas and recognized that, until a definitive encounter with the Nez Percé occurred, camp life would become increasingly more dangerous. Howard’s force now consisted of 530 soldiers, two howitzers, and two Gatling guns. This army moved to Horseshoe Bend on June 28 to cross the rain-swollen Salmon River. Here, they had their first contact with the



Indians when Joseph “paraded his warriors to our view with much pomp” and fired on the soldiers from long distance, and Sternberg related to Martha that the Indians “may dispute our crossing tomorrow.”<sup>29</sup> He only anticipated “a little skirmishing,” however, for “we are strong enough to whip them without any trouble.”<sup>30</sup> The Nez Percé demonstration proved to be only a diversion, which faded into the mountains as the soldiers began to cross the river the next day. At that moment, Joseph’s main force was recrossing the Salmon River at Craig’s Ferry, 25 miles downstream. It took Howard three days to get infantry and artillery across the swift and dangerous river. On Saturday morning, June 30, he sent a detachment of cavalry to intercept and arrest Chief Looking Glass and all the Indians with him on the south fork of the Clearwater.<sup>31</sup>

The main column began a 12-mile, 3,500-foot ascent into the Salmon River Mountains on July 2. The steep, rocky, and narrow trail was made extremely slick and treacherous by inclement weather that tortured man and beast. Mounted on the ever-faithful Kitty, Sternberg continued on “the hardest march we ever had.”<sup>32</sup> Darkness and exhaustion dictated the infantry and artillery camp half-way up the mountain; but, Howard, his staff, and the cavalry reached the summit at 7:30 that evening to dine on bacon, hard tack, and coffee. Sternberg had departed Walla Walla with an upper respiratory infection. He had written Martha on June 23 that he was “feeling quite well,” and the march had “not fatigued me much and my cough is better.”<sup>33</sup> However, 2nd Lieutenant William Parnell found the surgeon “ill and exhausted” after the grueling march up the mountain and “made him turn in under my blankets and canvas for the night.”<sup>34</sup> Sternberg reported to Martha, “we all got thoroughly wet during the night and did not sleep much.”<sup>35</sup> A large part of the following day was spent drying out around large campfires while the infantry and artillery companies ascended up a now fog-enshrouded mountain.<sup>36</sup>

Howard pursued Joseph’s shadow another 20 miles down the Salmon River before he learned that his foe had doubled back, recrossed the river, and was headed for the south fork of the Clearwater. Word was also received that the cavalry had engaged the Indians, and a 10-man reconnaissance detachment had been ambushed and wiped out on July 3. Retracing his steps, Howard crossed the wicked 250-foot expanse of river once again at Craig’s Ferry on July 6 and 7. A frustrated Sternberg wrote this home from their camp near Deer Creek between the Salmon and Snake rivers: “Our marching for the past week has been of no use. We have not seen an Indian, and we learn that we left them behind us and that the cavalry has been doing all the fighting.... I do not know which way we will move next.”<sup>37</sup> He sounded eager for a fight, but his comments more likely reflected his desire to engage in—and be done with—the inevitable battle. Fatigue and anxiety frayed everyone’s nerves. On the evening of July 6, another accidental shooting claimed the life of Private Michael W. Cassidy. Alexander and Sternberg attended to Cassidy, but he died about 5:00 a.m.<sup>38</sup>

Between July 8 and 10, the main column endured more fatiguing marches through White Bird Canyon, across the mountains to Grangeville, and over the Salmon River at Jackson’s Bridge to camp on the bluffs above the east bank of the

Clearwater River. Howard hoped to cut off the Indians' retreat by taking them in reverse. While Howard consolidated his forces, 80 local volunteers conducted a reconnaissance of Joseph's camp from the west, but soon found themselves on a hilltop hopelessly outnumbered. They requested assistance, but Howard refused to attack until all of his troops were assembled.<sup>39</sup>

Breaking camp early on the morning of July 11, Howard moved down an old mining road along high bluffs cut with steep ravines. He found the Nez Percé camp at noon 800 feet below near the mouth of Cottonwood Creek and immediately ordered 2nd Lieutenant Harrison G. Otis to unlimber one of the howitzers and both Gatling guns. With attention focused on the hapless volunteer force to their front, the Nez Percé were unaware of Howard's presence. Well out of range, the howitzer caused only momentary havoc among the Indians, but Howard's ill-conceived order lost him the element of surprise. To close in on the Indian village, he moved his column back around the head of the ravine, which had been passed only an hour before. As he did so, angry warriors swarmed up those bluffs to meet the soldiers racing onto the rocky, grass-covered plateau. Nez Percé sharpshooters put intense and frighteningly accurate fire into Howard's ranks, forcing them to congregate in the center of the plateau that offered little more than tall grass for cover, and mounted warriors attacked the vulnerable pack train. Warriors flanking Howard's right and left soon established a two-and-one-half mile semicircular battle line that was 700 yards in diameter. In the center of this area, pack mules were unloaded, supplies and pack-saddles were stacked to provide a light defense position for headquarters, and the three surgeons established their hospital just behind it.<sup>40</sup>

The cold, wet weather that had made the campaign so miserable now reversed itself. A broiling sun seemed to conspire with Joseph to rid the valley of blue coats. Howard launched multiple charges throughout this oppressively hot afternoon to dislodge the Indians and secure a water spring to his left front. These bold attempts put the ravine on the left and the ridge to the front in army hands, but the spring could not be held. Alexander, Sternberg, Hall, and their orderlies treated the increasing numbers of wounded on the firing line and removing them to the hospital. More than half of the Clearwater casualties were sustained during this initial engagement. After sunset, the hot, loud, smoke-filled battlefield became clear, quiet, cool, and intensely dark, but Nez Percé riflemen remained alert for any movement or inadvertent light that could give them a mark, and rifle fire continued intermittently until dawn.<sup>41</sup>

Shrouded in darkness, Sternberg crawled among the rocks and tall grass along the firing line in search of wounded soldiers. When practicable, he moved the wounded to the hospital or an area of relative safety for treatment. He found one severely wounded packer with arterial bleeding and prepared to operate. Light was needed to appropriately evaluate the extent of the wound and tie off the severed vessel, but the smallest flame would bring a hail of bullets. His finger pressed on the artery—he had one option to save the man's life. Sternberg directed his two orderlies to hold up a blanket while a third lit a candle. As soon as the

candle illuminated the operating field, Sternberg later reported, “bullets came thick and fast at this faint little mark, and it had to be quickly extinguished.”<sup>42</sup> He worked rapidly, from the fleeting memory of the briefly observed wound and sense of touch, “with the utmost coolness” in the stygian darkness.<sup>43</sup> The suture was placed, a knot was tied, and the bleeding stopped. As Sternberg continued his rounds, he was moved by the pleas of thirsty men for water. The Indians still held the spring and observed it closely, knowing it was the only water source on the plateau. He organized a water party from volunteers recruited at headquarters and, with knowledge of the terrain gained from making rounds on the wounded, described how they could approach the spring with minimal risk of detection. With canteens, buckets, and any other container that would hold water, the courageous men made numerous trips to the spring—under fire—to provide relief to their comrades on the line.<sup>44</sup>

Firing increased along the line as daylight spread over the plateau. Howard had the artillery companies withdrawn from the line to prepare for an assault that would penetrate the Indian left-center position. Once they were through the Indian barricade, they would immediately face right and roll up the Nez Percé line. Near mid-afternoon, Miller and the 4th Artillery stood ready to execute the mission, when a dust cloud announced the approach of a supply train from Fort Klamath. Miller and his men were dispatched to cover this arrival. An hour later, after substantial skirmishing, the train entered Howard’s lines safely, but as Miller—following behind—came abreast of the Indian barricade, he wheeled his troops to the left and charged. Desperate fighting raged for several minutes, but Miller’s sudden attack and the weight of reinforcing soldiers accomplished Howard’s original plan of the morning. The Nez Percé line was turned, and it fled down the bluffs, across the river, and beyond.<sup>45</sup>

The abandoned village consisted of 80 lodges and large stores of food, equipment, cooking pots and utensils, blankets, furs and tanned skins, ornamented robes, and moccasins. Naturally, Sternberg was interested in rummaging through these spoils of war for relics worthy of the Army Medical Museum and his own collection begun in Kansas. He had little time and claimed only a beaded robe and a large leather bag used for loading ponies. Alexander recommended to Howard that Sternberg accompany the sick and wounded to Grangeville and establish a field hospital there. Howard concurred and detailed Captain Winters’ E Company to escort him. Only three lumber wagons and 30 mules could be spared for the task, but Sternberg had 29 wounded, at least nine of which were severe. To augment his inadequate transportation, he ordered lodge poles collected from the Indian village, obtained some extra canvas, and constructed 15 horse litters.<sup>46</sup>

On the morning of July 13, the last of the dead were interred in a single, shallow grave behind the field hospital. When Sternberg finished preparing the wounded, he and Winters began the 25-mile journey to Grangeville. Sternberg remembered, “Each mule was led by a mounted man from the cavalry escort, and dismounted men stood by ready to lift the dragging ends over rough places.”<sup>47</sup> Fortunately, the trail was smooth and the litters performed well. The possibility of an Indian attack

caused great anxiety in the slow-moving column. Sternberg later commented that, "it was not improbable that the Indians might come to our side of the river again and, finding how weak an escort was left behind with the wounded, might murder us all."<sup>48</sup> Consequently, halts were infrequent and only for water, necessary repairs, and tending to the wounded. During two of these halts, Sternberg attempted desperately—but in vain—to save the lives of Corporal Charles Carlin and Musician John G. Heinemann.<sup>49</sup>

Sternberg was exhausted from more than 48 hours of almost continuous activity. Once more on the trail, the fatigue, darkness, and Kitty's easy stride soon had him slumbering in the saddle. He awoke with a start as a gentle hand grasped the bridle and another stabilized his swaying form. Sternberg recognized the trooper, a young orderly sent by Winters to ensure the surgeon did not sustain a fall. The two conversed until he became fully alert. Determining that activity was the best deterrent to sleep, Sternberg proposed to Winters that he ride ahead to Grangeville to alert the citizens and prepare for the wounded. Winters agreed and Sternberg departed into the darkness alone.<sup>50</sup>

The dozen or so houses that comprised Grangeville were overflowing as many residents from the neighboring area had taken refuge there. They received Sternberg's companions with generosity and kindness in the early hours of July 14. The community meeting house that served as a hospital was comfortable, and while Sternberg had sufficient medical stocks, the severely wounded needed more definitive treatment than he could provide in Grangeville. He was anxious to continue on to Fort Lapwai, but had been ordered to set up a hospital at Grangeville and felt compelled to seek Alexander's permission to proceed to the fort. Couriers did not bring these orders for three long days, and he delayed two more before he was satisfied that a few of the wounded could tolerate the trip.<sup>51</sup>

The delay in Grangeville provided Sternberg the opportunity to write home, something he had not had time to do since the encampment at Craig's Ferry. Without a letter from her husband and no word from any officers arriving at Walla Walla, Mrs. Sternberg could only prepare for the worst and hope for the best. Sleep did not come easy. One night in mid-July, as she contemplated the darkness of her bedroom, she heard a rider approach and then the jingle of spurs on the front porch of the duplex they shared with the post commander. A knock on the neighboring door followed. Before the knock was answered, Mrs. Sternberg was poised at the top of the stairway, intently listening for any word. Momentarily, Mrs. Grover, the commander's wife, tapped on the Sternberg's front door, "They have had a battle, your husband is safe and here is a letter from him."<sup>52</sup> The letter was dated Grangeville, July 16, and Sternberg related that his hospital was established, the wounded were progressing well, and he was "reveling in luxury. Have a straw bed on the floor of my office and get three regular meals at a neighboring house with plenty of fresh bread and butter and beef. I am quite well and nearly rested from the excessive fatigue of the past few days."<sup>53</sup>

Late on the afternoon of July 19, the train of wounded, augmented now by six more wagons donated by local farmers, resumed its journey. The wagons traveled

54 miles over the next two days and, on the evening of July 20, camped at White's deserted ranch. It was a busy and troubling night for Sternberg. Private Fritz Heber called out that he was bleeding. Sternberg was nearby and "arrested the profuse hemorrhage from a wound in the leg by compressing the femoral artery. As soon as light could be procured and a tourniquet applied I put the man under ether and enlarged the wound in the upper part of the calf of the leg to secure the bleeding vessel. I could not find it readily and discovered the head of the tibia had been badly shattered by the ball which had entered the head of the bone two inches below the knee joint, perforating the tibia in front, and comminuting it to a considerable extent posteriorly. I decided that amputation at once through the knee joint would be a better operation than ligation of the femoral [artery] with a certainty, almost, that amputation would have to be performed subsequently. I therefore amputated through the knee joint. The man is doing well."<sup>54</sup> Sternberg also dressed the stump with carbolic acid dressings, which may have been instrumental in the wound's prompt healing. Sternberg was also worried about Captain Bancroft, who had been shot in the chest on the first day of battle and was not doing well. Hope for them all was at Lapwai, and he had the column on the trail at 6:00 the following morning.<sup>55</sup>

When the column arrived at Fort Lapwai near mid-morning of July 21, Sternberg was relieved to find assistant surgeon Fitzgerald had prepared the hospital to receive them. Unfortunately, Fitzgerald had orders to join Howard as soon as the wounded were made comfortable. The one-and-a-half story hospital at Lapwai had only 300 square feet of ward space and two small garret rooms upstairs. The wounded soldiers overflowed this space and several hospital tents. Only one hospital steward and four men, who were assigned as nurses from the garrison and completely untrained, remained to assist him. By virtue of his location, which was only 12 miles from the expedition's supply base at Lewiston, Sternberg also became Howard's medical purveyor, responsible for ensuring all requested supplies were ordered and sent to Surgeon Alexander as the command followed Joseph up the Lolo Trail. When Fitzgerald rode away with Winter's company, Sternberg also became the post surgeon by default. He was no stranger to hard work, but by the end of the month Emily Fitzgerald, wife of the deployed post surgeon, wrote, "Poor Dr. Sternberg is disgusted and worked to death."<sup>56</sup>

From the beginning, Sternberg had not been content for the wounded to remain at Lapwai. If Howard sustained more casualties before the Indians surrendered, it would be impossible to adequately accommodate them there. In the oppressive heat, those living under canvas were more comfortable than their comrades in the hospital where daytime temperatures reached 98°, but their security was in doubt. Although Howard was supposedly pursuing the Indians to the northeast away from post, rumors circulated that Joseph had once again evaded the army and was on his way back to the valley. Should the fort be attacked, Sternberg and his hospital steward would have difficulty protecting their tent-bound patients. He requested the wounded be removed to Fort Walla Walla or Fort Vancouver. It was a reasonable request, and, if the command agreed, he could be home with Martha

in a matter of days. A decision on the issue was delayed, however, and Sternberg determined that if he were to see her in the near future she would have to come to Lapwai. Perry had returned to the post, but was preparing to leave for Spokane for an extended period. Rather than leave the house empty, he offered to let the Sternbergs occupy it. Discounting the rumors of possible Indian attack, Sternberg sent a message to Martha asking her to come to the post. She was to bring their Chinese cook, June, with her if he consented to go. Both agreed to the venture and arrangements were made for their journey.<sup>57</sup>

Sternberg met Martha in Lewiston early in August. Although he was elated to see her, he was concerned that he may have brought her into a tenuous situation. Since her invitation, Lapwai had become an Indian prisoner-of-war camp. Relatives and friends of these captives converged on the post in increasing numbers. The war had reduced the size of the garrison to a mere skeleton force—20 men from the regimental band, according to Mrs. Sternberg—and as the number of Indians milling about the post grew, so did the tension at Lapwai. Sternberg embraced his wife for the first time in more than a month as she stepped from the steamer. “The whole situation has changed so since I asked you to come,” he said, “that I am not sure that I do not owe it to you to send you immediately home again.”<sup>58</sup> Sternberg explained his current worries, and she listened patiently. The danger he related was manmade and tangible, not some mysterious disease that struck without warning. She was determined to share this danger with her husband. Mrs. Sternberg smiled, “I don’t want to be sent home...where you are is home for me.”<sup>59</sup> He could not argue with such love and devotion. In truth, the wartime atmosphere of Lewiston and Fort Lapwai was a stimulating change of pace for Mrs. Sternberg. Although she may not have envied the wives at Lapwai for their primitive routine existence, she did envy the experience they shared with their husbands during this crisis. Neither excitable nor complaining, she eagerly accepted the perils of the situation and endeavored to assist and support not only her husband, but also the few other women and soldiers at Lapwai. The Sternbergs opened their home to many of the officers who were continually on the road between Howard’s army and the fort, which gave the officers a welcome rest and kept the Sternbergs informed about friends at the front.<sup>60</sup>

By and large the Clearwater casualties were recovering well. The packer, Private Heber, and even Captain Bancroft survived. Sternberg received instructions in August to accompany all wounded soldiers stable enough to make the journey to Fort Vancouver. By late September, Howard had chased the Nez Percé into Montana Territory. With the army well beyond any support offered by Fort Lapwai, Sternberg received orders to return to Walla Walla. His departure from Fort Lapwai marked a major turning point in his career. He would never again deploy to combat—his days as a field surgeon were over. In the not too distant future, his desire to seriously engage in—and influence—the world of medical science would become a reality. Ironically, the national prominence he achieved as a medical scientist over the next 15 years would position him once again to deal with combat medicine issues. When he did so, it would be as the Army Surgeon General, and the problems he

faced would not be those of his frontier-oriented predecessors, but rather those of a Medical Department chief providing medical support to an army of thousands in two separate theaters of war.<sup>61</sup>





## Chapter Six

# Debut on the National Stage

In October 1877, the Sternbergs returned to the quiet garrison life of Fort Walla Walla. Transient officers, such as Dr. George M. Kober, were still welcomed. Kober, a 27-year-old German immigrant who had served in the army as a hospital steward and worked for Lieutenant Colonel Woodward in the Surgeon General's Office while he attended Georgetown Medical School, became a contract surgeon in July 1875. Kober became acquainted with the Sternbergs when he passed through Fort Walla Walla on his way to the field hospital at Camp MacBeth, Kamiah, Idaho Territory. Their friendship was instantaneous and—as will be seen—enduring.<sup>1</sup>

Preliminary experiments to test the efficacy of disinfectants, which Sternberg began in 1876, continued as well as efforts to refine his photomicrographic skills in an upstairs bedroom he had converted into a photographic gallery.<sup>2</sup> In a letter to the surgeon general's office in December 1878, he requested a heliostat and two objectives for his microscope, and stated he had become a “good practical photographer.”<sup>3</sup> It is unknown whether Sternberg attempted to produce photomicrographs of bacteria at Walla Walla. Robert Koch had accomplished that feat using the anthrax bacillus earlier in 1877 in the small town of Wollenstein in Prussia. Koch's paper explaining his techniques and demonstrating his results was not published until November in *Beiträge zur Biologie der Pflanzen*. Although it is unlikely Sternberg was a subscriber, he probably knew of Koch's work through Joseph Woodward, a skilled German linguist and one of the premier photomicroscopists in the world, at the Army Medical Museum.<sup>4</sup>

Sternberg's interest in disinfectants began in Kansas and was broadened by experiences with sanitary measures during the yellow fever epidemics at Fort Barrancas. Also, Joseph Lister's method of antiseptic wound treatment with carbolic acid remained an active topic of discussion in the medical profession at large and in the literature, and it very likely played a role in his continued interest in the preventive and therapeutic value of disinfectants. Apparently, Sternberg never seriously

experimented with Lister's technique. He did apply carbolic acid dressings to the wounds of the Clearwater casualties and left gunshot wounds open with the long ends of ligatures on blood vessels dangling from the wound. Regrettably, he left no comments on the benefit of Lister's method. This is interesting because Sternberg, with his deep interest in the most current developments in medical science and particularly the germ theory of disease, did not attempt to validate the technique, or at least report on his experience with it. Sternberg may have attempted his own case series using the procedure at Fort Walla Walla and obtained poor or equivocal results that he regarded as unreportable. If he could not reproduce Lister's results, he may have decided the method was more trouble than it was worth and lost interest in it to address disinfectants on a broader scope.<sup>5</sup>

Field duties notwithstanding, Sternberg also remained focused on the study of yellow fever during his tour in the northwest. His last paper concerning the yellow fever epidemics at Fort Barrancas, "A Study of the Natural History of Yellow Fever, and Some Remarks upon the Treatment Based upon the Same; with Cases and Tables of Observations upon the Temperature and Urine," was published in March 1877.<sup>6</sup> His photomicrographic work and expanding interest in disinfectants, like his ideas concerning the germ theory of disease, were not separate endeavors, but vital and interrelated pieces of the yellow fever puzzle. Sternberg was convinced that he could assist in solving the mystery of yellow fever etiology and develop preventive modalities through continuing research. Through experience in four epidemics, publication in the literature, and involvement with the American Public Health Association (APHA), he had established himself as an authority on yellow fever not only in the army, but also in the civilian medical community. Whether he perceived his rise in professional status among his medical peers in the east or from the distant confines of Fort Walla Walla is not apparent, but events in the Mississippi River Valley in the summer of 1878 placed Sternberg at the forefront of yellow fever investigations and research in the United States.

On July 12, 1878, the first official case of yellow fever was reported in New Orleans. In the ensuing weeks, an estimated 40,000 citizens of the Crescent City fled northward by wagon, steamer, and rail. This massive migration—and the disease it brought with it—overwhelmed the quarantines enacted against New Orleans by other cities and smaller communities along the way. By the time the epidemic ended in November, cases and deaths were reported as far north as Gallipolis, Ohio. It was estimated that more than 100,000 cases and 20,000 deaths occurred in 200 communities. The broad swathe of devastation left by the epidemic cut through all levels of society and generated a sense of helplessness and frustration on a large scale. Existing control measures had been inadequate, and immediate action was demanded at the national level. Under this pressure, Congress was forced to address not only the current system of quarantine, but also the growing agitation for public health reform.<sup>7</sup>

The public health movement in the United States was glacially slow. Some quarantine and sanitary regulations had been known since the colonial period, but these enactments were generally instituted during times of epidemic disease

and rapidly forgotten when the threat had passed. Health, like most social issues in 19th century America, was essentially local. Public health reform would not have a nationally oriented champion until the establishment of the APHA in the spring of 1872.<sup>8</sup>

The variability of a state or central public health system led to the creation of the APHA, and it eagerly joined in the campaign to establish a national health agency with quarantine supervision as one of its main functions. Advocates of a nationally regulated quarantine system substantiated their position based on the Federal government's constitutional right to regulate commerce. Those in opposition maintained such a reading of the commerce clause was a violation of states rights. Furthermore, a national quarantine would remove the authority of local health officials most knowledgeable on conditions in their cities. An ironic situation was created when political battle lines were drawn. Northeastern congressmen, directed by their states' well-paid quarantine officials and many southerners still clinging to the idea of state sovereignty, labored against a national quarantine, while southern congressmen and physicians rallied around the APHA in urging for federal control of quarantine operations. Northern interests, however, defeated or watered down the first four quarantine bills in the early 1870s. This was the situation in the spring of 1878, as Congress recessed and yellow fever docked in New Orleans aboard ships from the Caribbean and South America and drove up the Mississippi Valley.<sup>9</sup>

As the epidemic raged in late summer, John M. Woodworth, Supervising Surgeon General of the Marine Hospital Service, began a campaign to gain control of any national quarantine service, but APHA leadership—James L. Cabell, John S. Billings, Henry I. Bowditch, and Elisha Harris—feared him both politically and scientifically. As the November meeting approached, tensions between Woodworth and the APHA intensified.<sup>10</sup>

On November 2, Surgeon General Barnes directed Sternberg to be one of the Medical Department representatives to the APHA meeting. At the conclusion of the session, he was to report in person to Barnes in Washington. Barnes' selection of Sternberg and the fact that he directed him to report personally afterwards are significant. If Barnes had simply wanted an army representative experienced in yellow fever and knowledgeable on quarantine operations, it would have been easier and less expensive to send surgeon Harvey Brown. If he had wanted someone to provide him with a report of the meeting, he could have asked Billings or Woodward. Barnes believed Sternberg's experience with yellow fever would be valuable, and Barnes put special merit in his medical opinion of the proceedings. However, in light of the political tensions building between Billings and Woodworth, and the pro states rights faction of the APHA, Barnes may have been looking for Sternberg to provide a truly objective commentary of the events. Sternberg, who had worked closely with southern public health officials during the most recent yellow fever epidemics, was intimately familiar with quarantine problems along the Gulf coast. This experience put him solidly in the national quarantine camp, yet Sternberg, unlike Billings, Woodward, or Brown, was a Washington clique outsider. As such, his opinion may have carried extra weight with the surgeon general.<sup>11</sup>

The APHA meeting was called to order on the evening of November 19. That morning, Woodworth distributed an unauthorized program that allowed for all hypotheses regarding yellow fever causation and prevention to be aired during the convention. Such discussions caused dissension among those supporting an independent national health agency and permitted Woodworth to establish himself as the preeminent leader of the public health movement. The executive committee promptly crushed Woodworth's attempted coup. Although tensions remained, the drama of the opening session soon faded into rather anticlimactic discussions on the origin and progression of yellow fever in the south and the failure of preventive measures. After three days of intense haggling over the nature, origin, transmission, and prevention of yellow fever, a set of six propositions defining APHA's conclusions and position regarding the recent epidemic was prepared for a vote:

1. Yellow fever, in 1878, was a specific disease, not indigenous to or originating in the United States, and it was due to a specific cause.
2. Quarantine establishing nonintercourse will prevent the importation of yellow fever.
3. It is the duty of the government to establish such a quarantine.
4. It is the duty of the government to appoint and fund an expert commission to investigate the causes of yellow fever, and methods of preventing its introduction into this country.
5. It is the duty of the government to invite foreign nations to cooperate in establishing effective international quarantine regulations.
6. State and municipal authorities should ensure that local sanitary measures are attended to at all times. (All six propositions passed easily in the waning hours of the last session on November 22, and APHA adjourned for another year.<sup>12</sup>)

Sternberg was less than satisfied with the results of the convention when he departed Richmond. The content of his conversation with Barnes did not survive, but he composed an editorial concerning the Richmond meeting for the *Medical Record* that provided his opinions. Sternberg advocated—and believed the majority of those attending the convention also did—that the APHA should be a controlling influence on urgently needed national public health legislation that included a national quarantine. He also felt the majority agreed “that yellow fever in the United States usually results from the importation of cases or fomites, and... importation can be prevented by proper quarantine restrictions. I think... a majority were of the opinion that yellow fever never originates in the United States; but no vote having been taken upon the proposition formulated by a committee.... I cannot be sure that I am right.”<sup>13</sup> He referred to the first of the six propositions. Originally, it had stated that yellow fever was a specific disease that never originated in the United States except by importation, but since the commission had not completed its work, a compromise was reached that stated it was considered to be imported only in 1878. Sternberg was extremely displeased that the APHA had

accepted such a diluted position on the issue. His displeasure centered on the fact that “it gives color to the prevalent popular belief that the doctors know little or nothing about yellow fever, and that the late epidemic has upset all preconceived theories and opinions, and left us all afloat.”<sup>14</sup> He also emphatically stated that the “etiology of yellow fever is as well settled as is that of typhoid or remittent fever, and that those in and out of the profession who are still in doubt as to how epidemics of yellow fever originate and progress may obtain reliable information upon the subject by consulting...standard medical works...”<sup>15</sup> Sternberg was convinced yellow fever was always imported and contracted from exposure to an infected area. “The facts observed and recorded by myself for four minor epidemics fully support this statement,” he concluded, “and the matter is so thoroughly settled that in future investigations,...we should turn our attention to the discovery of the unknown special cause [of the disease].”<sup>16</sup> Although Sternberg’s pronouncements seemed brash, he did not miss the mark. More importantly, he was truly sparing in the ring of medical science. Sternberg’s blood was up, and Levi must have been extremely proud.

On December 2 in his annual address to Congress, President Rutherford B. Hayes urged “that Congress give the whole subject [of quarantine and public health] early and careful consideration.”<sup>17</sup> Faced with an expectation to do something, Congress created the National Board of Health (NBH), but gave it little or no real power. The first official meetings of the NBH were held in early April in the Army Medical Museum in Washington, DC. Officers were elected—James L. Cabell became president, John Shaw Billings became vice president, and Thomas Turner became secretary—and standing committees were organized. Without power or money, the membership determined that the board’s duties would be cooperative and advisory, and they established three objectives for the coming year:

1. the institutionalization of scientific investigation and collection of public health information,
2. the advisement to various governmental branches, and
3. the submission to Congress of a plan for a permanent NBH.

Also discussed in earnest was the organization of a commission to study yellow fever in Havana, Cuba. The act creating the board authorized it to “make...such special examinations and investigations at any place or places within the United States, or at foreign ports, as they may deem best.”<sup>18</sup> The board organized the First Havana Yellow Fever Commission over a 3-week period, and Congress supported the effort with a \$13,000 appropriation. The following designations were made: Stanford E. Chaille as chairman, Thomas S. Hardee as sanitary engineer, Juan Guiteras as pathologist, Henry Mancel as official photographer, and Rudolph Matas as clerk. Early on, the board decided a bacteriologist was essential to the investigation’s success, and, by law, it was permitted to request the loan of personnel from other governmental branches. The executive committee—most probably at the urging of Billings—lost no time in securing Sternberg as secretary and bacteriologist for the commission.<sup>19</sup>

Sternberg received orders to report to the surgeon general on April 18, but his new assignment was not specified. However, by the time he and Martha journeyed eastward, he must have had some idea of what awaited him. Mrs. Sternberg commented that he knew “that he would be able there [in the east] to pursue under favorable conditions the scientific and sanitary research on which he was engaged.”<sup>20</sup>

At the initial planning sessions in Washington, the objectives of the commission, equipment and training requirements, and other operational details were discussed in depth. Between July and October, the commission was to do the following:

1. “ascertain the...sanitary conditions of principal ports in Cuba...to determine how...sanitary conditions can best be made satisfactory, and ...what can and should be done to prevent the introduction of the cause of yellow fever into the shipping of these ports,”
2. “increase the existing knowledge of the pathology of yellow fever,” and
3. “obtain as much information as possible with regard to the...endemicity of yellow fever in Cuba, and the conditions which may...determine such endemicity.”<sup>21</sup>

Chaille and Colonel Hardee would address objectives 1 and 3, Guiteras would concentrate on objective 2, and Sternberg was tasked with the additional problems relating to yellow fever. It was an ambitious task with the time and money available, and the board members made it clear that they did not expect a complete investigation.<sup>22</sup>

Sternberg must have been pleased with his assignment. For the first time in his army career, he had been recognized for his abilities as a medical scientist. He had been given *carte blanche* to conduct yellow fever research in any direction he considered appropriate, and the most modern equipment had been procured for him to do so. Sternberg’s assumptions were that yellow fever had a bacterial or fungal origin that acted on the blood to change its constitution and, therefore, he determined the first line of inquiry would be the examination and culture of blood from yellow fever patients. Then transmission experiments upon lower animals would be performed, and a complete examination would be conducted of the water and air of Havana. If the disease was an organism visible under the microscope, Sternberg was confident that he could find, culture, and photograph it.<sup>23</sup>

The commission arrived in Havana on July 7. The San Carlos Hotel, overlooking the harbor, had been selected to provide office and laboratory space because of its moderate price—\$100 a month for five rooms—and because H. C. Hall, the U.S. Consul-General, resided there. Captain-General Don Ramon Blanco, the Spanish governor of the island, welcomed the commission and declared Spain’s enthusiastic support for its work and his personal assistance with its mission. In that regard, carpenters configured two rooms in the San Carlos to Sternberg’s specifications for photographic purposes. Blanco also appointed a 12-man auxiliary commission that included, among others, Dr. Carlos Finlay, to assist the commission locally and form a permanent organization in Cuba to continue yellow fever studies.

He also assured the commission that there was no dearth of yellow fever cases at the San Ambrosio Military Hospital.<sup>24</sup>

While Chaille gathered information on port sanitation, commerce, and the endemicity of yellow fever on the island and Guiteras began pathological examinations in the morgue, Sternberg collected blood from patients at the military hospital. At the end of the first week, he wrote Martha that he was “working away in the laboratory and had commenced some experiments.”<sup>25</sup> As promised, plenty of yellow fever cases existed, but problems—over which he had no control—emerged and caused him anxiety. In a letter to John Shaw Billings, he confided his impatience with the constant parade of Cuban physicians through his laboratory that delayed his work, Guiteras’ slow and unaggressive nature—a remark he would later retract—and how Matas was an industrious, but inaccurate clerk.<sup>26</sup> Although these comments sound like those of an obsessive-compulsive scientist incapable of understanding anyone less gifted or dedicated, they were merely the symptoms of larger personal issues. He had been ill for several days, and it delayed his work. Moreover, it intensified his own anxieties concerning his abilities to find the yellow fever germ in the short time allotted.

In one of his more prophetic statements, Sternberg told Billings, “I am satisfied that the man who succeeds in solving the problems connected to yellow fever must devote himself to the investigation not for three months but probably for years.”<sup>27</sup> With meticulous technique, he spent hundreds of hours patiently preparing and analyzing blood smears, photomicrographs, and culture preparations. He eventually examined 98 blood specimens from 41 confirmed yellow fever cases and produced 105 photomicrographs, which Woodward praised highly later. However, he found nothing significant. Culture experiments with urine, black vomit, and infected blood produced a wide variety of bacterial and fungal growth, but none of them had any correlation to his blood smear preparations. His attempts to find anything of interest in the water of Havana Harbor or the air of the city proved fruitless, as did his experiments on lower animals. However, he still hoped that the appearance of fatty granules in the red blood cells would prove pathognomonic of the disease. He commented to Billings in late August, “If this appearance in yellow fever blood is peculiar to this disease, and if by drawing...blood & examining it by the microscope a positive diagnosis can be made at the outset of a case the discovery will be of great importance. I speak of it as a discovery as I know of no recorded observation of a similar appearance wither in the blood of yellow fever or any other disease. If you know of any such observation please inform me at once. I propose at some future time to examine the blood of other febrile diseases & especially of pernicious remittent [malarial fever].... If in the meantime you can learn anything in relation to this matter from any source I hope that you will inform me of the fact.”<sup>28</sup>

By late August, Sternberg’s exasperation had increased with the conduct of the investigation and the commission members. He wrote to Billings on August 29, “This has been a bad week for me & I am in swearing humor today. My work had been interrupted by visitors who think nothing of spending three or four hours

with us & expect to see the photographs & look through the microscope. Some of these visitors are friends & relatives of Dr. Guiteras, some are doctors that Dr. Chaille or myself are under slight obligations to & who must consequently be treated politely. Then I have been bothered by cloudy weather & worried by heat & mosquitoes in my work room & fretted by mistakes made by the clerk in making out vouchers & exasperated by the fact that Dr. G is in Matanzas at the end of the month & I have been obliged to send him my vouchers for approval by Matas the clerk, at a time when his services were required here, etc. etc. I do not propose to make any complaints against my confreres of the Comm – but I assure you that I will not play second fiddle a second time in any future investigation of yellow fever – Nor will I serve on equal terms with a young man who has not passed the period in life when sweethearts & aunts & uncles are of primary importance. I am not in a position to order or direct & yet cannot help fretting. When I see time wasted – I must stop harping on this string. G is a clever fellow & I like him.”<sup>29</sup> More importantly, Sternberg’s hope that he would discover yellow fever’s causative agent had been obliterated by a plethora of negative laboratory findings. His work continued to be “...about the same thing everyday. Going to the hospital for specimens and looking through the microscope at blood and bilge water and black vomit and urine and all those nice things.”<sup>30</sup> He told Mrs. Sternberg, “I have not found the yellow fever germ...” but consoled himself by commenting, “...I have done good work here and think I will get credit for it with the Board of Health.”<sup>31</sup> It was the best that could be hoped for. By the end of the month he had concluded, “If there is any organism in the blood of yellow fever demonstrable by the highest powers of the microscope as at present perfected, the photographs taken in Havana should show it. No such organism is shown in any preparation photographed immediately after collection.”<sup>32</sup> In one of his last letters home, Sternberg’s loneliness and fatigue from the tedium and monotony of the investigation was clearly apparent, “It will be a happy day for me when I reach Washington and take my dear wife in my loving arms again. I feel that I need rest and the comforts of home and the company of my dear wife. This living in a hotel and working from 7 in the morning until 10 at night gets to be an old story after awhile.”<sup>33</sup> The commission departed Havana in early October. Sternberg returned to Georgetown to rest and write the commission report.<sup>34</sup>

The report, presented to the NBH at the APHA meeting in Nashville, Tennessee, on November 18, was well received. It described the following:

1. principal Cuban ports,
2. the amount of intercourse these ports had with American cities and its correlation with annual yellow fever activity,
3. yellow fever endemicity on the island with a description of unsanitary conditions in major harbors and cities, and
4. Sternberg’s laboratory investigations and Guiteras’ pathological work.

The commission had done excellent, comprehensive epidemiological work and offered recommendations to correct sanitation, and it suggested an international



sanitary conference be organized among nations who traded with Cuba. Although Sternberg's ego had been bruised by not finding the yellow fever germ, the NBH had been impressed with his laboratory methods and results, and it wanted him to continue with yellow fever research and other projects. Furthermore, the board had another medical corps officer on loan from the surgeon general, Captain Charles Smart, who had been assigned to perform "chemical and microscopical work connected with sanitary investigations."<sup>35</sup> To employ them both productively, the NBH established a laboratory in the building it rented in Washington at 1410 G Street, NW. Sternberg and Smart now had a scientific home in which to perform their duties.<sup>36</sup>

In December 1879, Sternberg was directed to pursue investigations on the value of gaseous and volatile disinfectants and to examine airborne dust particles for the presence of microorganisms. An ever-increasing array of chemicals claimed to have disinfectant properties was being used by public health officers and surgeons to preclude or halt widespread epidemics and local infectious processes. The precise nature, mode of action, and true practical value of these agents, however, were unknown. In his earlier work on disinfectants, he had noted the methodological dilemma of obtaining truly pure cultures in liquid media and then finding a reliable technique to appropriately evaluate the effect of an agent on an organism. For his experiments, Sternberg constructed an air chamber in which he could expose bacteria to various concentrations of disinfectant gases, such as chlorine, ammonia, and sulfuric, carbolic, and nitric acid. A microscope mounted on the chamber allowed him to observe the bacteria for cessation of motility during exposure. He also made the same tests using smallpox vaccine. Surprisingly to medical personnel today, after exposing doses of vaccine to sulfuric acid gas, he and Dr. Smith Townsend, Health Officer for Washington, DC, rubbed exposed and unexposed vaccine into the scarified arms of children from the public institutions in the capital. With but a few exceptions, all of the vaccine exposed to the gas failed to produce the expected vesicles, while the unexposed vaccine gave the usual reaction. Sternberg concluded, "Exposure for 6 hours or more to an atmosphere containing at least 1% of sulphurous acid gas, chlorine, or nitrous acid gas, is a reliable method of disinfection."<sup>37</sup> As for carbolic acid, he determined that it had no disinfecting capability—either in the gaseous or crude solid form—in the concentrations currently being used by public health officials and surgeons. Although historians have given Koch much acclaim for initiating comparative studies of disinfectant effects on certain bacteria and destroying the belief that carbolic acid had any therapeutic value, Sternberg's experiments predated Koch's work by at least a year.<sup>38</sup>

These experiments, in retrospect, were simple, relatively easy to accomplish, and provided the sought-after information in relatively rapid time. Determining the microbial content of the air and its significance would not be so simple. Sternberg had read the studies on atmospheric dust in relation to cholera and dysentery in India by Royal Army Surgeon David Douglas Cunningham and Pierre Miquel's similar studies conducted in Paris. He found "no gross or conspicuous germ or organism...in the air of infected localities" in Cuba, but had identified considerable

numbers of acicular and prismatic crystals.<sup>39</sup> Although these crystals were enigmatic, no one knew what the normal composition of microbes, crystals, and so forth in free air was or what happened to them once inspired into the lungs. With this in mind, the board had distributed small wooden boxes containing two glass slides to many of its members after a meeting in October so they could collect dust from their homes. The boxes were returned to Sternberg by mail. He examined all specimens closely and made an interesting discovery. Six pairs of the glasses had been exposed in rooms occupied by yellow fever patients in various areas of Louisiana. All 12 slides contained a large number of radiating acicular crystals exactly like he had found in the military hospital in Havana. In addition, slides from New Orleans demonstrated prismatic crystals, also similar to crystals found in the air of Havana, but specimens from Washington, DC, Philadelphia, Boston, Mobile, and Bellevue Hospital in New York City did not. With nothing else to go on, and probably at Sternberg's urging, the board sent him to New Orleans in early February.<sup>40</sup>

Sternberg arrived in New Orleans with instructions not only to examine the air of the city and blood of yellow fever patients for evidence of crystal formation, but also attempt to repeat the recent joint experimental work of Doctors Edwin Klebs and Corrado Tommasi-Crudelli on malaria. They claimed to have isolated the etiological bacteria of malaria, *Bacillus malariae*, the previous summer from the Pontine marshes near Rome and reproduced the disease in laboratory rabbits. The scientific community had generally accepted the high reputations of both investigators—Klebs as a bacteriologist and Tommasi-Crudelli as a malariologist—and their careful laboratory work. The NBH reasoned that if a swamp-dwelling bacterium caused the disease, then Sternberg should be able to find it in the malarious environs of New Orleans.<sup>41</sup>

From February until well into May, Sternberg exclusively pursued the investigation of suspended particles in the air. The results obtained left him so unimpressed that he did not feel justified in publishing them until January of the following year. Although no common microbe from infected atmospheres was demonstrated, Sternberg felt that more extended researches should be performed before a negative result was accepted. Furthermore, he commented, the “possibility of the existence of organisms morphologically alike, but differing in the physiological action must be borne in mind in investigations relating to the etiology of disease.”<sup>42</sup> He concluded the most important result—and one that agreed with the observations of Cunningham, Miquel, and others—was that “bacterial organisms are not found in the atmosphere, even in crowded cities in a southern latitude...during summer months, in any considerable number...and consequently that the method by direct examination...does not give promise of definite results in regard to the supposed relation of these...organisms to the prevalence of epidemics.”<sup>43</sup>

By May, Sternberg was ready to let the dust in the air settle and prepared to address the malaria question. He obtained and analyzed in detail a translation of Klebs' and Tommasi-Crudelli's report, “Studi sulla Natura della Malaria.” They had isolated a bacillus that, when injected into rabbits, produced a cyclic temperature curve, enlarged spleens, and black pigment in their blood and various organs. Sternberg initiated his experiments by mixing mud gathered from suburban marshes with distilled water and

subcutaneously injecting varying amounts of this solution into rabbits in his laboratory. However, he—not the rabbits—became ill as May progressed. He requested a leave of absence to travel north for his health in May and did not return to New Orleans until September 2.<sup>44</sup>

Sternberg had hardly reopened his laboratory when his old friend and NBH representative in New Orleans, Dr. Samuel Bemiss, contacted him with rumors of a yellow fever outbreak 52 miles south of New Orleans in Plaquemines Parish. Dr. J. B. Wilkinson, “the oldest and most experienced physician on the lower coast,” according to Bemiss, had diagnosed six cases—four of them fatal—in the Giordano family and advised residents to remove their unacclimated children from the area.<sup>45</sup> Bemiss had wired the NBH, Dr. Joseph Jones, president of the State Board of Health of Louisiana, and physicians in Plaquemines Parish immediately to verify the rumor. He also offered financial assistance from the NBH to assist in precluding the spread of the disease. Jones replied that Dr. B. N. Taylor and other physicians in the area did not believe yellow fever was circulating, but rather only mild malaria, and directed inspections and sanitary precautions be instituted as required. However, Jones’ response did not convince Bemiss of the absence of yellowjack along the lower coast.<sup>46</sup>

Relations between the two men and the public health agencies they represented had never been cordial. The National Quarantine Act of June 2, 1879 had given the NBH quarantine authority over states that failed in these duties. Jones, an unreconstructed Confederate, became president of the Louisiana State Board of Health on April 8, 1880, and resented what he considered federal interference in state matters. He saw himself as the champion of public health in New Orleans and the defender of the city’s commerce against federal incursion, but undoubtedly enjoyed the income and political patronage that came with quarantine control. During the summer, Jones’ relationship with Bemiss and the NBH deteriorated dramatically. NBH’s failure to provide financial aid requested by the Louisiana Board of Health over the past year, and its desire to shift primary quarantine operations from Mississippi River Station—65 miles below New Orleans—to Ship Island Station off the coast of Mississippi led to state and federal difficulties in coordinating and maintaining an effective quarantine along the Gulf coast. In late 1879, the NBH reported that Mississippi River Station was in the least desirable location possible. It could not preclude communications with New Orleans or the inhabitants along the river in Plaquemines Parish, infected ships could not be segregated from noninfected ones, hospital facilities were inadequate, and mosquitoes were rampant. Jones maintained the state-board-operated station provided appropriate protection to the Mississippi Valley. In July, with an eye toward public health power in the Mississippi River Valley and New Orleans commerce, he requested \$10,000 from the NBH for needed repairs and equipment, and the same amount to be provided to the state board for use in an epidemic. The request was denied, Jones declared, because he had not agreed with the federal agency in establishing the primacy of the Ship Island Station. As Bemiss and Jones wrestled with this issue, an erroneous message was released stating that the NBH reported 11 yellow fever deaths had occurred in New Orleans. Jones was sure the NBH had

orchestrated the incident to force the Ship Island Station issue. Although amends were made, the damage had been done. Now Bemiss could not be sure that Jones was not hiding a yellow fever outbreak just to maintain trade in the Mississippi Delta and his own sense of power. He needed Sternberg to visit the lower coast and render a verdict.<sup>47</sup>

On September 7 or 8, Sternberg conducted a field investigation at Pointe Michel and Pointe à la Hache in the company of two local physicians, Doctors Hays and B. N. Taylor. He visited 20 cases of the prevailing fever and found a total of 65 cases and six deaths had occurred. Most of the cases had been young children in the predominantly French Creole population. He described the disease as “a continued fever of single paroxysm, lasting...from a few hours to four or five days. No regular temperature observations have been made, but from the statements of Dr. Hays, and my own observations, I am satisfied that the fever is a mild grade, and not characterized by remissions or intermissions.”<sup>48</sup> Only three cases demonstrated any hemorrhaging, and while only Dr. N. M. Hebert’s fatal case demonstrated albumin in the urine, Sternberg found only three such cases during his visit. Although six deaths had occurred, he diagnosed the outbreak as one of benign, abortive, or incomplete yellow fever. He concluded in his September 10 report to Bemiss, “For me the fever is identical to yellow fever, and only differs in degree from the more severe forms.... It seems...extremely unscientific to make our diagnosis depend upon a greater or less percentage of mortality, and the sooner physicians in the yellow fever zone, admit...that yellow fever is not always a malignant disease...that the immunity of creoles is due to their having suffered (generally in childhood) from this milder form of the disease...and that it is not a birth right, the better will it be for the progress of medical science and the true interests of commerce where these diseases prevail.”<sup>49</sup>

Bemiss was pleased with Sternberg’s work, sent his report to Jones on September 13, and again reminded him that he was authorized to draw up to \$10,000 from the NBH coffers for preventive measures. If Bemiss thought Jones would now subvert his political position by accepting federal dollars previously refused, he was sadly mistaken. Jones curtly replied the same day, “The communication...has been received and noted. The board of health of the State of Louisiana has investigated the malarial fever.... Such measures as the board of health deem necessary have been instituted.”<sup>50</sup> Apparently, no report of this supposed investigation was forwarded to Bemiss, but he did receive a large dose of criticism from Jones concerning Sternberg’s opinion of the outbreak. The state board’s president made it clear that he considered the investigation a deliberate attempt to create a panic. Bemiss was furious and decided to repeat the investigation with a composite team of state board of health and NBH members. The committee on fever on the lower coast consisted of Doctors J. Dickson Bruns and J. P. Davidson, both of the board of health; Doctors Robert W. Mitchel and Sternberg, representing the NBH; and Mr. H. D. Bruns, son of Dr. Bruns, who would perform any required autopsies.<sup>51</sup>

Just before noon on September 15, the committee docked at Myrtle Grove, the plantation of Dr. J. B. Wilkinson. For the next two days, committee members

tramped about the lower coast between Pointe Michel and Pointe à la Hache seeing convalescent patients in the company of Doctors Hebert, A. B. Hays, and Westerfield. The local physicians were extremely accommodating, but Sternberg noted that their clinical histories were less than robust, urine testing for albumin was performed haphazardly, and temperature charts were nonexistent (Hays was the only physician to own a thermometer). Bruns reported upon returning that the illness was “an endemic malarial fever, of remittent type, and...of a mild character. Its unusual prevalence is due partly, to the meteorological conditions of the past summer, and partly...to the widely increased cultivation of rice.”<sup>52</sup> As to the nature of the malady, he stated “neither in its special features nor in their entirety, could I realize a single prominent characteristic of yellow fever.”<sup>53</sup> As to the deaths, he attributed them to noncompliance in taking the prescribed medication, quinine.<sup>54</sup>

Sternberg, unconvinced that malaria alone had generated all of the fevers and deaths noted, provided a minority report in which he said that nothing he had observed during his second tour of the lower coast or anything he had read in Bruns’ report induced him to change his opinion of the outbreak. Although he admitted he had not seen any single case that enabled him to positively diagnose yellow fever, he believed—nonetheless—the origin and progress of the outbreak supported his conclusions. The first fever cases had occurred in Westerfield’s practice, directly across the river from the quarantine station where the bark *Excelsior*, which was infected with yellow fever, had anchored from mid-July until mid-August. Westerfield saw his first case on August 1. Hays began to have an abundance of cases in mid-August, and, in early September, Hebert began to treat the same fever several miles north of Hays’ area of practice. Additionally, Westerfield noted this fever was the same as in 1878 and did not recall that any of the current epidemic victims had the fever then.<sup>55</sup>

Sternberg was adamant that the theory of the fever being malarial and emanating from the local rice fields was erroneous. Even though he agreed some cases were probably malarial, the natural history of the outbreak did not support an exclusively malarial diagnosis. Adults were exposed to the rice fields on a daily basis, but children suffered the most from this outbreak. Little of the fever was seen in rice-growing areas, yet some cases occurred in an area devoid of rice cultivation, but near a custom house station where infected ships docked before disinfection. Dr. Wilkinson, Sr., who was considered a most experienced and competent physician by his colleagues and was familiar with the presentation of endemic malarial and yellow fever seen on the lower coast, consulted on many cases in Hays’ and Hebert’s practices. He also concluded that it was continuous and definitely was yellow fever. Wilkinson’s assessment notwithstanding, the majority of New Orleans physicians closed ranks with Jones and the state board of health in upholding the malaria diagnosis. They declared the NBH had intentionally tried to cause a yellow fever panic and considered Sternberg’s knowledge of yellow fever in Louisiana as “tenth rate.”<sup>56</sup> Crescent City newspapers added their weight to this public flogging by painting the NBH representatives as inept scoundrels, and Sternberg as an “ignorant charlatan, unfitted for his position.”<sup>57</sup>

Sternberg returned to the mud of the river batture and Lafayette and Congo squares in New Orleans. He collected a few buckets of ooze, ladled it into terrariums he constructed in his laboratory, and observed these artificial marshes for microbial growth over the next six weeks. By the end of November, he had observed and photographed numerous organisms from his terrariums and injected a total of 37 rabbits with mud solutions and, as controls, saline and his own saliva. Ten rabbits had become ill and died, but he found little evidence that they had succumbed to malaria. Sternberg concluded: "Among the organisms found...are some which closely resemble and, perhaps, are identical with... *Bacillus malariae*...but there is no satisfactory evidence that these, or any other of the bacterial organisms...when injected beneath the skin of a rabbit, give rise to malarial fever.... The evidence upon which Klebs and Tommasi-Crudelli have based their claim of...discovery...cannot be accepted as sufficient; (a) because in their experiments and in my own the temperature curve in the rabbits...has in no case exhibited a marked and distinctive paroxysmal character; (b) because healthy rabbits sometimes exhibit diurnal variations of temperature as marked as those shown in their charts; (c) because changes in the spleen...are not evidence of death from malarial fever...as similar changes occur in the spleens of rabbits dead of septicemia produced by the sub-cutaneous injection of human saliva; (d) because the presence of dark-colored pigment in the spleen cannot be taken as evidence of death from malarial fever...as this is frequently found in the spleen of septicemic rabbits."<sup>58</sup>

After weeks of diligent and intensive experimentation, Sternberg could only state that, from his point of view, the results of Klebs and Tommasi-Crudelli were too weak to substantiate their claim. He admitted he had not found the *B malariae* in the mud of New Orleans and, more importantly, if the bacillus did exist, he could not say that it did not produce malaria in humans. The world paid scant attention to Sternberg's work in Louisiana, but it lauded the two researchers in Italy for their masterful bacteriological work. Ironically, however, his efforts to find the *B malariae* led him to stumble onto an unexpected and intriguing development. Of the 10 rabbits that died in his laboratory, he noted one had been injected with saliva and died from a "diffuse cellulitis and septicemia..."<sup>59</sup> Sternberg had no clue of what might exist in his own saliva to precipitate such an event, but was eager to investigate the issue in his Washington laboratory. Before these researches could begin, however, he had one more obligation to attend to in New Orleans.

APHA's annual meeting would be held in the Crescent City in early December. Sternberg had accepted a request from the APHA to prepare a presentation on yellow fever and national quarantine. The meeting provided him with the appropriate professional forum to return fire on his detractors, and he prepared his attack on the inadequacy of quarantine measures in New Orleans with skill and precision. Past experience, he declared, had demonstrated to quarantine officials that yellow fever is not transmitted person to person, but it is carried in some other fashion aboard cargo vessels. "It is evident," he declared, "that we, as sanitarians, cannot remain silent spectators of the administration of a quarantine based upon fallacious principles, and which

does not furnish any adequate protection to the people of the great Mississippi Valley, without a certain amount of criminal complicity. It is high time...this matter be thoroughly discussed.... I am strongly inclined to believe, that, for New Orleans, unrestricted intercourse and the quick dispatch of vessels from infected ports would present but few dangers beyond those annually incurred under the present system of quarantine administration. Let us have a quarantine worthy of the name, or none at all.”<sup>60</sup> Sternberg admitted New Orleans had many issues to contend with in the execution of an effective quarantine that other cities did not. “The numerous water-ways by which the city may be approached; its extended commerce; the strenuous opposition to quarantine on the part of an interested portion of the community; the support given to these opponents by a certain number of physicians who believe that yellow fever is an endemic disease in the city; and, finally, the difficulty of obtaining an efficient administration where politics control everything...”<sup>61</sup> He blasted operations at the Mississippi River Station as worthless and remarked that the continual whining about lost commerce was grossly overestimated and would never amount to the economic loss of one epidemic such as was seen in 1878. In light of the current situation in New Orleans, Sternberg defended complete non-intercourse quarantine measures, but he advocated a more practical solution to the problem. “I believe...sanitary science is...in a position to indicate methods, which, if faithfully executed, will reduce these risks to such an extent as to make a quarantine of non-intercourse unnecessary.... It is evident...we require uniformity of laws, and inflexibility in their execution; which can only be obtained by allowing the laws to emanate from a central authority, and their execution to depend upon persons removed from the domain of politics.”<sup>62</sup> He then outlined the fundamental principles for a rational quarantine and—in so doing—defended the logic of the Ship Island Station:

1. all vessels, cargoes, ballast, passengers, crew, and baggage coming from an infected port should be considered infected and treated as such;
2. detention in quarantine for a longer time than needed to disinfect the vessel and cargo is unnecessary and unjustifiable;
3. all cargo must be removed to properly disinfect a vessel;
4. keeping passengers and crew aboard a vessel suspected of being infected upon arrival in port in order to test the question of infection is unscientific, unreliable, and inhumane practice; and
5. a quarantine station should be considered an infected area, employing only immune individuals, and should be located so that unauthorized persons cannot gain access to it.

He concluded by saying, “...I believe it as much the duty of the National Government to protect the country from the invasion of pestilential diseases as from a foreign enemy; and consequently the maintenance of such a quarantine should devolve upon it,...and this without any tax upon commerce, or upon the unfortunate people who

are subjected to detention. A great government should resort to no petty measures when she stretches out her hand to protect the people from a serious evil.”<sup>63</sup> Sternberg’s part in Louisiana quarantine politics was finished. He returned home, wrote his report on malaria, and eagerly awaited the publication of his translation of Magnin.

The English translation of Magnin’s *Bacteria*, the first general text on bacteriology in English, appeared in bookshops late in 1880. This text had been an invaluable handbook for Sternberg during his experiments over the past year. His translation grew out of a desire to share this knowledge with his colleagues and fill a void in the scientific literature. Sternberg was convinced that the dearth of American literature on the subject belied the true interest of American scientists in bacteriology. A reliable textbook for experimentation was needed that also provided a foundation of knowledge by which individual American scientists could begin to correctly judge the value of bacteriological work emanating from Europe. Laudatory reviews of his translation from the *Medical Record* and the *American Journal of the Medical Sciences* indicate that his efforts to remedy this situation in an unbiased and scientific manner were well received by scientists and physicians alike.<sup>64</sup>

In January 1881, the United States hosted the 5th International Sanitary Conference in Washington, DC. The focus of the first four conferences revolved around discussions of cholera and international quarantine agreements to limit its dissemination. The United States had not taken part in any of these conferences, even though it was just as vulnerable to cholera as the rest of the world. Participation at this juncture was based on purely political motives covered in a thin veil of interest in international sanitary science. In response to the increased incidence of yellow fever over the past 2 years, Congress passed an act on June 2, 1879 that prevented the introduction of contagious or infectious diseases into the United States. Any vessel destined for America needed a sanitary history certificate verified by the U.S. consul in the country of origin, and this required the consul to inspect the ship. Obtaining international agreement on this piece of domestic legislation was crucial or it would be unenforceable, and hence the motive for sponsorship of the conference. Although the conference was largely an administrative exercise, the seventh session did include a prescient scientific announcement. On February 18, Finlay, representing Cuba and Puerto Rico, stated three conditions necessary for the propagation of yellow fever:

1. “The presence of a previous case of yellow fever within certain limits of time....
2. The presence of a person apt to contract this disease...and
3. The presence of an agent entirely independent for its existence both of the disease and of the sick man, but...necessary in order that the disease shall be conveyed from the yellow-fever patient to a healthy individual.”<sup>65</sup>

Finlay admitted his theory of an intermediate agent was “a mere hypothesis,” but maintained its validity, and in August he would proclaim the mosquito as that agent. His announcements, however, fell on deaf ears.<sup>66</sup>



Sternberg left no written opinion of the conference proceedings, and Finlay's hypothesis left him unmoved. His mind was engaged elsewhere. Experiments relating to the virulence of his saliva and work on disinfectants were begun in January in the Washington laboratory and continued in Dr. H. Newell Martin's laboratory at Johns Hopkins University, where he was reassigned by the NBH at the beginning of March. Martin, professor of biology at Johns Hopkins, was an outstanding research physiologist who had been trained by Michael Foster and Thomas Huxley, and had been recruited by the university in 1876. His small laboratory rapidly became a center for physiological research, and there Martin made many significant contributions to the physiology of the circulation. Sternberg's experiments, with what would prove to be *Streptococcus pneumoniae*, were as close as he would ever come to presenting a previously unknown microorganism to the world. Soon after he began his studies, he became aware that Louis Pasteur had found—and reported—a “new disease” generated by the subcutaneous injection of saliva from a child dying with rabies into rabbits. The etiological agent was a micrococcus, but it was weeks before Sternberg could unequivocally declare that the micrococcus recovered by Pasteur was identical to the one he had found in his mouth in New Orleans. His research, however, was independent of Pasteur's, and his report demonstrates the elegant, logical, and comprehensive approach to solving laboratory questions for which he became famous.<sup>67</sup>

Sternberg hypothesized that one to two cubic centimeters of his saliva injected subcutaneously into rabbits invariably produced death within 48 hours. To prove this contention, he first injected rabbits with other fluids—blood, putrefying bouillon, fecal and mud solutions—and saliva from colleagues in Philadelphia and students in Baltimore. Only solutions of mud from New Orleans and saliva from Philadelphia produced death. Sternberg's oral secretions were apparently not unique in their virulence, a difference he attributed to exposure to septic material by his colleagues and himself over the years. Then he attempted to produce fatalities in other laboratory animals, specifically dogs, guinea pigs, chickens, and rats. As with Pasteur's experiments, only the guinea pigs succumbed. However, one of the dogs died when injected with serum from a rabbit recently dead from septicemia. Apparently, whatever killed the rabbits became more virulent in the process and was capable of killing larger animals when transmitted by serum injection.<sup>68</sup>

He described the disease as a septicemia, both in the nature of its course and at postmortem examinations. Shortly after, injection fever developed, which was followed by marked inflammation and edema at the injection site. At 24 hours, the animal was sluggish, without appetite, and death usually occurred by 48 hours. He said that an examination of venous and arterial blood and the bloody serum from subcutaneous connective tissue revealed “an immense number of micrococci, usually joined in pairs.”<sup>69</sup> The virulence of the microbe was destroyed by boiling or incubating at 37°C for 24 hours. Filtration through a layer of plaster of Paris rendered these fluids innocuous, and, therefore, Sternberg concluded the virulence factor was particulate in nature. Virulence was maintained in initial and successive cultures in bouillon and serum from healthy dogs, and he noted, as did Pasteur, the capsule surrounding each organism.<sup>70</sup>

Finally, Sternberg concluded the microbe found in his saliva was morphologically identical to that found by Pasteur in the mouth of a child dying of rabies in Paris. He was quick to point out, however, that identical structural characteristics did not guarantee the diseases generated were identical. Sternberg was adamant on this point and stated, "The man of science soon finds that things which look alike are not necessarily of the same kind.... The argument...that because a certain bacillus, or spirillum, or micrococcus, is morphologically identical with another, which is proved to be harmless...consequently it must be harmless, has no support from analogy any more than it has from experiment. And it is high time that naturalists and physicians should open their eyes to the fallacy of such an argument, as it not only has a tendency to close the minds of those who receive it to the reception of demonstrated truth, but also acts...as a bar to the progress of science in this direction."<sup>71</sup> He admitted the two diseases had many characteristics in common, "but I am not prepared to pronounce a positive opinion upon this point, especially since Pasteur, who had previously given much attention to the study of septicaemia, pronounces the disease observed by him to be new, while I see no reason...for supposing that the disease observed by me differs essentially from the experimental septicaemia produced by Davaine, Koch and other investigators, who, however, obtained their first supply of septic organisms from a different source."<sup>72</sup>

Sternberg, for personal reasons, would have liked the two diseases to be different. But his obligation to science was to analyze and present his results as they were and correlate them with previously reported data. In doing so, he made these conclusions concerning systemic infections, their distribution in nature, and impact on society: "In the light of what we know now, it seems very probable that puerperal fever, hospital gangrene, and the various forms of septicaemia...result from the development of pathogenic varieties of harmless and widely-distributed species of micrococci.... The fact...that during the summer months the mud in the gutters of New Orleans possesses an extraordinary degree of virulence shows that pathogenic varieties of bacteria are not alone bred in the bodies of living animals. The more I study this subject the more probable it seems...that in this direction lies the explanation of many problems which have puzzled epidemiologists, and that the sanitarians are right in fighting against filth as a prime factor in the production of epidemics.... The presence of septic organisms, possessing different degrees of virulence depending upon the abundance and kind of pabulum furnished them and upon meteorological conditions more or less favorable, constitutes...the epidemic constitution of the atmosphere, which wise men were wont to speak of not many years ago as a cloak of ignorance. It must be remembered...the gutter mud of today, with its deadly septic organisms, is the dust of tomorrow, which in respiration is deposited upon the mucous membrane of the respiratory passages of those who breathe the air loaded with it. Whether the peculiar poison of each specific disease is of the same nature or not...it is altogether probable...this factor often gives a malignant character to epidemics of diseases which uncomplicated, are of a comparatively trivial nature."<sup>73</sup>

This passage reflects not only that Sternberg had acquired a bit of the preacher

from his father and had developed his epidemiological skills since 1870, but also that he recognized the broader implications and applications of laboratory medicine and a responsibility to articulate them. He understood that the very nature and distribution of microorganisms demanded sanitarians and bacteriologists to work together for the good of public health science. He also recognized in these experiments that morphological characteristics were not indicative of microbial virulence. The work of Casimir Davaine and Koch with the anthrax bacillus and Otto Obermeier with the spirillum of relapsing fever had generated a hope that structurally distinct organisms would be found for each infectious disease. Sternberg saw this as an easy answer to a complex subject, a forlorn hope. Virulence did not necessarily exist unchanged over time, and its effects were influenced by many host and environmental factors.

Sternberg undoubtedly recovered and observed *S pneumoniae* two months before Pasteur, but he was unable to describe its structural and virulent characteristics until three months after the French chemist had published his work, and, therefore, priority of discovery fell to Pasteur. He could claim, however, he was the first scientist in the United States to independently identify the organism. The fact that *S pneumoniae* was originally recovered from healthy carriers of the organism—not from patients ill with streptococcal disease—does not appear to have been considered significant, nor was the capsule surrounding the organism given much consideration. The medical communities in Europe and America gave little attention to the discovery. One more microorganism that induced septicemia in laboratory animals had been discovered, but no substantial connection with human disease had been offered.<sup>74</sup>

Nonetheless, the spring of 1881 was a high water mark for the 43-year-old Sternberg. His ambition, boundless energy, and motivation for studying, experimenting, and publishing overcame the difficulties multiple army relocations imposed on his scientific endeavors. He was a subject matter expert on yellow fever and microscopy and, through his NBH investigations, was recognized as one of the premier laboratory scientists in the nation and a leader in the fledgling field of bacteriology. Designated a fellow by courtesy of Johns Hopkins University, Sternberg settled easily into academic life at the university. With no army-imposed time limits bracketing his special assignment to the board, it appeared likely that he would continue in this capacity for an indefinite period.



## Chapter Seven

# Exiled to California

Sternberg engaged in various bacteriological projects for the National Board of Health (NBH) during the spring and summer of 1881. The highly virulent *Streptococcus pneumoniae* was an excellent subject for disinfectant efficacy studies, and he tested it against several nongaseous disinfectants in the laboratory at Johns Hopkins University. Through H. Newell Martin he obtained anthrax spores from British physiologist and pathologist, Dr. John Scott Burdon-Sanderson, raised his own colonies of anthrax, and made photomicrographs of the deadly bacillus. He also studied the micrococci of diphtheria and gonorrhea, and evaluated and described some of the normal microbial flora found in the human urinary and gastrointestinal tracts. Louis Pasteur's research had shown that micrococci, which normally inhabit the distal portion of the male urethra, were responsible for the decomposition of a urine sample over time. Joseph Lister had demonstrated urine taken from a healthy bladder was sterile and remained sterile if not inoculated with bacteria from some external source. Considering these two facts, Sternberg collected first flow and mid-stream urine samples in sterile flasks and observed them for turbidity indicative of microbial growth. While the first flow samples always became turbid with micrococci, variable results were obtained with mid-stream collections. He modified the collection procedure by disinfecting the penile tip—his own—with a 3 percent carbolic acid solution before collection. All of these samples remained transparent. For the first time, the value of the “clean catch” urine specimen was demonstrated and reported to physicians. Sternberg commented, however, that the application of carbolic acid to tender mucous membranes “produced some pain, and a little soreness upon passing urine was felt for two or three days.”<sup>1</sup>

In “A Contribution to the Study of the Bacterial Organisms Commonly Found upon Exposed Mucous Surfaces and in the Alimentary Canal of Healthy Individuals,” Sternberg identified, described, and photographed commensal organisms in the oral cavity and alimentary tract. This paper was a succinct distillation of his

thoughts, ideas, and laboratory techniques. It was presented in a readable literary style and illustrated two of his most valuable assets as a scientist:

1. the intellectual ability to absorb, understand, and synthesize a continually increasing amount of scientific data, and to generate hypotheses that—for the time—were remarkably accurate; and
2. the technical creativity and manual dexterity to solve methodological problems at the laboratory bench.

The importance of these studies was clearly evident to him. “That there are many widely distributed forms (species?) which are ordinarily harmless.... It is evident that a precise knowledge of the morphology and development...of these common forms is an essential prerequisite to the recognition of unusual forms and to the...study of...such forms to any particular disease with which they may be found associated.”<sup>2</sup> Sternberg suggested that these common bacteria were not merely parasites, but also played a vital role in the human body’s daily functions. Under certain conditions, pathogenic organisms could overwhelm the body’s resisting power and displace this normal flora, and he perceived the degree of virulence of an organism was directly related to the route of entry into the body, a proper environment for growth, and the organism’s ability to multiply rapidly. Concerning this resisting power, he noted, “It has occurred to me that possibly the white corpuscles may have the office of picking up and digesting bacterial organisms when...they find their way into the blood. The propensity exhibited by the leucocytes for picking up inorganic granules is well known, and that they may... assimilate, and so dispose of...bacteria...does not seem to me very improbable in view of the fact that amoebae, which resemble them so closely, feed upon bacteria and similar organisms.”<sup>3</sup> Sternberg would add little to this preliminary hypothesis in his book *Bacteria*; however, he boldly suggested his precedence for asserting this idea, worked out by Elie Metchnikoff in 1883, in later years.<sup>4</sup>

A skilled lab bench technician, Sternberg developed a method for ensuring the sterility of liquid culture media. Using quarter-inch glass tubing and a foot-operated bellows or Bunsen burner, he manufactured small bulbs with elongated necks that could be filled with whatever liquid media he desired, heat sealed, and then sterilized in a bath of oil, paraffin, or concentrated salt solution. By using these “Sternberg tubes,” as they became known, he could maintain the sterility of his solutions indefinitely. This was an advantage over Pasteur’s flasks and even Robert Koch’s new plating techniques, and he could always have media at hand because of the easy transportability of the tubes.<sup>5</sup>

At Johns Hopkins, he was comfortably ensconced in the academia of one of America’s most progressive institutions. But more than bacterial cultures would soon be incubating in the laboratory. In December 1879, Dr. James Cabell, president of the NBH, asked Dr. John W. Mallet, professor of general and industrial chemistry at the University of Virginia, to plan a series of water analysis studies. The board liked the plan, approved funding, and authorized Mallet to begin work. Like his friend and colleague Cabell, Mallet worked and directed his assistants from the

university in Charlottesville. As the water analysis project progressed, Mallet requested bacteriological support. Initially, Doctors Martin and Edward M. Hartwell provided this support, but Sternberg replaced Martin at the beginning of March 1881 when the latter was called away. For unknown reasons, Mallet also wanted to conduct certain yellow fever experiments in the Baltimore laboratory, and he probably thought that since Sternberg was an authority on the subject and now a part of his team, he would be glad to participate. But differences between Sternberg and Mallet regarding the experimental methods soon developed. Sternberg strongly disagreed with Mallet's approach and said so. He also offered to go to a quarantine station, presumably to conduct the experiments, but Mallet never responded to the suggestion. By July, this initially professional struggle had degenerated into a largely personal tug-of-war over scientific jurisdiction and control. Mallet finally informed Sternberg that he accepted full responsibility for such experiments, and the laboratory was to proceed with them.<sup>6</sup>

Sternberg interpreted the directive as an indication that Mallet regarded him in a subordinate capacity. It is doubtful whether the professor could have said or done anything that would have provoked Sternberg's sense of professional position, pride, and dignity more than to suggest such a relationship. It appears, too, that this may not have been the first instance in which Mallet gave the major less respect than he thought he was due. In a letter written to Dr. Thomas Turner, secretary of the NBH, Sternberg stated, "I can not doubt that the earnest remonstrance made by me when Prof Mallet first proposed that experiments with yellow fever material should be made in Baltimore, if made by Dr. Martin would have induced him to abandon the scheme at once.... He took the ground that I was not the equal of Prof Martin & himself but his subordinate. I freely admit that Prof Martin is my superior as a physiologist & Dr. Mallet as a Chemist, but do not admit that the title of Surgeon U.S. Army is in any way inferior to that of Professor of Chemistry or of Physiology...."<sup>7</sup> Sternberg quickly communicated this slight to Cabell hoping that the board president would adjudicate the situation in his favor. Whether Cabell was dutifully closing ranks with a university colleague or just remaining above the fray is unclear, but his return telegram made it obvious that he also considered Sternberg in a subordinate role: "Apply to Mallet, whatever he agrees to will be acceptable to me, but his directions must govern you."<sup>8</sup> Sternberg was furious and immediately tendered his resignation from the board to the army adjutant general.<sup>9</sup>

He regained his composure enough on the following day, July 18, to write a civil letter to Cabell explaining his proposed methods for conducting the yellow fever experiments. This correspondence has not survived, but whatever was said stimulated Cabell to ask Mallet to consider a compromise. Sternberg received this word from the NBH president, and a note from Mallet that declined any experimental compromise on July 19, after returning from a meeting with Turner in Washington to insist his request for relief was forwarded. Sternberg told Cabell, "This action was grounded upon your telegram of July 17th.... This telegram placing me directly under the orders of Dr. Mallet made it necessary for me to apply to

be detached from this duty as I am unwilling to serve the Board in a subordinate capacity. Some of the younger members of the Medical Corps may not feel as I do, in this matter, but being a surgeon of twenty years service & having occupied many responsible positions I much prefer my army duties to any subordinate position with the Board of Health. I was quite willing to aid Dr. Mallet as Prof Martin's substitute during his absence, and have made every effort to carry out his wishes, but I judge...he considers me under his immediate orders while it had not occurred to me that such was your intention until I received your telegram."<sup>10</sup> In conclusion, Sternberg thanked him for the "kind and liberal treatment [he] had received...up to the time you consented to sacrifice my interests upon the altar of Dr. Mallet's yellow fever experiments. I can not help thinking that this was done without a full knowledge of the circumstances & if I have done you an injustice by drawing too hasty a conclusion I ask you pardon."<sup>11</sup>

Sternberg's abrupt resignation caught the Surgeon General's Office by surprise. Colonel Crane's immediate response was to table the document for a couple of weeks to allow time to sort out the situation. In the meantime, he told Sternberg to take a trip to the beach to cool off. Sternberg dutifully packed up Martha, and they spent the next week in Asbury Park, New Jersey. But if Crane thought a few days of ocean air and sea bathing would put Sternberg in a more conciliatory mood, he did not know Levi Sternberg's son very well. Sternberg commented that they enjoyed the seashore, but he remained preoccupied with the current issue and soon became restless with the imposed inactivity. He wrote a farewell to the NBH on July 26 just before leaving Asbury Park. He asked the board's secretary to explain to the membership his reasons for leaving and stated, "I should be sorry to be considered ungrateful for past favors or to lose the good opinion of my friends in the Board & I desire to acknowledge my high appreciation of the consideration with which I have been treated during the two years I have been in the service of the Board.... I have never been willing to occupy the position of handy man to be called upon when needed for miscellaneous work, but have looked upon myself as an earnest & industrious worker in the difficult paths of experimental investigation by which we hope eventually to shed some light upon the unsolved problems relating to the etiology of epidemic & infectious diseases."<sup>12</sup> He also sent a courtesy copy of this letter to Crane. The matter was settled in Sternberg's mind, and he was ready for a new assignment. He hinted to Crane he "would be admirably situated for pursuing my studies & experimental researches if stationed at Fort McHenry as I would have the use of the library & laboratory at Johns Hopkins," but then excused himself as he did not know the practicality of the idea or "how far the Surgeon General will be disposed to favor me in my desire to continue my experimental studies."<sup>13</sup> Over the next five days, however, it appears that the board attempted to reconcile the issue in Sternberg's favor. Sternberg again wrote to Crane asking for advice on what he should do if the board asked him to return. He was not only willing to consider what they offered, but also ready to accept it, unless Crane could give him "a station where I can settle down for two or three years & where I will have some facilities for prosecuting the experimental studies in which I am



interested....”<sup>14</sup> Crane replied tersely, “I do not believe you can properly recede from the position you have taken and my advice, is, that you do nothing! This is the best time for you to dissolve your connection with the ‘National Board of Health,’ and resume your legitimate duties as a medical officer of the army. As soon as the matter can be discussed with the Surgeon General I will inform you of the assignment which will be made for your further station.”<sup>15</sup> The deputy surgeon general had lost patience with Sternberg and the idea of his assignment to the NBH. For reasons unknown, the discussions to keep Sternberg with the NBH rapidly unraveled, and the surgeon general—very likely on Crane’s recommendation—was not inclined to grant him any favors or concessions concerning his next assignment. On August 10, Major Sternberg was relieved from duty with the NBH and assigned to Fort Mason in the Department of California.<sup>16</sup>

The scant historical evidence available concerning this incident makes it difficult to clearly understand all of the personal and professional factors involved. Certain tentative conclusions may be drawn when the affair is observed on a broader scope. Sternberg was a respected soldier and physician with 20 years of exceptionally active service. At this point in his career, by today’s standards, he would have held the rank of colonel in a hospital command or senior medical staff position. His interests in science led him very early in his career down an unknown path—and one considered essentially useless—by the majority of his Medical Corps colleagues. Combat record aside, Sternberg was an oddity, something of an outcast in the army medical community of the time, but he persevered with his work and convictions until technological advancements in science and medicine demonstrated he was not as far out in left field as perceived. His clinical and epidemiological studies on yellow fever and skills as a microscopist gained the attention of the national medical community, and his laboratory investigations in Cuba solidified his position as an expert on the disease and as a laboratory scientist. By late 1879, Sternberg clearly recognized his status and expected to receive the respect to which this entitled him. From his active involvement with the American Public Health Association (APHA), it appears that he was accorded this respect from his colleagues in that organization. However, university faculty members, who considered themselves professional academicians, may have regarded him as a part-time scientist, or an upstart military surgeon with an over-inflated ego. Sternberg saw himself as a very serious medical scientist and academician. Yellow fever research had brought him to the NBH, and—justified or not—he felt a keen sense of ownership over any research bearing on the disease. When Mallet proposed conducting yellow fever experiments without Sternberg’s blessing, he encroached on the army scientist’s perceived territory and authority. His desire to be treated in a professional manner was understandable, yet Sternberg’s vanity overcame his own professional standards and good sense in resolving the conflict, not only with Mallet, but also with the surgeon general. He kept the Surgeon General’s Office fully informed about the status of the affair and expected support from this quarter. But he failed to consider the political impact his resignation would have on an organization struggling to establish its credibility in Washington, and

how it would reflect on the Medical Department. The Army and the Medical Department had supported Sternberg's special assignment to the NBH because of his superb abilities as a laboratory scientist. It was expected that his performance would reflect well on the army and Medical Department, and be their endorsement of the new health agency (the NBH). For Sternberg to unilaterally back out because he could not get along with his fellow scientists appeared as dissension within the board and only fueled the fire of antagonism the organization was facing on Capitol Hill. Barnes may also have been personally irritated with his decision. He had been listening to Sternberg complain for years about the importance of his research, and the difficulty to pursue it with little support from the Medical Department. The surgeon general had assisted in giving him the opportunity and support he had wanted for so long, but now Sternberg wanted to quit over an issue that was—when considered in the larger scheme—minor. He then had the audacity to suggest where his next assignment should be so he could continue the same research and requested the NBH loan him the necessary equipment. Barnes was in no humor to do Sternberg any favors, a fact reflected in the assignment he selected. By ordering him to the Department of California, Barnes essentially exiled him to do penance in a scientific desert for being so stubborn and intractable.<sup>17</sup>

If Sternberg was depressed or felt any remorse over the Mallet affair, as he and Martha rode the train west once again, it was only temporary. "The order relieving him from his experimental work in the East might have been so discouraging for many men that they would have given up the self-imposed task," Mrs. Sternberg noted, "but such was not the case with him."<sup>18</sup> With Crane's approval, they stopped briefly in Cincinnati, where Sternberg read his paper on common alimentary organisms to the American Association for the Advancement of Science, before proceeding to Indianapolis and then Ellsworth in late August.<sup>19</sup>

In early September, the Sternbergs were situated in their new quarters at Fort Mason on Point San Jose in San Francisco, which was "a charming little house on the side of a high bluff, overlooking the bay," according to Mrs. Sternberg.<sup>20</sup> As usual, her husband quickly fashioned a laboratory in their home. To furnish it, he applied—through Crane to the surgeon general—for microscopical equipment. It probably came as no surprise that the request was denied. "I presume...you have learned from Genl Crane that the Surgeon General disapproves your application for microscopical apparatus. For this I am personally sorry," wrote a sympathetic Joseph Woodward. "I may mention that General Crane showed me your application and asked me what I thought of it. I told him that I hoped it would be granted and believed you would make good use of the apparatus."<sup>21</sup> Sternberg was not to be denied by his disgruntled chief, so he purchased the equipment himself.

In addition to Sternberg's clinical duties and participation on various army evaluation boards, he found time to pursue science and literary endeavors. He wrote *Photomicrographs and How to Make Them*, a handbook for the novice photomicrographer and one of the earliest instructional texts on the subject. Sternberg provided complete and concise directions on how to collect, stain, and mount bacteria for photographing. He believed—as Koch did—that when the subject was

appropriate, photomicrographs were superior to drawings and should be made and used as proof in scientific investigations. Although the San Francisco posting had made his scientific pursuits more difficult, it does not appear that they were significantly impeded. His laboratory work, although conducted under more austere conditions, was a continuation of the ever-broadening bacteriological research he had conducted in Baltimore. In retrospect, the time he spent with the NBH had tremendously influenced the direction of his career as a bacteriologist and medical scientist. Sternberg became the first laboratory authority in the United States to confirm new discoveries in bacteriology. Mrs. Sternberg commented more than once that it was a shame so much of her husband's time was engaged in confirming the observations of others. In reality, Sternberg's technical skills, interests, and objectivity and conservatism as a scientist placed him in this role, one he considered critical for medical science advancement. His attempts to demonstrate the gonococcus of Albert Neisser and the tubercle bacillus using Koch's method from the spring to the fall of 1882 illustrate these points very well.<sup>22</sup>

Neisser, a young dermatologist and bacteriologist in Breslau, had demonstrated the gonococcus in urethral discharges of male and female patients suffering from purulent urethritis and in infants with blennorrhoea neonatorum in 1879.<sup>23</sup> Although he did not prove cause and effect, the gonococcus immediately joined the list of specific bacterial disease agents. Sternberg's interest in the gonococcus originated in Baltimore in 1881, after his yellow fever and malarial research was temporarily halted. In 1882, presumably using the methyl-violet staining method advocated by Neisser, Sternberg found plenty of micrococci in gonorrhoeal discharges, but identified them as *Micrococcus ureae*, a common commensal organism of the distal male urinary tract. He conducted culture and inoculation experiments anyway, and his commentary on these experiments provided valuable and interesting insight concerning his scientific philosophy and methods, and the state of medical research. He initiated his work with culture and inoculation experiments with specimens from a case of gonorrhoea diagnosed in a soldier at Fort Mason. Unable to produce the disease in dogs or find any willing subjects through bribery, he obtained male volunteers through Dr. Joseph O. Hirschfelder at the San Francisco City and County Hospital.<sup>24</sup> According to Sternberg, "These patients consented... with a full knowledge of the possible results, from a desire to please their doctor, and under the *promise* of [a] speedy cure [*italics mine*] and a suitable recompense in case of successful inoculation."<sup>25</sup>

The ethical implications of such experimentation are glaring today, but in 1882 modern experimental medicine was in its infancy. Ethical responsibility for medical experimentation devolved upon the moral character of the individual physician. No sanctioned ethical code for medical experimentation existed, and the only guidance for appropriate human experimentation came from Claude Bernard who wrote: "It is our duty and right to perform an experiment on man whenever it can save his life, cure him or gain him some personal benefit. The principle of medical and surgical morality, therefore, consists in never performing on man an experiment which might be harmful to him to any extent, even though the result might be highly advantageous to science, that is, to the health of others."<sup>26</sup>

Hirschfelder's volunteers consisted of three bedridden patients who suffered from end-stage diseases. Their desire to please Hirschfelder and need for compensation cannot be assessed, but probably influenced their decision significantly. Although Sternberg did obtain what he considered informed consent, it is questionable how much of his explanation they understood. That he truly believed cure was possible—using urethral injections of mercuric bichloride or zinc sulfate solutions—is confirmed by the fact that he swabbed his own urethra with gonorrheal cultures during his research. No cases were forthcoming, but by comparing *M ureae* to the septic micrococcus (*S pneumoniae*) of rabbits he did show—to his satisfaction anyway—that structural and functional differences do exist among bacteria. It was, therefore, possible to develop a taxonomic categorization of these organisms as advocated by Ferdinand Cohn and Koch. Confident that he had made no technical errors, Sternberg wrote about his results. In the introduction of this report, he cautioned his colleagues to maintain “a proper scientific conservatism” and not rush to embrace the idea that all infectious diseases were caused by specific microorganisms.<sup>27</sup> This last statement is incongruous today, but in 1882 it was plausible because the nature of infection and infectious disease was just beginning to be elucidated. Sternberg concluded that Neisser was wrong to claim that his organism could be differentiated from other micrococci by morphological characteristics and that the gonococcus and *M ureae* were the same organism.<sup>28</sup>

On March 24, 1882, Koch demonstrated the tubercle bacillus for the first time to colleagues in Berlin.<sup>29</sup> His work was published on April 10. By late May, Sternberg had read the abstracts of Koch's work and conducted his own examinations of tuberculous material obtained from Hirschfelder. For the next 10 weeks, he was repeatedly frustrated by his failure to find the bacillus using Koch's or Paul Baumgarten's staining methods. He was not alone. Other American and European physicians also found Koch's method too difficult to manage, which led to skepticism and outright disbelief in the German discovery. Sternberg never mastered Koch's technique, but on August 8, he finally demonstrated the bacillus in postmortem lung preparations using Paul Ehrlich's method, a variation on Koch's theme, which he apparently had only become cognizant of at the beginning of the month. Cultivating the organism and producing disease in laboratory animals were difficult. Although Koch was convinced the bacillus was the specific causative agent of tuberculosis, Sternberg remained unconvinced, a fact that he wrote about in a five-article series in the *Medical News* between July and the end of December. His skepticism stemmed not from a lack of faith in Koch's techniques, a man whose intellect and technical competence he greatly admired, but from his own understanding of the tubercular disease process, the variability of his repeated experimentation, and a healthy scientific conservatism. Tubercular nodules were considered to originate from a local inflammation that could be infectious or non-infectious. He was convinced of this because he had seen numerous postmortem sections of tubercular lungs devoid of Koch's bacillus. While Sternberg believed in the validity of the germ theory of disease causation, he freely admitted that it did not yet rest upon a solid experimental foundation. Negative evidence from his

own laboratory led him to argue that Koch's bacillus could be associated with the disease, but no undisputed proof of its specificity as an agent existed. Moreover, other bacteria apparently could produce tubercular nodules just as easily as Koch's bacillus if they were situated in one of these inflammatory areas. Sternberg reluctantly concluded this work in October. Obtaining laboratory animals was difficult, and anti-vivisectionist sentiment—fueled by Mrs. Irvin McDowell, the garrison commander's wife—was strong. Moreover, the large expenditure of time and money required and the lack of proper facilities had become too great a burden to continue such work. He returned to an old passion, disinfectants, a venture he considered more universally lucrative in the long run for public health and bacteriology.<sup>30</sup>

Not all of the standard disinfectant agents then on the market were equally effective. Some killed bacteria (germicides) while others only inhibited bacterial growth (antiseptics), and some—in concentrations or volumes practical for public or clinical use—had no effect on bacteria, but were good deodorizers. Some of these germicides were also used as therapeutic agents. Sternberg evaluated the germicidal power of many agents at different concentrations and compared his results with current clinical experience. His experiments performed on various micrococci demonstrated that the value of these agents depended on the concentrations used and the microorganisms to which they were applied.<sup>31</sup>

This series of investigations was the last he performed at Fort Mason. The year 1883 would be a busy one for him, but at his desk and in the Surgeon General's Library rather than in the laboratory. *Photomicrographs and How to Make Them* and an article on malaria were published in January, the "Germicidal Value of Certain Therapeutic Agents" appeared in April, and he was heavily engaged in completing the second edition of his translation of Magnin's *Bacteria*. Nevertheless, he accepted a request from the APHA to report on the value of experimental evidence of the etiology of malaria for presentation in November, and, with considerable hesitation, one from the William Wood Publishing Company to compose a book on malaria and malarial diseases. Sternberg's complete transition from laboratory bench to literary endeavors—at a great distance from required resource materials—suggests he needed a break from the laboratory, but it would be uncharacteristic of him not to have had a professional goal for this transition. One such goal may have been to establish himself as the foremost authority in bacteriology in the United States by writing the definitive treatise on the subject.<sup>32</sup>

Sternberg's translation of Magnin's work had been well received, and it was an instructive handbook to American bacteriologists. By 1883, its contents had become outdated and incomplete. In the three years since publication, technological advancements in the cultivation, recognition, staining, and attenuation of microorganisms were made; germicides and antiseptics were more clearly defined and understood; the list of pathogenic organisms grew considerably longer; and the volume of bacteriological literature became massive. Just as he had perceived the need for a basic manual on the subject, Sternberg now recognized the need to update it for the benefit of his colleagues. Magnin's original work comprised only the first third of the second edition. The remainder originated from Sternberg, a complete,

comprehensive, detailed, and thoroughly understandable tour de force in bacteriology. Probably no other scientist in America—perhaps even in the world—had so universal an understanding of this field in 1883, the intellectual ability to synthesize and condense this knowledge, and the literary skills to put it on paper. In producing a second edition of *Bacteria*, he ensured that his name and ideas were associated with the most current bacteriological knowledge and progress.

Mrs. Sternberg's status as a widow to a man driven by science changed in style, but not in substance in 1883. Her biography contains no comments for this year until late in November. Sternberg's personal papers also provide little information concerning his activities, an indication that—apart from routine post surgeon duties—he was consumed by his study. By the middle of August, he had completed the second edition of *Bacteria*, and on October 6, he boarded the eastbound train for Washington, where he immersed himself in the malaria literature available in the Surgeon General's Library for the next 5 weeks. At first glance, *Malaria and Malarial Diseases* appears as another example of Sternberg's compulsion to always have more work than one scientist could accomplish. A more accurate assessment is that he accepted the request as a challenge to write the definitive work on malarial fevers.<sup>33</sup>

In the fall of 1883, the Army Medical Museum and Surgeon General's Library were about to undergo some major administrative and personnel changes. It was proposed that the museum and library be reorganized under one head and the current curator, surgeon David Low Huntington, be reassigned as an assistant to the surgeon general. How privy Sternberg was to these changes before his visit is unclear, but he apparently attempted to maneuver himself into the curatorship and, presumably, looked to Surgeon General Crane for support. Unfortunately, Crane, who had assumed the Medical Department helm from retiring Surgeon General Barnes in June 1882, died on October 10, 1883, and Robert Murray replaced him in November. Surgeon General Murray opted for John Shaw Billings to assume the combined museum and library duties, and Sternberg learned of Murray's decision before he left Washington, DC, for the APHA meeting in Detroit. Sternberg was tremendously upset over Billings' selection. His professional timing—so critical in securing choice assignments—had been off since his tenure with the NBH. When the museum's previous curator, surgeon George A. Otis, died in February 1881, Huntington assumed the curatorship. When Joseph Woodward became ill in early 1882, Major Charles Smart, Sternberg's former laboratory colleague who was still working for the NBH, was tapped to continue Woodward's work on the *Medical and Surgical History of the War of the Rebellion*. Now Billings, who had been in Washington since the Civil War, was given the dual responsibilities of museum and library, while Sternberg languished in California.<sup>34</sup> By the time he returned to Fort Mason, he had mulled the entire issue over and over again. On November 27, he prepared a lengthy missal for the surgeon general in which he vented his grievances:

"I would respectfully ask your attention to the following statements relating to my future career....It is my earnest desire to devote my time to scientific and literary work and especially to microscopical and experimental studies relating to the etiology of infectious diseases. Since leaving the National Board of Health, Aug. 23, 1881, I have been obliged to prosecute my experimental work at my own expense...in order not to drop out of sight as an investigator,

in a field in which I have gained some distinction. And this notwithstanding the fact that apparatus of the same kind, purchased with government money, has been for two years lying idle [in Washington].

“With the experience and special training I now have and with proper facilities I...could cultivate this field still more successfully in [the] future and...by such labors accomplish more for humanity, for the credit of the Medical Corps of the Army, and for my own reputation than by continuing to perform the routine duties of an Army Surgeon. But I am satisfied that it is useless to continue my attempts in this direction...without encouragement and material assistance from some source.

“I find also that I labor under great difficulties in prosecuting the literary work which I have undertaken on account of my remoteness from libraries and from my publishers.... I would further respectfully represent that my Army service has been mostly at remote posts; that I have seen my full share of epidemics and Indian wars; that I have had but one brief tour of duty in the East (1870–1872); that this was broken by three changes of station and an epidemic of yellow fever, that when I accepted a detail as member of the Havana Yellow Fever Commission I made considerable sacrifices, and enlisted in the cause of scientific research; that my tour of duty with the National Board of Health ought not to have been counted against me as Eastern service as I spent the first summer in Havana and the second in New Orleans and I was only in Washington during the winter months for the purpose of writing my reports and recuperating my strength.

“I would further respectfully represent that two positions, which I have felt that I had some claim to, have been filled by the detail of officers junior to me in the service and both of whom had just served a tour of duty in the East. I refer to the position of Curator of the Army Medical Museum and to that of a member of the National Board of Health. Either of these details would enable me to pursue my microscopical and experimental studies and to continue my literary labors under favorable circumstances.”<sup>35</sup>

The sacrifices Sternberg mentions in relation to the first Havana Yellow Fever Commission (unless he is referring to the time he spent away from Mrs. Sternberg) remain obscure. Whatever sacrifices he thought he made paled in comparison to the recognition he received as a scientist. His complaint about a junior officer, Billings, being selected over him for curator must be taken in context. Sternberg had no personal or professional animosity toward Billings or any of the other museum staff members. His relationship with all of them through the years had been one of mutual support and cooperation. However, he felt excluded from a club in which he felt he had earned a place—the Mallet affair notwithstanding—but was continually denied membership. That Billings understood this—and was thinking of Sternberg’s future—is evident in his remarks to him in a letter from mid-January 1884: “I am sorry that it has not been found possible to meet your wishes by placing you in charge of this department, but I hope I shall be able to help you to a part at least of what you want after a little [time?].”<sup>36</sup> Whether Sternberg’s letter or Billings’ advocacy materially influenced Surgeon General Murray’s decision to retrieve him from the west coast can only be speculated, but in April 1884, Sternberg received orders to report to Governors Island, New York, in the Department of the East.<sup>37</sup>

The importance of Sternberg’s contributions to the field of bacteriology while in California has been glossed over, usually with the statement that he was the first—or most likely the first—scientist to demonstrate the tubercle bacillus in America, or it

has been totally missed by historians and biographers. He was the first to demonstrate the tubercle bacillus in America. This event, however, was significant to Sternberg and other scientists because it validated the work of Koch and Ehrlich and, thereby, supported the existence of a tubercle bacillus, and not because he was the first American scientist to do so. Regrettably, the primacy of giving Sternberg a “first” at something—a landmark for posterity—has become the focus of his California experience and a roadblock to understanding his true intentions, goals, and accomplishments performed under difficult conditions. During his three-year tour at Fort Mason, he persevered with his laboratory and literary work upon the tubercle bacillus, a variety of micrococci, and disinfectants. All of these labors had the same two fundamental objectives: (1) to materially assist the development of bacteriological science through hypothesis testing, reproducing and verifying the work of others, and comparing their experiments with his own; and (2) to educate and mentor American scientists via the written word. These are the successes—the firsts he established for bacteriology in America—for which he should be remembered. While young bacteriologists, like William Henry Welch, T. Mitchell Prudden, William Councilman, Herman Biggs, and others were studying at the feet of the masters in Germany, Sternberg was already well versed in the most current experimental methodology. His many theories, experimental philosophy, and laboratory techniques reached only a limited audience, however, until the publication of the second edition of *Bacteria*. This book, a culmination of all of his research and an objective discussion on current bacteriological issues, as well as a valuable laboratory manual, launched Sternberg to the forefront, established him as an undisputed authority in theoretical and practical bacteriology, and provided the groundwork for his magnum opus, a *Manual of Bacteriology*, published in 1893.<sup>38</sup>



## Chapter Eight

# Dean of American Bacteriology

Sternberg completed *Malaria and Malarial Diseases* just before leaving Fort Mason in April 1884. Laboratory and sentimental belongings were carefully packed, and the rest of the Sternberg household was consigned to the auctioneer. "Crossing the continent was no longer a novelty," Mrs. Sternberg commented years later, "but we took considerable interest in drawing comparisons between conditions on this trip and on those we had previously made. The railroad had made great strides and...the new dining car service a great improvement on the eating stations of earlier days. Many little towns were springing up near the railroad, marking the advance of civilization across the plains. The immense herds of wild animals that formerly roamed at will were almost annihilated. Where as...there were in the sixties such great numbers of buffalo that they blocked the railroads, we now saw only small bands. Immense numbers had been slaughtered for their skins alone, or for the tongues, as these were considered a great delicacy.... The buffalo, self-supporting on the grass of the unclaimed prairie, deserved a better fate, more especially as the red man drew largely upon him for subsistence."<sup>1</sup> For the next two months, the Sternbergs lived an unsettled life. He reported for duty at Department of the East headquarters, Governors Island, New York, on April 28, and then attended the American Medical Association meeting in Washington in early May. By the middle of the month, he was on unspecified temporary duty in the Surgeon General's Office, and on June 6 he received permanent assignment as attending surgeon and examiner of recruits in Baltimore. The assignment suited Sternberg perfectly because he could perform army duties and still have time to conduct bacteriologic research in Dr. H. Newell Martin's laboratory at the downtown campus of Johns Hopkins University.<sup>2</sup>

The Sternbergs rented a furnished home at 52 McMechan Street. Mrs. Sternberg was extremely pleased to be back in Baltimore for its social, cultural, and educational opportunities. She studied art history with Miss Jane Addams, and she and her husband found classes on French literature at Johns Hopkins University a relaxing

and entertaining way to spend late afternoons together. She also admits for the first time that she “went frequently to the laboratory” as Sternberg had “little or no assistance, and I tried to make myself useful, for with a little instruction I had learned to make bouillon and other bacteriologic media.”<sup>3</sup>

The leadership at Johns Hopkins, inspired and directed by Dr. Daniel Coit Gilman, had planned for medical research and education to be part of the university complex from the school’s beginning in 1876. This concept and the interrelationship of medicine, science, and research are obvious today, but in the last quarter of the 19th century it was radical—even threatening—to the profession at large. Many practitioners still could not see anything practical emanating from the laboratory. Furthermore, as John Harley Warner wrote, “The laboratory, and particularly reasoning from the bench to the bedside, threatened to remove medical knowledge from the realm of common experience, not only that of the public but also that of most regular practitioners.”<sup>4</sup> The laboratory would destroy empiricism through the remystification of medical knowledge. Little had changed from when Sternberg graduated in 1860. American colleges and universities contributed essentially nothing to medical research. Physicians who wanted to continue their medical education and stay abreast of current medical developments still had to go to Europe, yet now they booked passage to Berlin rather than Paris. In the spring of 1883, Gilman organized the nucleus of a medical faculty consisting of Ira Remsen, Professor of Chemistry, H. Newell Martin, Professor of Biology, and John S. Billings, Professor of Hygiene. For the Pathology professorship, Gilman was interested in a 33-year-old pathologist named William Henry Welch, who had studied under Julius Cohnheim in Germany and was employed at New York’s Bellevue Hospital. Welch wanted to conduct original bacteriological research in his laboratory, but the Bellevue leadership ignored his proposals. Gilman was so impressed with the modest, quiet, gentlemanly pathologist after one interview that he offered Welch the position, the promise of a new laboratory near the school, and a one-year university-sponsored sabbatical to Europe to become thoroughly familiar with the latest laboratory methods and equipment. Although Sternberg did not record his initial impression of Welch, it may be presumed that these two like minds found common ground almost immediately, and rapidly developed the friendship and mutual admiration that would last for the next 31 years.<sup>5</sup>

While Welch was in Europe, Sternberg and his assistant, Dr. Alexander C. Abbott, continued original bacteriologic research in Martin’s small laboratory. On October 17, Sternberg presented his latest paper titled “Disease Germs” to the annual meeting of the American Public Health Association (APHA) in St. Louis. The theme of the presentation revolved around variations in the natural origin and existence of microorganisms and their virulence, a topic that became more convoluted and confusing as the list of disease-causing organisms grew. Researchers around the world questioned daily where these organisms lived, external to human and animal bodies, and whether pathogenic bacteria were distinct species with permanent physiological characteristics that determined pathogenicity, or varieties of common bacteria that became pathogenic due to environmental conditions. Dr.

Henry Formad of Philadelphia had claimed that pulmonary tuberculosis could develop from injected inorganic material. Facilities available in Baltimore had allowed Sternberg to invite Formad for a repetition of the Philadelphian's experiments during the summer. The results of these studies removed Sternberg's indecision on the issue. Inorganic substances had no ability to produce tuberculosis. While he had assured himself that pulmonary tuberculosis resulted from infection with the tubercle bacillus, he also felt some additional factor had to be present for nodule formation. It was clear from his work with septic micrococci that not all animals respond in the same way to these organisms; therefore, "The supposition that...different pathogenic organisms give off different kinds of poisonous products...is sustained by what is known of the action of non-pathogenic organisms of the same class in various processes of fermentation and putrefaction, and by the facts which relate to the influence of protective inoculations and the non-recurrence of the specific infectious diseases in the same individual."<sup>6</sup> Although Sternberg presciently touched on natural immunity and the existence of individual and specific organism virulence factors here, they remained suppositions. It was clearly manifest to Sternberg that several pathogenic organisms lived freely in nature. Sternberg stated the following about erysipelas and hospital gangrene: "It seems to me beyond question that these diseases may...originate *de novo*...without direct or indirect infection from a preceding case. And hospital gangrene especially is so rare...we can...suppose...outbreaks which occasionally occur at widely remote localities are necessarily connected with preceding cases...."<sup>7</sup> He believed the cocci, which induced septicemia in mice and rabbits, existed in the same way, "and as regards the cholera bacillus...of Koch...there seems to be ample evidence of the power of multiplication external to and independently of the human organism."<sup>8</sup> Robert Koch's cholera work was new, and although he had not produced the disease in experimental animals and, therefore, had not fulfilled the postulates for which he would become famous, Sternberg thought that Koch's bacteriological and epidemiological work was solid enough to tentatively accept it.<sup>9</sup>

During the past summer, cholera had reemerged from Asia in the shipyards at Toulon and Marseilles and then spread into Italy. In the United States, fears of cholera generated a lot of discussion at the annual APHA meeting, and Dr. James F. Hibberd introduced a resolution to compile a formulary of genuinely potent disinfectants for rapid and efficient use by physicians and sanitarians. The proposal was approved, and a committee was appointed.<sup>10</sup> Sternberg was selected as chair, and the new committee met on November 20 in Baltimore. A complete and exhaustive investigation of all disinfectants and antiseptics was impractical, and, therefore, Sternberg limited the committee's work to "agents...capable of destroying the infecting power of infectious material,"<sup>11</sup> and those "most relied upon by sanitarians for disinfecting purposes."<sup>12</sup> Only the biological test of disinfecting power was employed, that is, concentrations of disinfecting agents were applied to organisms and then these cultures were observed for growth. The work was divided into two subcommittees. One committee examined the literature, abstracted and tabulated the results, and investigated the relative germicidal value of the various substances

used as disinfectants in the biological laboratory at Johns Hopkins, while the other one investigated the practical application of disinfectants on a large scale, including their cost, methods of use, chemical relations, effects on furniture or fabrics, and effects on humans and animals.<sup>13</sup>

Although the conclusions of the committee were not ready for presentation until the fall, preliminary reports of their experiments were prepared and released in late January and early February 1885. Much of Sternberg's work was repetition and revalidation of his earlier studies from April 1883. This allowed him time to compose a section on the destruction of cholera germs in *A Treatise on Asiatic Cholera*, edited by Edmund C. Wendt, for which he drew heavily upon the committee's preliminary work. Sternberg asked whether it was "practicable to destroy cholera germs in the alimentary canal, and thus arrest the progress of the disease, or prevent its development? And, if so what agents are best suited to accomplish this purpose?"<sup>14</sup> In one of the earliest published scientific discussions on specific antimicrobial therapy, Sternberg theoretically proposed that medicinal doses of mercuric chloride—the most potent germicide he had tested—should, if continually present in the intestine, inhibit the growth of cholera or any other bacteria. To test this hypothesis, he suggested—as a clinical experiment only—the use of 0.01 of a grain mercuric chloride tablets administered two at a time every five minutes for one hour, then every 10 minutes for two hours. Remembering the severe cholera epidemic at Fort Harker in 1867—and the rapid death of his first wife—he added that therapeutic success would be more likely in those treated in the early stages of the disease.<sup>15</sup>

In the early spring of 1885, Sternberg's laboratory work was put on hold. President Grover Cleveland designated him as the U.S. representative to the International Cholera and Sanitary Conference to be held in Rome in mid-May. The conference, stimulated by the recent cholera epidemic in Naples, was a forum for the discussion of, and agreement upon, practical sanitary and quarantine regulations to preclude such epidemics in the future. Sternberg advised on preventive and remedial measures against cholera and, because of his fluency in French, also translated the conference proceedings. With the stroke of a pen, Cleveland validated the last 17 years of Sternberg's life to the American scientific establishment. Sternberg has been called the "father of American bacteriology," but it is more accurate to say that by 1885 he was the undisputed dean of this science in the United States. The moment was not lost on Sternberg. Now the opportunity was at hand to meet with international colleagues, share ideas and laboratory techniques, and personally engage in the polemics of bacteriology that—heretofore—had only been conducted through the scientific literature. Such interaction was rewarding for him personally, and because it allowed him to dismantle some of the "geographical bias" (as he called it) that Europeans held for American bacteriological science.<sup>16</sup>

The Sixth International Sanitary Conference convened on May 20. As the sole U.S. delegate, Sternberg provided a brief synopsis of the previous conference in Washington to his colleagues. Presumably, he returned to his seat eager to listen to and engage in discussions of the etiology and transmission of cholera and assist in

formulating preventive strategies to preclude its dissemination. Koch's pronouncement from India that the comma bacillus was the cause of the disease was only 15 months old. The German government and scientific community had hailed Koch and the German cholera commission he led as conquering heroes, but a large part of the world remained openly skeptical as Koch had failed to produce the disease from pure cultures in experimental animals. Great Britain, however, led the most organized and vocal opposition to Koch's claims. Although cholera was a perennial health threat to British troops in India, and Britain was considered the major purveyor of cholera to the world, Britain's government had political and economic interests in India and the Suez Canal that would suffer quarantine restrictions should Koch's discovery be accepted. The potential loss was considered so great that the British government sent Dr. Emmanuel Klein, the most eminent British bacteriologist of the era, and Heneage Gibbs to India in the autumn of 1884 to conduct independent investigations to demonstrate the flaws in Koch's hypothesis. Their report, published just 2 months before the conference in Rome, stated they had found many villagers who remained disease free after consuming water from contaminated cisterns, and they maintained that until pure cultures of the bacillus produced disease in an animal model the theory remained unproven. Armed with a scientific refutation of Koch's work, the British delegation began to manipulate the direction of the conference proceedings. Britain and India were given separate voting delegations, and Dr. Jacob Moleschott, the Italian delegate and technical committee chairman, was persuaded not to include any reference to the etiology and transmission of cholera in committee discussions because it was too controversial. With Koch stifled, British and Indian delegations focused on evading quarantine regulations in Indian ports and the Suez Canal.<sup>17</sup>

From May 20 until June 6, delegates debated sanitary and quarantine precautions to be taken before, during, and after international travel whether on land, sea, or river. Upon Sternberg's request, Moleschott appointed a special committee on disinfectants that consisted of Sternberg, Koch of Germany, Achille Adrien Proust of France, Sir Richard Thorne-Thorne of Britain, Nikolai Eck of Russia, Georg Hoffmann-Wellenhof of Austria, and Mariano Semmola of Italy. Special regulations for transit through the Red Sea and the Mediterranean, and pilgrimages to Mecca were discussed. As in the United States during the 1870s, the majority of disagreement arose over the inherent value and duration of quarantine and the impact it had on commerce. The British and Indian consortium attempted in vain to block port inspection of ships and the disembarkation and isolation of passengers if the ship became infected. Although British medical authorities had developed and perfected sanitary surveillance and preventive measures that effectively kept cholera from Britain's shores, southern European cities did not enjoy the protection of a sound sanitary infrastructure, and saw quarantine as the only practical way to avoid cholera epidemics. A modified quarantine resolution that isolated passengers only long enough to disinfect the ship was finally agreed to, but passed by a slim margin. All delegations did agree on two issues. First, cholera invades countries not by *de novo* development, but as a result of human

intercourse; and second, certain local unsanitary conditions are required for the disease to gain a foothold. Considering this and yellow fever, Sternberg introduced a proposition during the last session that passed with only one dissenting vote: "The measures recommended against cholera are...applicable to yellow-fever, and to other diseases which prevail in epidemic form under...bad sanitary conditions, and which are transmitted by human intercourse. The most effectual means for preventing the propagation of diseases of this class are: The sanitary improvement...of seaport towns, and...vessels sailing from infected ports; isolation of the sick; and disinfection of infected or suspected articles and localities."<sup>18</sup>

The conference concluded on June 13. Overall, Sternberg was satisfied as he reflected on the work accomplished at the conference on his way back to New York. As he later commented, "Epidemics are not an unmixed evil. Indeed...they are productive of more good than harm. They call attention to sanitary sins, and lead to sanitary reforms, which...would often not be made."<sup>19</sup> Although no international code of sanitary regulations had been agreed to, he believed that "the interchange of opinions among leading sanitarians...the formulating of the knowledge which has been gained in the laboratory, or by the practical management of epidemics, the publication of explicit directions relating to quarantine, disinfection, municipal and maritime sanitary supervision, etc. cannot fail to be useful."<sup>20</sup> The conference was intense and exhausting, but fatigue was only transient. The stimulating professional interaction with men such as Koch, Ettore Marchiafava, and Angelo Celli lasted forever; that was the breath of life for Sternberg. Before he departed Rome, Sternberg was made an honorary member of the Royal Italian Academy of Medicine and given a tour of Santo Spirito Hospital by Marchiafava and Celli. Marchiafava also included a microscopical demonstration that erased any doubts Sternberg entertained about Alphonse Laveran's hypothesis on malaria. Marchiafava searched directly under the microscope for the wriggling parasite in a thin blood smear. Within a few minutes, he stepped back and allowed Sternberg to observe what he had found. "I saw the amoeboid movements very distinctly and cannot doubt that the extremely minute, transparent, and apparently structureless mass which I was looking at was, in truth, a living organism."<sup>21</sup> Nine months later, on March 24, 1886, Sternberg demonstrated the malarial parasite for the first time in America to Dr. Welch, Abbott, Councilman, and others in the laboratory at Johns Hopkins.<sup>22</sup>

In late summer, Secretary of State Thomas Bayard notified Sternberg that he would attend the follow-up sanitary conference in mid-November in Rome. The Italians had been tremendously impressed with Sternberg's professional and technical competence, hard-working nature, and tactful manner. This commendation affirmed to Bayard that the right man had been selected for the task, and he saw no advantage in changing horses in a race, which if lost, could result in a deadly victory for cholera in the United States.<sup>23</sup>

Sternberg was eager to return to Europe and requested five weeks of leave in conjunction with his return travel to Rome so he could visit Koch's laboratory in the Hygienic Institute in Berlin.<sup>24</sup> Although Sternberg was interested in studying

the latest staining techniques with Koch that could be applied to yellow fever tissue sections obtained from Havana, his real motivation for visiting Berlin had its inception in the Johns Hopkins laboratory in January 1885. At that time, he and Abbott found the micrococcus of rabbit septicemia in sputum specimens from a pneumonia patient, a significant discovery that allowed Sternberg to personally make the etiologic connection between this organism and croupous pneumonia. That theory was then being advocated by G. Salvioli and Nikolai Gamaleia in Italy; Charles Talamon in France; and Carl Gunter, Albert Fraenkel, and Carl Friedlander in Germany, who had found and described the organism in pneumonic sputum and conducted animal experiments with the organism. In 1882, Friedlander reported—and clearly described—diplococci in fibrinous exudates from lung and pleural tissues of eight patients ill with pneumonia. In November of the following year, he introduced the organism to the Medical Society of Berlin as the etiologic agent of croupous pneumonia. This announcement was based on the isolation of organisms from the lung tissues of nearly all of 50 additional pneumonia cases. Friedlander described the capsule and regarded it as characteristic of the organisms he had found. However, while his organism was lethal to mice and guinea pigs, it failed to kill rabbits. Eleven days later, Talamon presented similar studies to the Anatomical Society in Paris. He had injected pure cultures of *Coccus lanceole de la pneumonie* (*Streptococcus pneumoniae*) directly into the lungs of guinea pigs, dogs, and rabbits. While the guinea pigs and dogs showed no adverse effects, 16 of the 20 rabbits injected died, and eight of these demonstrated fibrinous pneumonia. Fraenkel presented supporting experiments to the Third Congress for Internal Medicine in Berlin on April 24, 1884. He also had found cocci in the lung sections of pneumonia patients. His organism was lethal to rabbits, but only variably so to guinea pigs. Fraenkel also argued that neither growth patterns nor capsule formation were essential characters of the causative agent of pneumonia.<sup>25</sup>

Sternberg had followed these developments closely with great interest. Upon reviewing Friedlander's work and comparing the German's description of the microbe with his own, he published an article confirming that the two organisms were structurally and physiologically identical and took the liberty of naming it *Micrococcus pasteuri*, in honor of Louis Pasteur. Sternberg also thought it "extremely probable...this micrococcus is concerned in the etiology of croupous pneumonia...but...cannot be considered as definitely established by the experiments which have thus far been made upon lower animals."<sup>26</sup> He rejected Friedlander's view that the capsule was a distinguishing characteristic of the organism because it was not constantly present. Sternberg published the first photomicrographs of capsular formation in 1881, and commented later: "The development of this external envelope of mucine...is altogether exceptional. I have not...ascertained the...conditions which control the development of this envelope, but believe it to be most marked in a rich culture-medium, and as a result of an exceptionally vigorous and rapid development of the micrococcus."<sup>27</sup> That Friedlander's *pneumonia coccus* was not lethal to rabbits, and only variably so in experiments conducted by Talamon and Salvioli, Sternberg explained as a variation in pathogenic power observed

repeatedly during his work with the organism. He was now eager to get to Koch's laboratory, where he could see the organism he had so recently advocated as identical with the micrococcus he had found in 1880. After four pleasant and rewarding weeks with Koch, and with slide preparations of Friedlander's pneumococcus carefully packed in his luggage, Sternberg caught the train for Rome. Upon arriving, he learned that the second conference was postponed indefinitely by the Italian government and returned home.<sup>28</sup>

In the spring of 1886, Mrs. Sternberg accompanied her husband on a second trip to Koch's Institute. While she enjoyed Berlin's museums and art galleries, Sternberg huddled over microscopes and culture plates with Koch and his assistants, reviewed cholera and typhoid preparations, and discussed Friedlander's organism at length. Koch was so impressed with Sternberg's self-taught laboratory skills that he admitted he could add little to them. The German master did request a demonstration of *Micrococcus pasteurii* from Sternberg's oral secretions, and Sternberg confidently consented. On the eve of the demonstration, he confided to his wife his anxiety over the event. "How dreadful I would feel," he told her, "if I have lost that germ...and could not demonstrate a thing that I have written and talked so much about."<sup>29</sup> His anxiety was unfounded. The micrococcus was alive and well in his mouth, and the demonstration was successful.<sup>30</sup>

Sternberg had returned from his first visit to Koch's laboratory with an altered opinion of Friedlander's micrococcus. His second visit confirmed—in his mind—that Friedlander's organism and *M pasteurii* were not the same. He quickly put his opinion into print, and expounded on it in another article in 1889 and in his *Manual of Bacteriology* in 1893. In doing so, he became entangled in the historical confusion over exactly what organism Friedlander was looking at and working with in 1882–1883, and who should be given credit for linking the pneumococcus etiologically with pneumonia.<sup>31</sup>

Sternberg had long maintained—as had Koch—that organisms appearing to be the same structurally can be very different physiologically. While he had no doubts—at least in 1885—that Friedlander was working with a micrococcus structurally identical with *M pasteurii*, by the following year he recognized "differences which [he could not] reconcile with the idea of specific identity."<sup>32</sup> He also maintained that pathogenic variations existed within the same species of microorganism. He had used this theory to explain the differences in experimental results—namely rabbit mortality—between Friedlander's work and his own in his earlier paper. However, after again reviewing the work of Talamon and Salvioli, and Fraenkel's most recent work from earlier in the year, Sternberg was convinced that he and these scientists were working with the same organism, and Friedlander had identified a variant of this species of micrococcus. Sternberg's about-face was based on three issues. First—and oddly enough—Friedlander's coccus was not lethal to rabbits. Second, Friedlander had injected cultures directly into the lungs of mice and still did not produce pneumonia in all of these animals. Third, the recent work of Fraenkel, who like Sternberg had found the micrococcus in his own mouth, made identical culture and inoculation experiments, noted reduced



virulence of the organism in convalescent sputum, and—through it all—had been oblivious to Sternberg's earlier work. However, other conundrums generated by pneumococcal peculiarities and another pneumonia-causing microbe confused the issue.<sup>33</sup>

The capsule surrounding the pneumococcus is integral to the natural survival of the organism. Composed of complex polysaccharides, this antigenic coating is the organism's primary virulence factor and protects it from being consumed by white blood cells. In vitro capsular development is extremely dependent on rather complex nutritional and environmental requirements that include protein and an increased carbon dioxide concentration with some strains. When grown on nutritionally adequate solid media, the capsule gives the colony a shiny appearance, but if not, the capsule will be smaller and virulence can be reduced or lost completely. Sternberg and others noted difficulties growing pneumococci on a variety of media, and the variations in media preparation most likely produced the differing capsular formations noted. Both Sternberg and Fraenkel were also aware that the pathogenicity of the microbe in their saliva varied at different times, and that older colonies and those that had undergone serial plating demonstrated reduced virulence. Therefore, in 1883, when Friedlander carried colonies through eight culture plate passages to ensure culture purity, he altered capsular formation drastically and significantly attenuated his cultures. The cultures were variably lethal when injected into mice, yet they had no ill effect on rabbits.<sup>34</sup>

Although the weak pathogenicity of Friedlander's original cultures became the anchor for Sternberg's rejection of his claims, his earlier explanation of these results would have made this an untenable position had he not observed some obvious differences among the organisms on the slide preparations in Koch's laboratory. Ironically, Friedlander inadvertently introduced these differences during his studies with pneumonic tissues in 1883. That same year his laboratory assistant, Dr. Christian Gram, developed a new staining technique that allowed pneumococci to be discerned more readily from other cellular material and debris. Gram's method became the basis of the Gram-positive and Gram-negative classification, according to the staining properties of the cell wall, which is still used today. However, this property was not appreciated until late 1885 at the earliest. In his report of March 1884, Gram remarked that he had examined sections of lung from 20 cases of fatal lobar pneumonia. Of these 20 cases, 19 remained brightly stained, but one case became decolorized. Concerning these results, he wrote: "One case of croup pneumonia with capsule coccus. Here one finds very many cocci which do not all lie in the cell walls of the exudate. They decolorize very easily in alcohol... with and without treatment with iodine. From this case stem a great part of the cultures of Dr. Friedlander. Most of those [cocci] from animals injected and exposed to infection behave in this fashion."<sup>35</sup> It appears that during these experiments, Friedlander isolated what he later called Kapselbacterium, and what is recognized today as *Klebsiella pneumoniae*. Without an appreciation of cell wall staining characteristics, it is easy to understand the confusion this organism introduced into all of these studies. *K pneumoniae* is an encapsulated gram-negative rod and a bacillus,

but it can appear as a very short, fat, and rather round organism, and its capsule is thick. It, too, can be found in the mouth and nasopharynx of healthy individuals and can induce pneumonia, although much less frequently than the pneumococcus. It is evident from Friedlander's description that the organism he saw in 1882 was a pneumococcus, but whether he injected laboratory animals in 1883 with attenuated strains of pneumococci or cultures of *Klebsiella* will never be known. Fraenkel, however, continued to vie for his piece of glory in linking the pneumococcus with lobar pneumonia. When Friedlander suggested that more than one agent may be responsible for pneumonia, Fraenkel heartily agreed. Although Friedlander was correct once again, this suggestion and the negative mortality in rabbits created a suspicion among scientists that what he had originally isolated in 1882—before the advent of Gram's staining method—had been a bacillus and not a coccus.<sup>36</sup>

Just exactly what organism Sternberg saw—in 1885 and 1886—on the slides labeled "Pneumococcus of Friedlander" remains obscure. In his paper from 1886, "Micrococcus Pasteuri," he never confused Friedlander's organism with a Gram-negative bacillus, but maintained his opinion that it was a variant micrococcal species that may cause pneumonia. However, seven years later in his *Manual of Bacteriology*, Sternberg rewrote his part in the pneumococcal controversy when he stated: "I fell into the error of inference, previously made by...others, and assumed that the 'pneumococcus' which Friedlander had obtained from the same source was the same, although I found it difficult to reconcile the experimental data, inasmuch as he had obtained uniformly negative results in his inoculations into rabbits. To explain this discrepancy I suggested that Friedlander's pneumococcus was probably a variety having a different degree of pathogenic power.... This supposition seemed to find support in the fact...that my *Micrococcus Pasteuri* became attenuated, as to its pathogenic power, when the cultures were kept for some time; and... there seemed...to be different pathogenic varieties in the buccal secretions of different individuals. At this time I had not seen a culture of Friedlander's bacillus. Later, in the autumn of 1885, when I made its acquaintance in Dr. Koch's laboratory, I recognized my mistake and hastened to correct the error."<sup>37</sup> Sternberg quoted Gameleia as saying: "As to the researches of the authors who preceded Fraenkel, it is sure that the microbe which they often found in sections of diseased lungs, and which they called the microbe of Friedlander, was in fact the microbe of Pasteur, since it was colored by the method of Gram, which decolorizes the bacillus of Friedlander. Many of the positive results...which have been reported relative to the last-mentioned microorganism, ought to be put to the account of the other."<sup>38</sup> To this Sternberg added, "This opinion the present writer has entertained since his researches made in 1885."<sup>39</sup>

Sternberg's comments from a paper written in 1889 and his manual in 1893 are difficult to reconcile with his earlier papers. He obviously found something amiss upon scrutinizing the slides and cultures of Friedlander's organism in Koch's laboratory, but he never defined what it was. Sternberg disregarded the growth characteristics noted by others, discounted the significance of capsular formation,

never differentiated the microbes he reviewed on the basis of Gram staining, and, in 1886, still referred to Friedlander's organism as a coccus. Furthermore, if he did entertain Gameleia's idea in 1885, he did not make that opinion public. More accurately, Sternberg considered Friedlander's experimental results less than robust, whereas he was tremendously impressed with the research of Talamon and Fraenkel. He may have demonstrated some bias in favor of Fraenkel, although he would have been horrified at the accusation, because of the similarities with his own research that Fraenkel obtained independently. However, he maintained it was Talamon—not Fraenkel—who first demonstrated the etiologic relationship of the pneumococcus to lobar pneumonia.<sup>40</sup>

By the time Sternberg made his second trip to Berlin, a new and spacious laboratory facility was under construction at Johns Hopkins University. Welch, who had returned from Europe in October 1885, had the two-story morgue on the downtown campus renovated to adequately accommodate students closer to the hospital wards. Martin's small laboratory was moved into the Old Pathological—as the building became known—and immediately went to work during these renovations. Welch and his assistant, Dr. William T. Councilman, along with Sternberg, Abbott, Martin, Franklin P. Mall, and E. Meade Bolton, prepared lectures and laboratory exercises for two postgraduate courses, pathological histology and bacteriology, to be offered to physicians beginning in February 1886. The primary purpose of this facility, however, was for bacteriological research, not teaching. During the spring and summer of 1886, Sternberg published a review article on studies of the typhoid bacillus (*Salmonella typhi*) and commenced experiments on the thermal death point of microorganisms. These experiments provided sanitarians with the exact temperature required to destroy organisms, such as typhoid and cholera, in the excreta in patients, infected clothing, and drinking water. After Sternberg taught his laboratory colleagues how to find the malaria parasite in stained blood smears in March, Councilman began to study the plasmodium in earnest. At this time, malaria was endemic in Baltimore during the summer months, and he had no difficulty obtaining blood specimens for his work. At the inaugural meeting of the Association of American Physicians in Washington in mid-June, Councilman presented "Certain Elements Found in the Blood of Malarial Fever." Once he had finished his remarks, Dr. William Osler voiced his skepticism because Councilman had not verified all of Laveran's claims. Osler, then at the University of Pennsylvania Medical School, was becoming a leader in the world of clinical medicine and one of the most experienced physicians in microscopical studies of blood. He stated he had studied a handful of malaria cases and believed the amoeboid bodies to be nothing more than vacuoles in the red blood cells. His words carried significant weight and authority. As Councilman's own doubts about the cause and effect of malaria then became apparent, Sternberg rose from his seat in the audience. He stated his hearty support for Laveran's work, and—without pretense or arrogance—pointed out if Osler had stained his blood preparations, he, too, would be convinced that the vacuoles were malarial parasites. After further investigations, Osler saw the error of his observations and stated later that at the time of the

meeting he had spoken “in the fullness of his ignorance.”<sup>41</sup>

The Johns Hopkins Laboratory, dedicated primarily to original medical research, was now a reality. However, not all of the American medical research visionaries resided in Baltimore. Other laboratories were becoming established, but they were significantly influenced by Welch’s ideas, methods, and actions. The pathological and bacteriological laboratory he created at Bellevue had stimulated the alumni association of Sternberg’s alma mater to create a facility of its own under the direction of Dr. Francis Delafield and his assistant Dr. T. Mitchell Prudden. Dr. Frederick Dennis asked Andrew Carnegie to give \$50,000 to build a pathological teaching laboratory in New York City. This facility opened in the spring of 1885 under the direction of Dennis, Dr. Edward G. Janeway, and Dr. Hermann Biggs. The idea for another purely bacteriological research laboratory evolved in the mind of Cornelius N. Hoagland the same year. Sternberg played a key role in the design, development, and success of this Brooklyn facility.<sup>42</sup>

Cornelius Hoagland, a physician, gave up practice after the Civil War to become a millionaire, along with his brother, Joseph, producing baking powder in New York City. He probably would never have thumbed through another medical journal had diphtheria not killed his oldest grandson—whom he adored—in December 1884. Jolted from a life of leisure, Hoagland was determined to put money and energy into a medical endeavor with the potential to reduce—perhaps even eradicate—childhood mortality from infectious diseases. With advice of physicians in New York, such as Dr. Joseph H. Raymond, Hoagland convinced Long Island College Hospital to accept sponsorship of a bacteriologic laboratory. In recognition of Sternberg’s standing in the field, he also was determined to recruit him as director.<sup>43</sup>

Hoagland was favorably impressed and directed Raymond to draft a proposal that would make Sternberg reconsider staying in Baltimore. Their initial correspondence has not survived, but Raymond’s proposal was apparently robust enough for Sternberg to indicate a definite interest. In a letter dated November 14, Sternberg explained what he could provide the laboratory and the compensation he expected, but career desires and Army politics kept him from immediately accepting the position:

“This much...I can promise. I will give you a course of ten lectures on bacteriology during the winter of 1887–1888 for \$500 – paying my own expenses and if I am still stationed in Baltimore or Washington, will go to Brooklyn for this purpose at such times as you may arrange. I will also accept the position of director...in the laboratory and will give as much time as I can to the students who wish to take a practical course in bacteriology. I could have an assistant upon the spot who could be instructed by me there or could come here for a practical course (four weeks or more.) If I should be stationed in New York Harbor I would be able to give more time to the laboratory work and I think you ought in some way give me a salary of \$1000 at the outset to be increased if the school is prosperous and if my connection with it should prove advantageous to it.”<sup>44</sup>

As in the fall of 1883, Sternberg was again trying to gain access to the inner circle of the Surgeon General’s Office as the administration changed. Surgeon General Murray retired in August. Colonel Jedidiah H. Baxter became the acting surgeon

general during the ensuing political and highly partisan struggle by candidates for that office. The internecine strife raged for three and one-half months until President Cleveland abruptly ended it by appointing Lieutenant Colonel John Moore to the post on November 18, 1886. Regrettably, neither Sternberg's earlier biographers nor his personal papers indicate what position he sought in Washington. It was one that he believed he had an excellent chance of securing if Moore was selected as surgeon general and one that would allow him to continue bacteriological research either at the Army Medical Museum or at Johns Hopkins. Immediately upon assuming office, Moore announced that Baxter would remain in place and two other "strong and remarkable" assistants, Majors Charles Greenleaf and Charles Smart, would join him "for the upbuilding of the medical service."<sup>45</sup> If Sternberg was vying for one of these positions, his friendship with Moore and his political acumen were inadequate. In late November he informed Raymond if Hoagland accepted his terms he would assume the directorship from Baltimore. Four days later, Raymond responded affirmatively and requested Sternberg's advice on floor plans and laboratory apparatus.<sup>46</sup>

The Hoagland Laboratory would consist of four departments: (1) bacteriology under Sternberg, (2) physiology under Raymond, (3) histology and pathology under Frank F. Ferguson, and (4) photomicrography under Hoagland. All of these directors, except for Hoagland, needed assistants to ensure practical laboratory demonstrations were appropriately prepared for the students. Sternberg especially required a man well qualified in bacteriologic techniques because of his long-distance teaching. Hoagland suggested one man could assist both Raymond and Sternberg for the meager salary of \$600 per year. Hoagland did not become a millionaire without a bit of parsimonious penny pinching, but his expectation of obtaining a competent and diligent physician to serve two masters was ludicrous. Sternberg argued that two assistants were required because it would be nearly impossible to find a man qualified in both fields. He suggested that since pathology and bacteriology were overlapping fields to some extent, Joshua M. Van Cott, assistant director of histology and pathology, could assist Ferguson and himself, and another man could be found for Raymond. Unfortunately, Van Cott balked at the idea. Bolton, one of Sternberg's assistants at Johns Hopkins, was mentioned as a very qualified candidate, but Bolton had accepted a position at a southern medical school for \$2,500 per annum. Sternberg then considered Mall, another one of his associates in Baltimore who was then a fellow in pathology at the university and had an outstanding background in pathology, physiology, and bacteriology. Mall was interested, but not for the pittance Hoagland was offering. As 1887 arrived, the frustrating matter remained unsettled. However, medical issues of a more immediate national and international concern pulled Sternberg away from Brooklyn and Baltimore once again.<sup>47</sup>



## Chapter Nine

# Yellow Fever Investigations

Reports appeared in the medical literature and lay press of two phenomenal discoveries achieved independently—and nearly simultaneously—in Brazil and Mexico. In 1885, Dr. Domingos Freire, a chemist working in the medical school in Rio de Janeiro, Brazil, and Dr. Manuel Carmona y Valle in Mexico announced that they had found the agent of yellow fever and developed protective vaccines. These revelations caused a great stir among physicians in the United States, particularly along the Gulf coast. While the medical profession was divided on the veracity of these discoveries, the editor and staff of the *New Orleans Medical and Surgical Journal* lambasted Freire's abilities and experience as a pathologist and microscopist, declaring he had failed to describe or demonstrate the microbe. The following month the journal pronounced Carmona y Valle as "opposed to sound logic and accurate observation," and it also doubted his statistical acumen.<sup>1</sup> These discoveries were a major topic of discussion at the November American Public Health Association (APHA) meeting in Washington, DC. Dr. Joseph Holt, president of the Louisiana State Board of Health, introduced resolutions requesting that a government-sponsored investigative commission validate these new claims. Congress debated until January 1887, and then approved one government-employed physician to conduct the investigations.<sup>2</sup>

Although Sternberg's selection as the sole investigator was probably a foregone conclusion, Holt organized intense lobbying efforts to ensure his old friend would be named when wrangling over amendments to the bill ended. He wrote to Secretary of State Thomas F. Bayard endorsing Sternberg's candidacy in late February. In early March, Representatives Robert T. Davis (MA) and Newton C. Blanchard (LA), Senator James B. Eustis (LA), and Judge John H. Reagan (TX) presented the same endorsement directly to President Grover Cleveland, and Surgeon General John Moore added his recommendation for Sternberg by mid-April. Two weeks later, Sternberg had presidential orders in hand, his luggage packed, and a complete field outfit for bacteriological investigations prepared.<sup>3</sup>

Given the nature of the visit, the Sternbergs were presented at the Court of Princess Isabella, Regent of the Empire, during the absence of her father, Dom Pedro II, soon after their arrival. This point of protocol was meticulously planned, yet it appears that coordination for Sternberg's visit with Freire was somewhat faulty. Freire was in France demonstrating his inoculation technique and would not return until the first of July. The director of the medical school provided Sternberg with working space in Freire's laboratory and introduced him to two of Freire's assistants, Doctors Chapot Prevost and Joachim Caminhos. They received him warmly and provided a tour of the laboratory, but Sternberg was not impressed with the facility. Freire's microscope objectives were not state-of-the-art, and there were no culturing apparatus, dyes, solid culture media, or histological preparations. Liquid cultures were stored in three large cabinets marked "yellow fever," "cholera," and "cancer." Sternberg also learned that the yellow fever vaccine and inoculations performed in the city had divided the medical profession of Rio de Janeiro into two camps. Supporters consisted mainly of younger physicians and Freire's students, who considered the criticisms—hurled at a man they considered to be the "Pasteur of Brazil,"—to be based purely on jealousy. The opposition was composed of older physicians and leading members of the Imperial Academy of Medicine—all skeptical of their colleague's results and claims—and some had challenged his methods and use of statistics. The populace of the city was not impressed with Freire's public inoculation program either. When insufficient numbers of volunteers failed to come to his Vaccine Institute, Freire obtained government approval to vaccinate in private homes. His vaccinators invaded poor tenements by stating they were members of the board of health and claimed police authority to vaccinate by force, if necessary. The public outcry over this abuse was tremendous and supported by Freire's detractors. With this firestorm engulfing his inoculation program, it is odd that Freire chose to be absent when Sternberg arrived.<sup>4</sup>

Until Freire returned, Sternberg cultured the contents of flasks that supposedly contained the *Cryptococcus*, reviewed inoculation results from the preceding three years, and collected epidemiologic data from those inoculated. With the yellow fever season ending, he sought out cases and collected blood and black vomit for culture. Sternberg was given use of a culture oven in Dr. Joao Baptista de Lacerda's laboratory at the Museum of Natural History. While various bacilli grew in the Esmarch tubes he used, Sternberg could find no organism in the cultures provided or in the blood and vomit samples that fit the description of *Cryptococcus xanthogenicus*.<sup>5</sup>

Freire returned on July 1. When he met with Sternberg three days later, he produced a culture tube of—what he described as—pure *Cryptococcus* growing on agar-agar that he had brought back from France. Freire described in detail the growth and pathologic characteristics of the organism and how it proliferated in all organs and fluids, and he demonstrated his method of examining body fluids. To ferret out the organism in tissues, Freire pulverized the tissue in a mortar with sterile water—a process known as trituration—and then filtered the extract through a linen cloth. A drop of extract was then put on a slide with a cover slip, and observed. One can



imagine Sternberg's impressions as he watched Freire perform these primitive and obsolete laboratory techniques, but he tried to remain diplomatic. Freire was completely unfamiliar with solid media cultures and thin-section organ preparation, and when questioned about the use of aniline dyes, Freire indignantly replied he was studying the microbe in the fresh state and felt it was unnecessary to "mask them, disguise them under a costume of carnival, in order to please certain microscopists..."<sup>6</sup>

Sternberg determined the organism Freire presented him was *Staphylococcus aureus*—a skin contaminant—that did not fit any of the descriptions provided and produced neither spores nor pigment as Freire claimed. He concluded, "The only explanation of this wonderful versatility as to form and color...which I can conceive of is...that Dr. Freire has mistaken deformed blood corpuscles, fat globules from the liver, and the debris of tissue elements in his trituration... for micro-organisms."<sup>7</sup> Sternberg knew he was now on "a wild goose chase," but persevered with a thorough investigation. Blood taken from confirmed yellow fever cases in local hospitals was cultured, and tissue sections from fatal cases were examined. Of 34 inoculated culture tubes, 28 remained sterile. A variety of bacilli and micrococci grew in the remaining six tubes, a result attributed to accidental skin contamination when blood was drawn. Sternberg's tissue examinations provided an excellent example of his compulsive, exacting nature in investigational research. He noted in his report, "In all infectious diseases...due to the presence of a parasitic micro-organism in the blood, this organism may be demonstrated in properly stained thin sections of tissues. In such sections we often obtain cross-sections of small blood-vessels in which the blood corpuscles are in situ, and in which a stained micro-organism...would be very apparent."<sup>8</sup>

Sternberg found his Brazilian colleague's animal inoculation experiments and vaccine production to be just as imprecise and illogical as the rest of his work. Freire had inoculated monkeys, dogs, pigeons, and guinea pigs with blood from yellow fever patients all to no avail, but found injections of black vomit or cultures made from it were lethal to small rodents. It was obvious to Sternberg that the animals had died from septicemia induced by one or more of the various organisms in this material. Freire also attempted to demonstrate the lethality of the pure cultures of *C xanthogenicus* that he brought from France. First, Freire explained, the virulence of the organism, which was lost during the long voyage, had to be regenerated by injecting one gram of *Cryptococcus* bouillon culture into a pigeon. Four hours later, the regeneration was complete, the bird was killed, and one gram of cardiac blood was injected into the abdominal cavity of a guinea pig. This guinea pig survived, yet two others inoculated with unregenerated cultures died within 10 days of injection. To Freire, who concluded they died from yellow fever, this experiment vindicated his theory. Sternberg just shook his head in disbelief. What proof was there that the virulence of the cryptococcus had been reconstituted in so short a time? What proof existed that the organism injected was truly in the cardiac blood withdrawn? Cultures of this blood remained sterile. Sternberg remarked later, "Both of these guinea-pigs were supposed to have died

of yellow fever, although they had been inoculated with a culture not 'regenerated' by passing it through the blood of a pigeon, and one which he had taken with him to Paris and back. Yet he repeatedly asserts...the virulence of his microbe becomes quickly attenuated in cultures preserved for a short time.... Dr. Freire was unwilling to show me his method of inoculating man...and stated...the fact... these guinea-pigs had died was evidence...this culture—which had crossed the ocean and back—was too virulent to be used as a vaccine. Yet his experiments had been inaugurated with a view to regenerating the virulence of this same culture, upon the assumption...it was too attenuated to kill guinea-pigs.<sup>9</sup> To produce his vaccine, Freire injected blood from a yellow fever victim into a guinea pig or rabbit. Blood taken from this animal was injected into a second of the same species, and serial passages were repeated through six or seven animals. Blood from the last of these was cultured and serially passed at least four times in liquid culture media. The last of these cultures was used to inoculate the population of Rio de Janeiro. Again, Sternberg concluded the only reason anything grew in the culture vessels was because the original inoculum had been contaminated somewhere in the process.<sup>10</sup>

There was no *C xanthogenicus*. No laboratory animals had died from yellow fever and no protective vaccine had been produced. But, to be fair to Freire, Sternberg sifted through three years worth of immunization data. As he stated, "...these inoculations have been made on so large a scale, and the statistical results...appear so favorable to his method...it becomes necessary to analyze these statistics; and if... they establish the fact that the mortality from yellow fever is very much less among those who have been inoculated...than among non-inoculated persons exposed in the same way, we will be obliged to concede the value of his method, although the rationale of this protective influence may not be apparent."<sup>11</sup> Sternberg found Freire had little epidemiological or statistical finesse and a very poor understanding of yellow fever's natural history. Freire assumed person-to-person transmission and that the risk of disease was the same from year to year and from month to month. He failed to consider differences in exposure risk due to age, duration of residence in Rio de Janeiro, or time of year. Observation and follow-up were also inaccurate. Persons who had died from other causes or departed Rio de Janeiro before the yellow fever season were counted, and certain segments of his population were counted twice. Sternberg concluded that "...there is no satisfactory evidence that Dr. Freire's inoculations have had any prophylactic value."<sup>12</sup>

The Sternbergs sailed from Rio de Janeiro on August 11.<sup>13</sup> Mrs. Sternberg's memories of the voyage are few, other than it was dull and uncomfortable. Her husband was completely engrossed in compiling his report, and she filled in her time by making a card catalog of his notes, but the boredom was tedious. "If we were going home how happy we would both be," she said.<sup>14</sup> Then, although she knew he had been directed to Mexico by the president, she asked, "Why do you want to go to Mexico?"<sup>15</sup> Her husband looked up from his papers and gazed at her tenderly, "Because I have given so much of my time and strength to the investigation of the cause and spread of yellow fever, that I feel I have exhausted all the legitimate

experimental methods that could elucidate the subject. I hope in Mexico I can arrange to make human inoculations. In our own country this is not possible, and I now think that is the only way this problem will ever be solved.”<sup>16</sup> Sternberg had hoped to make such experiments—transmission from person to person via blood injections—while in Brazil, but the opportunity did not present itself.

By the time the ship arrived in Barbados, quarantine authorities had been notified of smallpox epidemics in Rio de Janeiro and Pará. No one was permitted to leave the ship. After the passengers and crew were examined for evidence of smallpox and provisions were taken on, the ship continued to St. Thomas where the same rigid quarantine was in effect. Passengers could depart the ship only to go to the quarantine station where they were charged \$3 per day for board and \$5 per day quarantine tax that went to the station physician. Sternberg had always deplored this method of sustaining quarantine operations as nothing less than extortion. Irritated by the current quarantine system and frustrated by being trapped on a vessel moving farther away from Mexico, he could only continue with his report and hope the October 1 deadline for his investigations would be extended.<sup>17</sup>

Upon arrival at the quarantine station just outside of New York Harbor, he was again exasperated by what passed for disinfection. A man, who accompanied the port’s deputy health officer, poured a liquid into a bucket full of some powder. He lowered it into the hold and allowed it to remain there for an hour. At the end of this time, the ship departed for the wharf. Sternberg was curious about what was in the bucket, so he asked the ship’s surgeon to go with him to inspect it. They opened the hatch and hauled up the bucket. Sternberg could not detect any odor of disinfectant emanating from the hold, yet when he stuck his nose into the bucket he perceived that the reaction of liquid and powder had produced chlorine gas. He was told this small amount of material had disinfected the entire hold. Sternberg commented later, “The only object...I can conceive of depends upon the fact... there is a fee for disinfecting, which must be paid by the agents of the ship: at least I was so informed by one of the officers.”<sup>18</sup> The Sternbergs arrived in Baltimore on September 4. He was granted an extension of 20 days for his report and departed immediately by rail for Mexico City.<sup>19</sup>

In Mexico City, Sternberg proceeded to the National Medical College of Mexico, where he met Carmona y Valle, director of the faculty. Sternberg was delighted with the laboratory, which contained a complete set of Robert Koch’s culture apparatus, two large Zeiss microscopes with a full set of objectives, and a large English binocular microscope. It was also obvious Carmona y Valle knew how to use this equipment effectively. Carmona y Valle’s yellow fever theory was based on a fungal origin. Accordingly, zoospores produced by *Peronospora lutea* damaged renal tubules, blocked urine outflow, and formed yellow spores that gave the typical skin color to disease victims. Carmona y Valle confidently demonstrated them in capillaries of liver tissue sections and provided cultures from urine of yellow fever patients. While Sternberg found Carmona y Valle’s knowledge of scientific methods admirable, he also found glaring errors in its technical application. Sternberg demonstrated Carmona y Valle’s spores to be masses of red blood cells

altered by preservation fluids. He determined that Carmona y Valle's cultures contained various commensal organisms from the distal urethra caused by improper collection techniques and bore no etiological relationship to yellow fever.<sup>20</sup>

Carmona y Valle produced his vaccine by allowing urine from yellow fever patients to evaporate in shallow plates. The residue was mixed with distilled water, and the vaccine was ready for subcutaneous injection. He inoculated himself in 1881. By November 1885, he had injected 1,358 persons in and around Mexico City. None of these people became ill with the disease, but apparently it never dawned on Carmona y Valle that his success was attributable to the fact that yellow fever did not exist in the Mexican capital, except for a few imported cases. In Vera Cruz, the story was different. In early May 1885, yellow fever struck the military garrison there, resulting in 17 cases and eight deaths. Carmona y Valle inoculated the remaining 380 soldiers and six prisoners, but of these 28 became ill and 19 died. Sternberg pointed out that these statistics, although not supportive of Carmona y Valle's method, were essentially useless. Sternberg concluded, "A simple perusal of Dr. Carmona's published work is sufficient to convince any competent bacteriologist that, owing to a defective technique and inexperience in bacteriological researches, he has fallen into serious errors of observation and of inference, and... his supposed discovery has no scientific basis."<sup>21</sup>

During his investigations in Vera Cruz, Sternberg met Dr. Daniel Ruiz, director of the city hospital. Ruiz vehemently denied the infectious nature of yellow fever and had no faith in Carmona y Valle's inoculations. He—like Sternberg—believed if the yellow fever agent actually resided in the blood and urine, then injecting these substances from the sick to the susceptible should produce the disease. Unfettered by moral or legal research considerations in Mexico, Ruiz had attempted such an experiment in 1885 with negative results, but gladly repeated them for Sternberg. Unfortunately, only three volunteers could be found. Two of these volunteers were injected with blood from a patient who was found at autopsy to have died of leukemia and not yellow fever. The third was injected with 50 cubic centimeters of blood from a patient with a confirmed mild case of the disease; however, as he was in the eighth day of his illness, he was beyond the period where his blood could transmit the virus, a fact unknown to Ruiz and Sternberg at the time.<sup>22</sup>

Sternberg returned to Baltimore in late October. At the last meeting of the APHA in Toronto, he became president of the association. His presidential address, to be given shortly in Memphis, was long, but well crafted. In this bully pulpit, he wanted to establish several objectives critical to the public health of the nation and motivate the membership to pursue them vigorously. He lamented the demise of the National Board of Health, a sound idea whose implementation had been faulty. He advocated a centrally located bureau under its own cabinet officer, directed by a commissioner with enough administrative staff to ensure efficiency and a laboratory of bacteriologists, chemists, and sanitary engineers. The commissioner would have a technical advisory board consisting of the surgeon generals of the army, navy, and marine hospital service; and presidents of state boards of health, who would have no executive power nor receive pay. Sternberg then focused

on quarantine and imported diseases. He applauded the vigilance of quarantine activities along the southern coasts, but cautioned them against complacency. No system was foolproof and, furthermore, none of the six international sanitary conferences agreed on quarantine regulations. The only way pestilential diseases could be contained within acceptable limits was through education, continual sanitary improvements, and efficient quarantine stations funded not by commerce but by the federal government and supported by the public with constant supervision by trained sanitary officers. Here is where the APHA could make an impact at the national and state levels in this area. Sternberg's vision of the APHA mission was to identify effective sanitary measures, teach community and personal hygiene, and conduct special investigations, such as the value of protective inoculations and water supply purity in various American cities and towns. Moreover, he recommended that a special fund be created by the association to encourage such investigations.<sup>23</sup>

Construction on the Hoagland Laboratory had begun in the summer. With Sternberg's return, plans proceeded in earnest for staffing and equipping it and developing a solid program of instruction. By mid-January 1888, however, he recognized that an assignment in New York City was unrealistic for the next two years at least. He reiterated his promise to provide not 10 but 12 weekly lectures, and on these days he also taught practical laboratory exercises for several hours. No army billets existed in New York for Sternberg, but clearly the prospect of continued government-funded yellow fever research and a functioning laboratory he could use as an operational base kept him at his Baltimore station. He was no closer to positively demonstrating the etiology of yellow fever than he had been nine years earlier. He had prepared hundreds of cultures, blood smears, and tissue sections; studied epidemiologic patterns; and modeled plausible etiologies until he was mentally exhausted. A sufficient amount of disease and cadaveric specimens—both of which were lacking in Brazil and Mexico—was required to conduct what he considered a thorough investigation, and, therefore, he would have to be in an endemic area during the epidemic season. Havana, Cuba, was the natural choice, and Sternberg began working to this end from the moment he returned from Mexico.<sup>24</sup>

By the time he wrote to Raymond in January, he had another strong motivation to go to Havana. Dr. Paul Gibier, a French bacteriologist, had gone to Havana in November 1887 to verify Freire's work. After demonstrating to himself that Freire was in error, he conducted his own blood studies. Finding no microorganisms in the bloodstream, Gibier then looked in the alimentary canal. The intestinal contents of many cases yielded a certain bacillus—later named *Bacillus lepinus lethalis* by Sternberg—frequently enough to suggest he was on the right etiologic trail. Sternberg had closely watched Gibier's studies. He stated later, in March 1889: "The possibility that the infectious agent in yellow fever may have its habitat in the alimentary canal, occurred to me several years ago, and I determined, in advance of my visit to Havana last spring, to give special attention, to a bacteriological study of the intestinal contents."<sup>25</sup> In 1875, Sternberg had clearly stated his belief that the yellow fever organism—considered by him at the time to be a fungus—infected

individuals via the gastrointestinal membranes. He concluded in his *Report Upon the Prevention of Yellow Fever by Inoculation* that a thorough search of alimentary canal microorganisms was needed, but his investigations in 1879 and 1887 do not discuss it in detail, and his reports were not tremendously concerned with pathological findings in the stomach or intestines. The reason for this lies primarily in the fact that from 1879 onward he was looking for blood-borne bacteria whose major pathological impact was on the liver and kidneys. Although it is impossible to know all the things he considered in regard to his work during these extensive studies, he may have seen his primacy in the search for a yellow fever agent slipping away to a colleague who—thanks to Sternberg's previous work—knew where *not* to look for the organism. He received the desired orders to Cuba in the third week of April.<sup>26</sup>

Whether Gibier enthusiastically received Sternberg when he stepped off the steamer is unknown, but he gave him cultures of his newly found bacillus. By mid-May, Sternberg was convinced Gibier's organism, while lethal to laboratory animals, had nothing to do with human disease. He then scrutinized the gastrointestinal tracts of every yellow fever patient he could find, but obtaining enough autopsies was difficult. Between May 12 and June 6, he performed only 10 and had to return home because his funding ended. In his official report from 1890, he wrote, "My first five autopsies, made in 1888, gave a negative result. In case 6 [May 23], autopsy 4 hours after death, colonies of two different kinds were obtained in cultures from the blood, liver, and kidney. One of these was my bacillus a. ... Again, in cases 7 and 8 the result was negative; but in case 9, in which the autopsy was made 5 hours after death, numerous colonies of bacillus a developed in my cultures from blood, liver, and kidney."<sup>27</sup> This version of events written more than a year later and after many experiments and much contemplation does not coincide with what Sternberg reported in his letters home. Interestingly enough, he began to see positive results in his search for a gastrointestinal agent of yellow fever almost immediately. On May 17, he wrote home in an exuberant mood: "I have some good news for you. I believe that at last I have discovered the yellow fever germ in the stomach and intestines. I have also obtained it in cultures from the kidney and urine. I will not attempt to give you particulars but there are several good reasons for believing that the bacillus which I get in my cultures is the long sought yellow fever germ...I have only had two autopsies as yet, but they were typical cases and both give me the bacillus in question.... It is not found in the blood. As I am the first one to cultivate it and to describe its characters I must be considered the real discoverer.... I am feeling very well and very cheerful at what I believe to be a successful search."<sup>28</sup> Four days later, he wrote home again in the same ebullient mood: "I am getting on famously and...believe I have at last discovered the yellow fever germ. I have now had three autopsies and find it in every case, not in the blood but in the stomach and intestines. It kills rabbits and guinea pigs and in a guinea pig which died on the 4th day the characteristic black liquid was in the intestines in large quantity... I am feeling very well and very happy at having accomplished that which I so long have been trying for."<sup>29</sup> By May 23, Sternberg

had performed six autopsies and found *Bacillus a* in all stomachs and intestines. He told his wife: "The announcement I made to you is fully confirmed and I shall publish the discovery very soon. Dr. Gibier who has been here four or five months has published the discovery of a different germ and he is wrong. I have not encountered his bacillus in any of my cases..."<sup>30</sup> His optimism over *Bacillus a* faded by the end of the first week in June as cultures failed to grow. In a letter home on his 50th birthday, he stated, "I can see now that I will not be able to make a definite announcement of a discovery. The best I can say is that there is some probability that my Bacillus A is the yellow fever germ. I shall have a lot of work to do again after my return home."<sup>31</sup> Some probability went to zero in July after he conducted an extended series of comparative experiments at Johns Hopkins. Sternberg demonstrated that *Bacillus a* was identical to the *Bacillus coli* commune of Escherich, a resident of healthy intestines worldwide and what is known as *Escherichia coli*.<sup>32</sup>

In his final report, one sees the steady, methodical, precise researcher. Sternberg had had time to conduct further trials, compared the results, pinpointed errors, and evaluated the whole objectively in his Baltimore laboratory. In fact, he experimented with Gibier's *Bacillus* well into December 1888. Standing in stark, uncharacteristic contrast to this is his rapid rejection of Gibier's work and the equally rapid acceptance of his own. Based on material derived from only three autopsies and the deaths of a few laboratory animals, Sternberg consigned Gibier's *Bacillus* to the trash heap of scientific history and replaced it with *Bacillus a*. Only 10 autopsies were performed during his eight weeks in Havana and, although he did not find Gibier's *Bacillus* in any of them and found *Bacillus a* in only three, this confidence in such little data defies the proper scientific conservatism that Sternberg always touted as prudent in research. Moreover, he was prepared to publish the results derived from this meager information immediately. His almost adolescent gloating over his colleague's error and his own discovery is also uncharacteristic. It may well represent—just as in his argument with Dr. Mallet in 1881—not only a self-styled priority of ownership in regard to yellow fever studies, but also a sense that, by virtue of his lengthy research on the subject, the right of discovery was reserved for George Sternberg.

In searching for the cause of yellow fever Sternberg, Gibier, Burgess, and their Cuban colleagues—Carlos Finlay, Claudio Delgado, Fernandes Malo, and others—discussed treatment modalities at length. Contemporary active therapy, including emetics, purgatives, quinine, and calomel (mercuric chloride), was considered unsatisfactory at best by physicians who saw a lot of the disease. These physicians tended more and more to advocate expectant or symptomatic treatment. Sternberg approached treatment from a more physiological perspective. His remedy consisted of 150 grains of sodium bicarbonate and 0.3 grains of bichloride of mercury mixed in a quart of ice-cold water and given in a dose of one and three-quarter ounces every hour. Sternberg described the logic of this therapy: "My principal object...was to test a decidedly alkaline treatment from the outset of the attack, with a view to relieving the gastric distress and acid vomiting which is a prominent feature of cases treated by the expectant method, and...to render the highly acid

urine neutral or slightly alkaline, in the hope that secretion would be more abundant and the tendency to suppression diminished.”<sup>33</sup> Also, he hoped this would prevent “those structural changes which give rise to passive hemorrhage from the stomach and suppression of urine—two symptoms which present themselves in a majority of the fatal cases.”<sup>34</sup> He stated further: “Bichloride of mercury in a comparatively small amount was added...not with the idea that it would to any extent destroy the pathogenic microorganisms in the intestine, but as an antiseptic, which might be useful in preventing fermentative changes in the stomach, which would perhaps be favored by the free administration of an alkali. The idea has also occurred to me that the specific germ may possibly find a suitable nidus in the acid secretions of the stomach, and in this case the administration of an antiseptic in combination with an alkali would be the most rational treatment. Still, I have not given much weight to this idea.”<sup>35</sup> After Sternberg departed Havana in June, 12 cases—all confirmed as yellow fever by Dr. Burgess—were treated successfully using Sternberg’s therapy at the Garcini Hospital. Eight other cases treated in the same hospital by other methods were considered controls and of these five died. Sternberg was pleased, but realized the number of cases treated was too small to substantiate the value of his method and wanted a thorough trial.<sup>36</sup>

While Sternberg continued to search for the etiology of yellow fever in cultures and tissue preparations during the summer in Baltimore, he also lit a fire under Joseph Raymond to find a laboratory assistant for him at the Hoagland Laboratory. Courses were to begin in October and desperation was beginning to set in. Although Sternberg told him that anyone—even a student with a short course in bacteriology in Welch’s laboratory—would be acceptable, none of the candidates had satisfactory credentials. This state of affairs continued until mid-July when he found a talented prospect, George T. Kemp, Ph.D., at Johns Hopkins. Kemp had studied with H. Newell Martin and William Henry Welch, and the more Sternberg talked with him, the more enthusiastic he became that Kemp was the best candidate. In a letter to Hoagland in July, Sternberg described Kemp: “He is about 27 or 28 and has been a student in different departments of the University for about eight years. I think he is a man who would help us to build up the reputation of the Hoagland Laboratory for original scientific work, and who might take my place if in a year or two if I find it necessary to resign the honorable position to which you have appointed me...I think you will find him a very well qualified and useful man.”<sup>37</sup> Kemp interviewed successfully with Hoagland and Raymond later in the month and was appointed as associate director of bacteriology and physiology.<sup>38</sup>

The summer of 1888 marked the 10th anniversary of the devastating yellow fever epidemic in the Mississippi Valley. In those 10 years, the United States had been virtually free of the scourge. A large share of the credit for this situation was given to the southern public health establishment, which had matured during the 1880s through the sound leadership of men such as Joseph Holt of Louisiana, Wirt Johnson of Mississippi, and Jerome Cochran of Alabama. By 1888, all of the southern states except Florida had state boards of health. It was, therefore,



doubly unfortunate for Florida that the next large yellow fever epidemic would originate in Jacksonville.<sup>39</sup>

Sternberg acted on the research opportunity presented by the Jacksonville epidemic. On September 5, he received approval from the War Department to proceed to Florida. Before he could execute these orders, he became aware—either from the newspapers or directly from Cochran—that the Jacksonville outbreak had spread to Decatur, Alabama. Sternberg stated he went to Decatur rather than Jacksonville because of the higher mortality in the former city and because he knew he would get excellent support from his old friend Cochran. He arrived in Decatur on the evening of October 3 and “found that yellow fever of a most malignant type was prevailing, and...the mortality had been very great.”<sup>40</sup> The town would suffer 154 cases and 35 deaths, which was a mortality rate of 23 percent, by the first of November. Of the 10 physicians in Decatur, nine became ill and five died. The four remaining doctors, B. F. Cross, E. J. Conyngton, W. C. Buckley, and E. M. Littlejohn, fought the disease using Sternberg’s new therapy, and Littlejohn assisted him as well in a makeshift laboratory. Sternberg performed his first autopsy later that night on a 35-year-old man who had died only an hour earlier. Although during the next month he only obtained permission for two more autopsies—none of which provided any positive information—his main purpose in Decatur was to answer a question that Gibier had raised in Havana. Assuming Gibier’s *Bacillus*, *Bacillus a*, or some other bacillus caused the disease, but was found only sporadically in post-mortem tissue specimens, was it also reasonable to assume that the bacillus was present in the intestines early in the disease and then, after performing its mischief, disappeared before death? To answer this question, Sternberg collected and cultured a total of 35 fecal specimens, but found nothing.<sup>41</sup>

The epidemic in Florida and Alabama also provided an excellent opportunity to evaluate Sternberg’s treatment on a large scale, and physicians used it in both states with excellent results. In Decatur, 64 cases were treated from the beginning of their illness with a 6 percent mortality. The control group of 90 individuals not treated by this method suffered a mortality of 34 percent. From Jacksonville, a mortality of only 4.7 percent was credited to Sternberg’s therapy, and many physicians agreed that the method was remarkable in preventing urine suppression. Sternberg proudly reported these glowing statistics in the medical literature, but failed to describe his methods convincingly. It was assumed that if the patient was treated and survived, he or she did so because of the treatment. Randomized double-blind, controlled therapeutic trials were unknown at the time and, while confounding was not discussed as such, Sternberg understood the concept. He realized that race, age, and gender affected infection and recovery rates, as did severity of infection, but ignored other factors, such as nursing care, previous health of the patient, and severity of infection, which he knew were important in recovery. He had not allowed Freire or Carmona y Valle to use shoddy epidemiologic techniques, but Sternberg’s desire to make an impact—if only therapeutically—on yellow fever seems to have clouded his analytical judgment. Furthermore, Sternberg apparently assumed the free flow of urine equated to successful

alkalinization with bicarbonate, but no test for urine acidity was done to verify this assumption. He had constructed a rickety therapeutic bridge part way over a wide clinical chasm and then made a leap to the other side based on faith in his statistical results. Over time the ratio of recoveries to deaths using Sternberg's therapy declined dramatically, and his treatment went away.<sup>42</sup>

A frost followed by a hard freeze ended the Decatur outbreak. Sternberg arrived home in early November. Two weeks later, he delivered his first lecture to 200 physicians and students gathered in the lecture hall at the Hoagland Laboratory. The lecture, which was reported in the *Brooklyn Daily Eagle*, reviewed bacteriologic science from the time Robert Koch established his research methods and techniques. Sternberg said the Germans led the way and made the most progress because of the support and encouragement provided by an enlightened government. He was saddened because the United States had contributed so little to bacteriology, but closed by stating, "Let us hope that we are entering upon a new era. Here in Brooklyn private munificence has provided the means of research which the government should have provided long ago. The fault will rest with the medical profession if active workers are not found to avail themselves of the facilities provided."<sup>43</sup>

December was a crowded month for Sternberg. At Johns Hopkins, experiments with cultures from Havana and Decatur continued and preparations of tissue sections were made and photographed. He refined his lectures and prepared remarks for the official dedicatory ceremonies at the Hoagland Laboratory. Opening ceremonies for the laboratory commenced at 8:00 pm on December 15 with introductory remarks by Doctors Charles H. Hall, Hoagland, Sternberg, and the Honorable Joshua Van Cott, Sr. Sternberg commented that, with such a finely appointed laboratory, he saw no reason why the Americans could not achieve the glorious deeds of the French and Germans, and received warm applause. The guest speaker for the evening, Dr. H. Newell Martin, presented a history of laboratory development from the era of the Ptolemies in Egypt to the current German models. He said that previous scientific research had been government funded and controlled. Martin proudly noted—much to Sternberg's chagrin—that American laboratories were not so encumbered and, therefore, worked not for the government, but for the good of mankind!<sup>44</sup>

Experiments conducted through December left Sternberg with no definite yellow fever organism. He lobbied once again to go to Cuba during the entire epidemic season, and orders dated February 5, 1889 directed him to return to Havana. In the last half of February in Brooklyn, he made new photomicrographs of all the organisms he had encountered during his laborious investigations of the past two years and gathered the bacteriologic equipment necessary for four and a half months of study. Hoagland and Raymond—still intent on securing Sternberg as a full-time professor of bacteriology—unsuccessfully attempted to lure him with financial and professional inducements. Sternberg's declination has never been explained. Probably for all of his irritation with the army concerning its disregard for his routine research, Sternberg was dedicated to the Medical Department, and

furthermore, it was his link to government funding for continued yellow fever research. Hoagland offered a fine salary, shares of collegiate profits, and research facilities in Brooklyn, but he could never support yellow fever research projects on the scale to which Sternberg had become accustomed. He arrived in Havana on March 16. Through the cooperation of the local Spanish government, Sternberg was given free access to both military and civilian hospitals. The auxiliary yellow fever commission had become a permanent research organization, and it provided continuity for continued Cuban-American research efforts.<sup>45</sup>

Of all the men on the auxiliary commission, Carlos Finlay was the most tenacious, scientifically courageous, and prescient in yellow fever research. His yellow fever studies predated the First Havana Yellow Fever Commission, but after studying Sternberg's 1879 photomicrographs, he formulated a novel hypothesis of yellow fever transmission based on the fact that "red blood globules are discharged unbroken in the hemorrhages of yellow fever. This fact taken in connection with the circumstance that those hemorrhages are often unattended with any perceptible break in the blood vessels, while...they constitute a most essential clinical symptom of the disease, led me to infer that the principal lesion of yellow fever should be sought for in the vascular endothelium. The disease is transmissible, it attacks but once the same person, and always presents in its phenomena a regular order comparable with that observed in the eruptive fevers...yellow fever should be considered as a sort of eruptive fever in which the seat of the eruption is the vascular endothelium."<sup>46</sup> It occurred to Finlay that, for transmission, infectious material from within a blood vessel of a yellow fever patient had to be withdrawn and transferred into the interior of a blood vessel of a nonimmune individual. Since person-to-person transmission did not occur, this had to be accomplished by some intermediate agent capable of tapping into blood vessels silently and repeatedly, an ability "the mosquito satisfies most admirably through its bite."<sup>47</sup> For the next two years, Finlay studied the habits of *Culex cubensis*. He noted only the female took numerous blood meals very soon after mating or else she died, and he theorized the blood was required for the development of fertilized eggs.<sup>48</sup> He postulated there must be a "transportable substance, which may be an amorphous virus, a vegetable or animal germ, a bacterium, etc., but...constitutes something tangible which requires it to be conveyed from the sick to the healthy before the disease can be propagated."<sup>49</sup> Finlay was convinced the mosquito conveyed this substance, but attempts to prove his theory during the summer of 1881 by infecting mosquitoes and inoculating five nonimmunes failed.<sup>50</sup>

Retrospectively, Finlay was a visionary. However, he was not the first to indict the mosquito of complicity in disease transmission. Sir Patrick Manson had reported certain developmental stages of *Filaria bancrofti* occurred in *Culex* mosquitoes in 1878.<sup>51</sup> Manson believed, however, that filaria were not transmitted by the mosquito's bite, but, upon the mosquito's death, escaped into the surrounding water. Individuals were infected when they consumed this water. At the time of Finlay's presentation, direct disease transmission from vector to human was too large of a leap of faith for many of his contemporaries. The devil was in the details

of his hypothesis and experimentation. Finlay, like Sternberg, was searching for an etiologic agent that fit the bacteriologic construct of the era. He assumed the mosquito transmitted the disease agent via a contaminated proboscis, the natural hypodermic needle it uses to obtain a blood meal, found a contaminating organism, and assumed it came from the blood of yellow fever patients.

Sternberg studied cultures sent by Finlay in the winter of 1887–1888. He had seen this organism occasionally in stomach and intestinal contents of yellow fever patients and noted it was also a common skin contaminant of patients in Havana, Vera Cruz, and Rio de Janeiro. Finlay also assumed the mosquito was competent to transmit the infection immediately after charging itself with infected blood. The yellow fever virus requires a 9–12 day incubation in the mosquito host before the infection can be transmitted. Finlay applied his mosquitoes to his volunteers within two to six days after biting a yellow fever victim. He continued these inoculations over the next eight years, but obviously they could never provide sufficient statistical significance to prove his theory. He continuously, but unsuccessfully, tried to enlist Sternberg's support for the idea of mosquito transmission. Sternberg did not consider "the subject as demanding serious attention for the reason that the mosquito does not inject the blood drawn from a yellow fever patient into the inoculated individual, but it enters the insect's stomach, and whatever remains after its meal has been digested is passed per anum. When the mosquito introduces its proboscis into the individual who is to be inoculated it is for the purpose of withdrawing blood, and it is difficult to see how any inoculation can occur, unless some virus has adhered to the exterior of the delicate instrument during the considerable interval which elapses after one full meal before the insect can be induced to fill itself again."<sup>52</sup> He found this possibility highly improbable. Furthermore, Ruiz' attempts in Vera Cruz to transmit yellow fever by blood injections had been negative. Although Sternberg did not consider these experiments conclusive, neither did he have any experimental evidence to show the disease agent was truly in the blood of yellow fever victims. Although Finlay and Sternberg appear to have maintained an amiable personal and professional relationship, Sternberg's a priori rejection of mosquito transmission, which meant essentially the subject was ignored in American medical circles, rankled Finlay.<sup>53</sup>

Upon Sternberg's arrival, the yellow fever season was just beginning, and initially cases were few and sporadic. Therefore, he studied the bacterial flora of Havana's sewers, not because he expected to find anything definitive, but because, as he said, "it [was] good preliminary work."<sup>54</sup> He corresponded frequently with Franklin Mall, who was studying anaerobic organisms in the Johns Hopkins Laboratory.<sup>55</sup>

In the second week of April, Sternberg read a letter by Dr. Frank Billings, director of the pathological laboratory at Nebraska State University, in the Medical Register of Philadelphia, which got his full attention. Billings had been studying pathological sections of tissues taken from six yellow fever patients that had been sent to him by Daniel Burgess in Havana; material from two cases had come from autopsies numbers 9 and 10, performed by Sternberg in 1888. The Nebraska physician claimed that he had found the organism described by Babes in 1885 "in the blood

in every section and in great numbers, every authority to the contrary” and confidently declared “against all contradiction, that in such a disease as yellow fever, where one finds one organism closely and sharply in many sections and all parts of these sections,...that that organism is the cause of the disease of which the individual died.”<sup>56</sup> Billings had to be aware of the authority he was challenging and that authority quickly sent a letter to Mall: “Now if this is true it is a matter of great importance that I should know it,” Sternberg wrote, “and if it is false the sooner I am satisfied of the fact the better for my peace of mind. You have all of my material in your hands, & Dr. Billings has given his method. Will you not take the matter up at once & give it your best attention & report to me as soon as possible. If Dr. Billings can demonstrate microorganisms by the methods he has given you ought to be able to do so by the same methods. Please show this letter to Prof Welch & say to him that I earnestly hope him to give a little time to this matter, & either to make mounts by the methods described or to examine yours & let me know his opinion. Certainly the matter is sufficiently important to claim some of his time. I want to know the truth about it as soon as possible for if you find what Billings claims to find it will have a bearing upon my further experimental work.”<sup>57</sup> By mid-May Mall’s analysis, presumably with the assistance of Welch and possibly William T. Councilman, had allayed Sternberg’s apprehensions enough for him to let the issue rest for the summer. Later Sternberg demonstrated the organism Billings had identified as *Babes bacillus* was identical to his *Bacillus a* (*E coli*).<sup>58</sup>

The expected epidemic of yellowjack failed to materialize early. Sternberg complained to Martha that he was “not getting on at all” with his research because he had no autopsy material.<sup>59</sup> But he added, “it can’t be long before some of the unfortunate Spanish soldiers will fall victims to yellow fever.”<sup>60</sup> The first fatal case among the soldiery did not occur until April 23. He obtained permission for an autopsy of this patient and another five days later. From then until late August, Sternberg conducted a total of 30 autopsies and another 18 on persons dead from maladies other than yellow fever for comparison. He studied fresh and preserved specimens of kidney, liver, stomach, and intestines; prepared aerobic and anaerobic cultures of blood, urine, stomach, and intestinal fluids; identified and photographed a large number of organisms from these cultures; and injected them into laboratory animals to determine their virulence. His spirits rose and fell as his work proceeded. On May 6, he told Martha the discovery of the yellow fever organism would not be easy, but was sure that “whether I demonstrate the germ or not my work will stand as scientific work of value in this department of research.”<sup>61</sup> A week later he lamented to her, “so far as I can see, I am no nearer a solution of the main question,” and added, “I am doing my work thoroughly and, if I don’t demonstrate the specific germ, it won’t be for want of working faithfully by the most approved methods, and no one else is likely to make an easy discovery in the field if I have to give up in the end.”<sup>62</sup>

About this time Sternberg found what he designated as *Bacillus X*. This organism resembled *Bacillus a* structurally, its virulence in laboratory animals far surpassed anything he expected, and it was “the most promising yet.”<sup>63</sup> If found in a majority

of autopsies “it may turn out to be the specific microbe I have so long been in search of.”<sup>64</sup> Experiments over the next 10 weeks continued to bolster his faith in the primacy of *Bacillus X*. “I am feeling more encouraged with reference to my Bacillus X,” he wrote home at the end of July, “and I think now I will probably be able to announce it as a probable specific agent, even if I can’t claim to have made a complete demonstration of it.”<sup>65</sup> Twelve days later he determined the source of the organism’s rapid lethality. “I am again quite hopeful with reference to my Bacillus X,” he told his wife, “and have proved by experiment that it produces a deadly volatile ptomaine. I have collected this in distilled water from culture of Bacillus X and injected it into rabbits, which die from such injections in a few hours.”<sup>66</sup> His optimism was understandably high, but tempered perhaps by memories of his impetuous rush to claim the prize from Gibier in 1887, for he added, “You can say to my friends who ask you that I have strong hopes...I have discovered the right germ but am not yet prepared to announce positively that this is the case.”<sup>67</sup>

Sternberg sailed for home on August 31. For the next seven months, he pursued experiments with *Bacillus X* in the comfort of the Johns Hopkins Laboratory, had Councilman verify old and new slide preparations, and reviewed all his yellow fever research over the past three years. His *Report on the Etiology and Prevention of Yellow Fever*, submitted June 21, 1890, was a complete and all-encompassing tour de force that defined and described all that was known about the disease both from the clinical and research perspectives. Regrettably, Sternberg was unable to rule in or out *Bacillus X* as the specific etiologic agent. After years of difficult, painstaking effort, travel, and separation from Martha, he effectively concluded his work with two sentences: “The specific infectious agent of yellow fever has not been demonstrated. The most approved bacteriological methods fail to demonstrate the constant presence of any particular microorganism in the blood and tissues of yellow fever cadavers.”<sup>68</sup> Sternberg was sorely disappointed and commented that, “No one can regret more than I do that the...etiology of yellow fever is not yet solved...but I at least have not to reproach myself with want of diligence or failure to embrace every opportunity for pursuing the research. The difficulties have proved to be much greater than I anticipated at the outset.”<sup>69</sup>

Although Sternberg did not discover the long-sought yellow fever organism, he took some comfort in at least having been “able to exclude in a definite manner a majority of the microorganisms which I have encountered in my culture experiments, as well as those which various other investigators (Freire, Carmona, Finlay, Gibier) have supposed to be the specific cause of the disease.”<sup>70</sup> In a world where fame is gained by making great discoveries and where there are no laurels for second place, Sternberg’s yellow fever investigations, like his work with the pneumococcus, have become only a footnote in the annals of medical history. However, his summation above was accurate. Using state-of-the-art methods and equipment, meticulous technique, and reasoning, he eliminated all microorganisms found by these methods as candidates for the etiology of yellow fever. It was no small feat in 1890 and virtually brought significant yellow fever research to a close until the last half of the decade.

## Chapter Ten

# Immunology and Cholera in New York City

“S ince the summer of 1885 Sternberg’s professional pace had been tiring, if not grueling, and not completely as satisfying as he would have liked. On the home front, his mother died December 7, 1888, in Ellsworth. Levi wrote to his oldest son: “Ma left us at 12 PM today. Her death was quick & easy. She had her mind clear to the last. She was very anxious to go. She was reduced to a mere skeleton. Her last message to her children was, ‘Meet me in Heaven.’ I had hoped to keep up as long as she needed me. But I broke down completely...The world seems very lonely to me without Ma.”<sup>1</sup> Margaret Sternberg’s apparently debilitating and wasting illness probably resulted from her earlier stroke or strokes. Although Sternberg knew that such a letter could come at any time, the knowledge did not soften the blow. Sixteen month later, in the spring of 1890, another letter informed him that his sister Emily, Mrs. Frank Humlong, had succumbed to cancer in Albion, Iowa.”<sup>2</sup>

The summer of 1890 appears to have been a relatively slow one for Sternberg; it was a refractory period in which he recovered physically, mentally, and emotionally from the rapid and intense pace that he had established for himself over the past three years and the recent family losses. It gave him time to put professional disappointment in perspective and philosophically reflect on the nature of life, death, and the will of God. The official army duties Mrs. Sternberg claimed always interrupted his research now furnished time for Sternberg to rest and refocus his scientific and military sights on future endeavors. He was still attending surgeon and examiner of recruits in Baltimore and served on numerous examining and promotion boards, and in July he assumed additional duty as post surgeon at Fort McHenry.<sup>3</sup>

In June, a letter from Major Charles R. Greenleaf to the surgeon general in reference to the ongoing revision of *Personal Histories of Medical Officers of the Army* set the bureaucratic wheels in motion that resulted in Sternberg being awarded another brevet commission for gallantry. Greenleaf’s story began in Montana in 1882. In

his travels he met an old friend, a retired army packer with one leg whom Sternberg had saved by candlelight on the dark and dangerous Clearwater battlefield in 1877. The crippled veteran related the story once again of how Sternberg stopped the bleeding in dim light and under fire, and nursed him carefully on the trek from battlefield to Fort Lapwai, and also how he had stubbornly refused amputation until he nearly bled to death again in the post hospital. The packer told Greenleaf that no other officer was there that night on the Idaho plateau, which accounted for the story being unknown to the Medical Department. Greenleaf apparently did not take notes during the interview because in his letter to the surgeon general he described the event correctly, but placed it on the trail to Fort Lapwai rather than on the battlefield. Sternberg was eventually asked to relate the facts of the episode that resulted in a brevet lieutenant colonelcy.<sup>4</sup>

The impending retirement of Surgeon General Moore in August generated the usual scramble among medical officers to present their credentials for review. Sternberg submitted his packet, which was more impressive because it contained a letter of endorsement from Army Commanding General John M. Schofield: "Surgeon Sternberg is one of the most eminent medical scientists of the age, and has contributed very greatly to the advancement of that science. He has also performed ably and bravely every variety of duty devolving upon a medical officer of the army, with an Army in the field in time of War, in campaigns against hostile Indians, and in the midst of epidemic diseases. Not only his medical and surgical skill, but also his administrative ability is of the highest order. He is thoroughly qualified to administer the affairs of the Medical Department of the Army. On no other ground but that of seniority in rank and greater length of service in the varied duties of a surgeon in the army could, in my judgment, any other officer be considered more worthy of appointment to the office of Surgeon General."<sup>5</sup> Those eager applicants for the Medical Department throne, however, need not have bothered. Colonel Jedidiah H. Baxter, senior ranking medical officer, chief medical purveyor since 1872, and perennial candidate for the office, was the clear choice well before Moore's term as surgeon general ended. Secretary of War Redfield Proctor was a strenuous supporter, and President Benjamin Harrison was an old friend and patient. Baxter had a reputation as a volatile personality with strong opinions, but he was also known to have outstanding administrative ability. On August 16 he became surgeon general with plans for extensive and comprehensive improvements throughout the Medical Department. His ascension created a vacancy in the colonel's ranks, thereby allowing each senior officer in the lower ranks to be promoted in turn. As Sternberg was the senior major in the corps, he was promoted in October to lieutenant colonel. He was 52 years old.<sup>6</sup>

Tied to the promotion was a permanent change of station. Sternberg was detailed as medical purveyor at San Francisco in early October. This order, Mrs. Sternberg declared, "caused them no little regret" as army duties and the well-known dearth of laboratory facilities on the west coast would interfere with experimental bacteriology.<sup>7</sup> Her husband, in his usual aggressive and optimistic manner, had already begun planning what scientific goals could be practically pursued in conjunction with the large logistic responsibilities he would assume in California. Sternberg



set his sights on the completion of *Manual of Bacteriology*. Exactly when he determined to produce what would become the American gospel of bacteriology for many years is unknown, but why he did is obvious: it was the logical sequel to—and much needed revision of—*Bacteria* published in 1884.<sup>8</sup>

Between October 3, when he received his orders, and October 7 when he and Mrs. Sternberg boarded the train for their fifth transcontinental trek together, the Sternberg home was a flurry of activity. In that time, he put his laboratory corner at Johns Hopkins in order. The Sternberg's household was packed up or disposed of at auction once again, and they said good-bye to many friends and colleagues. They arrived in San Francisco a week later, and Sternberg immediately began inventorying the medical and hospital property at the purveying depot with the outgoing purveyor, Colonel Bernard J. D. Irwin. He also—with a great deal of regret—tendered his resignation as director of the Hoagland Laboratory. However, the facility's trustees were not disposed to let him sever his connections so easily with the laboratory merely because he now resided 4,000 miles away. The resignation was tabled, and a year's leave of absence was granted.<sup>9</sup>

As medical purveyor at San Francisco, Sternberg was responsible for medical logistics support to 34 posts that comprised the Departments of California, Columbia, and Arizona, essentially every fort and barracks west of the Rocky Mountains. He contracted for every drug, chemical, dressing, instrument, and hospital furnishing used by the Medical Department, then received and stored these items, assembled them for unit issue, and shipped them to their final destination. Although the army was small in 1890, the job still demanded indepth knowledge of the army formulary and medical equipment required in the garrison and field environments, as well as foresight, planning, and attention to detail.<sup>10</sup>

That Sternberg dedicated nearly every waking moment to his logistic responsibilities and the compilation of his textbook are reflected by the minimal contributions he made to the professional literature over the next year. He did read Finlay's report on yellow fever inoculations made with infected mosquitoes in the *Medical Record* and felt compelled to respond to his old friend and colleague in a professional forum. Finlay claimed to have successfully inoculated 92 percent of the 52 volunteers in his study against yellow fever. Of these, only 12 developed disease symptoms in the 3- to 25-day incubation period Finlay allowed. Twenty-four of the remaining 40 volunteers had mild symptoms later on, four had severe yellow fever, and one died. Sternberg took issue with his friend's experimental methods and presumed results. He commented "that 12 out of 52 unacclimated persons arriving in Havana should suffer mild attacks of fever...is not surprising; and inasmuch as 40 other persons inoculated did not suffer similar attacks within twenty-five days after the supposed inoculation, we see no reason for ascribing the slight attacks of fever suffered by these 12 to the application of a mosquito by Dr. Finlay."<sup>11</sup> He also noted Finlay's incubation period was five times longer than the generally accepted timeframe, and the fact that 24 of his volunteers developed mild attacks of the disease later provided little support as such fevers were common in Havana. Moreover, although it could not have been known at the time, many of Finlay's infected mosquitoes were not infectious at the time of application.

Sternberg concluded kindly: "I esteem both of these gentlemen [Finlay and Delgado] very highly, and I would welcome most gladly a demonstration of the value of the method which they faithfully endeavored to test. But a justifiable scientific skepticism makes it necessary to demand more direct and satisfactory proof that the so-called inoculations produce any pathogenic effect before any great importance can be attached to the results of Dr. Finlay's laudable efforts to discover a method of prophylaxis in yellow fever."<sup>12</sup>

Sternberg's main endeavor at the time was to gather and read the most current literature in bacteriological research, and then extract and concentrate the essence of these data for his textbook. His bibliography for the manual eventually encompassed more than 2,000 references, many of them in French, but the majority in German. He could read the French technical literature without difficulty, but without a translated text it was impossible for him to struggle through the overwhelming number of German articles with accuracy and efficiency. With a tutor's help, Sternberg taught himself to read German between 1889 and 1892. It is a small and obscure episode in his life, but one that impressed Alexander Abbott with Sternberg's "will and energy."<sup>13</sup> He probably engaged this academic goal with the same zeal as he did all other professional and scientific pursuits, leading Mrs. Sternberg to lament the fact that while in San Francisco "he scarcely gave himself an hour's leisure."<sup>14</sup> An insightful woman, she realized the world of academia—in any form—was sustenance, not stress, to her husband. But she was also a devoted and caring wife in an era when 50 years was considered well past middle age and too much studying was detrimental to both mind and body. She also seems to have entertained the idea that Sternberg's near fatal bout with yellow fever in 1875 had reduced his stamina and endurance, the Clearwater Campaign notwithstanding. Furthermore, and perhaps more to the point, she found herself once again vying for her husband's attention. "It devolved upon me," she asserted, "to plan diversion for his mental and physical welfare. His interest in botany gave me excuse to suggest short trips to Monterey and other coastal resorts, to the beautiful Santa Clara Valley and to San Jose. Many times we drove to Golden Gate Park, a magnificently cultivated tract of one thousand acres fronting the ocean."<sup>15</sup>

In December 1890, a little less than four months after taking office, Surgeon General Baxter contracted pneumonia and died. Baxter's untimely demise caught all contenders for his vacant chair—except those in Washington—completely off guard. Army Commanding General Schofield was looking after Sternberg's interests, however. He and a contingent of senators, numerous physicians, and public health officials across the country, and prominent businessmen Andrew Carnegie and Enoch Pratt endeavored to have Sternberg installed as surgeon general. Moreover, Schofield, a strong advocate of the seniority system of promotion, worked diligently to ensure that politically connected junior ranking medical officers, such as Billings, did not obtain a prize that they could keep until the turn of the century. Part of the reason that this august group of supporters did not achieve their objective was not so much a failure on their part to present a worthy candidate as it was a reflection of the personality of the president. The dogmatic Benjamin Harrison ignored

the proffered advice and selected Charles Sutherland, the senior Medical Corps officer. Schofield wrote to Sternberg after the decision was made in December: "Your position in the matter has been thoroughly understood both by me and the Secretary of War. I have watched the matter very carefully with the end in view that has finally been reached, and which will, I think, be gratifying to all, except the few who may have been more or less disappointed in their own personal ambition. I am glad to see that you are satisfied with the selection of the senior head of the corps, as indeed I knew you would be."<sup>16</sup> Sternberg, although undoubtedly disappointed, breathed a sigh of relief because Sutherland would retire for age in three years. He still had time to win the race.

It is unclear just when and how Sternberg developed this close relationship with Schofield, but it appears it was genuine friendship and mutual admiration that transcended army politics. Schofield was a strong advocate of increasing professionalism in the army through appropriate initial and continuing education. He not only appreciated Sternberg's research in the abstract, but also was interested enough to visit Sternberg's office during a trip to San Francisco, where the doctor showed him some of his bacteria and gave him "an idea of our methods of cultivating these minute plants."<sup>17</sup> As Sternberg neared the completion of his manual, he once again contacted Schofield concerning his future and his pressing need to be on the east coast: "You will remember...when you were here I spoke to you with reference to my reasons for desiring an eastern station. I have been devoting all of my spare time...to writing *A Manual of Bacteriology*, and the work is now approaching completion. In order to arrange for its publication & to see it through the press in good shape it is important that I should be on the eastern seaboard. Then, as you know, I am anxious to continue my bacteriological studies, and can only do so to advantage when stationed within reach of a well-equipped laboratory, such as the Hoagland laboratory...or the laboratories of Johns Hopkins University...I do not propose to allow these studies to interfere in any way with the duties to which I may be assigned, but by persistently devoting my spare time to this special department of research I hope to add something to the progress of scientific medicine & hygiene. I have had comparatively little duty on the eastern seaboard during my 30 years of service unless the department counts against me the time when I have been on detached service engaged in the study of yellow fever under the orders of the President. I look upon this duty as 'field service' & think it should be placed to my credit rather than charged against me...I have had more frontier service than many medical officers of my rank & have had an exceptional experience in encountering epidemics, which for medical officers are trying & protracted campaigns against an invisible but deadly foe.... I write to you because I feel assured of your friendship & kind interest in my efforts to accomplish something of value in my chosen field of scientific research. I wrote to the Surgeon General several months since telling him of my desire & the reasons for it, and as he has heretofore been friendly to me. I hope that he will be disposed to give me such a detail as I have suggested whenever a vacancy occurs."<sup>18</sup>

Orders relieving Sternberg from duty in San Francisco were issued February 2, 1892. As soon as his replacement, Lieutenant Colonel Joseph P. Wright, arrived from Fort Leavenworth and an equipment inventory was completed, Sternberg proceeded to New York City to assume duties as attending surgeon and examiner of recruits. According to Eggerth, in his *The History of the Hoagland Laboratory*, Sternberg did not resume an active role at the laboratory, with a tidy annual salary of \$1,000, until September. But he was very much engaged in trying to define the practical value of the most recent bacteriologic discovery—the presence of antitoxins in blood sera—from the moment he arrived at his new station. As his research moved into the enigmatic realm of natural and acquired immunity, he again became a pioneer in a new science, one of America's first immunologists.<sup>19</sup>

Immunity to certain diseases, such as smallpox and yellow fever, derived naturally by surviving an attack of the disease had been an accepted fact for generations. It was not a new phenomenon either that immunity could be induced artificially, or acquired, by deliberate exposure to a disease agent. Smallpox variolation and vaccination were examples of artificially acquired immunity, as were Louis Pasteur's attenuated anthrax and rabies vaccines. Both of these vaccines resulted from the natural loss of virulence, known as attenuation, by these organisms when exposed to dry air over a given time period. Attenuation was a well-known phenomenon to bacteriologists. Sternberg and others had encountered it during their work with the pneumococcus, and he also found he could attenuate certain bacteria with disinfectants. What caused the organism to attenuate, how these less virulent strains induced an immune response, or how natural immunity was generated were unknown, but explanatory hypotheses were soon forthcoming.<sup>20</sup>

Based on observations of in vitro cultures of chicken cholera and other organisms, Pasteur offered the "depletion theory" that stated a disease organism obtained the vital material it required for life from its host just as it did from artificial culture media in flasks. Pasteur assumed the supply of this material in the chicken—just like artificial media—was exhaustible, and once consumed the organism inevitably died. Hence, multiple injections of attenuated organisms into chickens over time consumed this nutritional substance without causing disease, and thereby induced immunity. Pasteur also suggested waste products generated by the organisms may produce an environment ill suited for their continued growth. Hypotheses proposing that bacteria essentially poisoned themselves to death and, in the process, established immunity abounded. Jean Baptiste Chaveau's "retention theory" held that toxic metabolic by-products did this very thing. Paul Baumgarten's "osmotic theory" and Emil von Behring's "alkalinity theory" were variations on this theme.<sup>21</sup> In April 1881, Sternberg gave a critical appraisal of these theories in the *American Journal of the Medical Sciences*. The assumption that the human body produced and stored nutritional substances unique to each of the wide variety of infectious diseases it was subject to—without new production of the same—did not make biological sense to him. Neither did the idea that microbial metabolic waste products were somehow retained when the human economy provided so well for the elimination of toxic substances. Sternberg believed the explanation for

immunity was to be found in the “peculiar properties of the protoplasm, which is the essential framework of every living organism.”<sup>22</sup> He explained this by stating that “during a non-fatal attack of one of the specific diseases the cellular elements implicated which do not succumb to the destructive influence of the poison, acquire a tolerance to this poison which is transmissible to their progeny, and... is the reason of the exemption...the individual enjoys from future attacks of the same disease.”<sup>23</sup> He was essentially advocating what was known as the “adaptation theory,” by which the body adapts to pathogenic toxins during an illness similar to the way in which it adapts to the effects of narcotics or alcohol with increasing doses. Over the next decade, all of these theories were rendered untenable.<sup>24</sup>

At the American Public Health Association meeting in Memphis in 1887, Sternberg was appointed chairman of the committee on protective inoculations in infectious diseases. The final report of this committee was not presented until the annual meeting in 1892. He commented the tardy report was due “...partly to the pressure of other engagements...the magnitude of the subject, and...to the fact that experimental evidence...has been constantly accumulating during the past five years, and the fundamental question concerning the explanation of acquired immunity has not been answered in a satisfactory manner until very recently.”<sup>25</sup> Great strides were made in humoral immunology during this time. In 1886, D. E. Salmon and Theobald Smith induced immunity in pigeons by injecting them with heat-killed hog cholera cultures. Two years later, George H. F. Nuttall discovered blood had bactericidal properties, and Hans Buchner confirmed this bactericidal blood component was a protein—which he named alexin—unrelated to cellular blood elements. In Berlin in 1890, Emil von Behring and Shibasaburo Kitasato, working with diphtheria and tetanus, respectively, reported results that would have a profound impact on the practical application of acquired immunity against human disease. They demonstrated that blood sera from laboratory animals made immune to these diseases protected nonimmune animal subjects from fatal outcomes.<sup>26</sup>

Sternberg was fascinated with these discoveries, the results of which he called “so novel and so unexpected,” and he waded into this new science with gusto.<sup>27</sup> By the end of June 1892, he had initiated his own immunological research and presented two papers, “Practical Results of Bacteriological Researches” and “Infectious Diseases, Causation and Immunity,” to the Association of American Physicians and the medical department of Yale University, respectively. It appeared to Sternberg that the morbid phenomena that resulted from ricin poisoning or infection with tetanus or diphtheria were “due to the specific toxic action of substances resembling the toxalbumins [antigens] already discovered, and that acquired immunity...results from the formation of an antitoxine [sic] [antibody] in the body of the immune animal....Evidently the production of antitoxine [sic] during an attack...would account for recovery in non-fatal cases; and it may be that this is the true explanation of self-limitation in this disease class. If nature adopts this method of cure, we but follow her if we seek to introduce more...antitoxine for the purpose of arresting the progress of cases of unusual severity and fatal tendency.”<sup>28</sup>

Referring to the attempts by German scientists to treat croupous pneumonia and tetanus with immune serum, Sternberg commented, "Although the production of these antitoxins...for therapeutic use will be attended with difficulties...methods will be devised for obtaining them on a large scale as soon as it is...established that they may be successfully used as specifics in the treatment of infectious diseases."<sup>29</sup> How would sufficient quantities be produced for strictly human maladies such as smallpox? While Sternberg admitted transfusion of a moderate amount of blood from immune to nonimmune humans was worth consideration, he sought a more practical and universal solution.<sup>30</sup>

Calves were used to produce cowpox virus for human vaccination. If these animals could be used as vaccine factories, could they also be used as smallpox immune serum factories? Sternberg contacted Dr. William E. Griffiths, a producer of vaccinia quills in Brooklyn, to assist him with an experiment to determine whether the calf did produce neutralizing antitoxin to vaccine virus. Sternberg and Griffiths combined serum from a recently vaccinated calf with fresh vaccine lymph in one test tube and with a fresh vaccine crust from a child's arm in another. After these mixtures sat for 24 hours, they shaved and scarified the thighs of a nonimmune calf and rubbed the contents of both tubes into each of the scarified areas. Nine days later, the calf was noted to have had an entirely negative reaction to the vaccinations. An experiment using a nonimmune calf was performed as a control and verified that "the blood serum of an immune calf contains something which neutralizes the...virulence of vaccine virus, either bovine or...lymph-crust from the arm of a child."<sup>31</sup> Although he could not know it at the time, Sternberg had performed the first viral neutralization test. The Association of American Physicians received his results with caution. William H. Welch commented, "There can be no doubt... the blood-serum of immunized animals may possess powerful therapeutic effects. As regards the practical application of this principle to the treatment of human beings, it does not seem to me that we...possess positive results entirely free from doubt as to the correctness of the interpretation put upon them."<sup>32</sup> Dr. Sewall, who had shown immunity to rattlesnake venom could be obtained by multiple small injections of venom components in 1887, questioned "whether this is not simply establishing a tolerance for the poison, instead of a true vaccine action," and added that no pure toxalbumin had ever been distilled.<sup>33</sup> Victor Vaughn remarked: "I wish to express my high appreciation of Dr. Sternberg's paper, and especially of his own experimental work with regard to vaccine. Of course, the number of experiments is too limited...for positive conclusions to be drawn...we must be very slow to conclude...all of this is going to be of special benefit in medicine."<sup>34</sup> Dr. Lyman concluded, "we are not so very near, as some enthusiasts think, to the time when we shall be able to protect our patients from diseases."<sup>35</sup> Sternberg admitted he "admired conservatism and skepticism, but why Dr. Kitasato should be so very conservative about the results obtained upon a man when they correspond so entirely with the results which he and others have obtained on the lower animals I do not understand. When I see carefully reported cases...in which all the symptoms are carefully detailed and the results of treatment seem to be...definite, I feel like

giving considerable credit to it without admitting that the thing is proved. I am... free to say that I think the future of scientific medicine is in this direction, and that we have entered upon a field that is to be cultivated vigorously, and... will give you results that will knock the conservatism from under your feet before many years."<sup>36</sup> Sternberg also told the association it was his intention to isolate the antitoxin of vaccinia and test whether it could neutralize smallpox virus in infected patients. However, before he could do so he was called on to assist with a public health crisis that had the potential to devastate not only New York City, but also the nation.<sup>37</sup>

Cholera had reappeared in Central Asia. The disease spread from Afghanistan by railroad into the Russian heartland and reached Kiev by the summer. At that time, massive numbers of Jews were immigrating from Russia to the United States, a journey which took many of them—infected with cholera—to Hamburg where they secured passage in the cramped, filthy, and poorly ventilated holds of ocean liners. By August 14, the inadequate barrack latrines, chamber pots, and earth closets that were emptied into Hamburg Harbor and the Elbe River had seeded these waters with cholera. Less than a week later, contaminated river water had made its way into municipal reservoirs and was then pumped—without benefit of filtration—into city homes.<sup>38</sup>

Had the first few cases of cholera seen in the neighboring town of Altona been admitted for what they were by medical authorities, both Hamburg and Altona may have been spared a tragedy. Procrastination and prevarication by Hamburg civil and medical authorities not only allowed the epidemic to rage, but also allowed five cruise liners—the *Moravia*, *Rugia*, *Wyoming*, *Scandia*, and *Normania*—to obtain clean bills of health and sail for New York.<sup>39</sup>

While the medical and political authorities in Hamburg were just beginning to feel the intensifying heat of public, professional, and international wrath for their stubborn complacency at the end of August, those in New York City were hoping their similar troubles were taking a cooler turn. Mayor Hugh J. Grant, a Tammany Hall Democrat, had systematically replaced almost all Republicans in municipal office, including the Board of Health, with loyal Democrats. This generated a hue and cry from the medical and lay press. Doctors T. Mitchell Prudden, Abraham Jacobi, Edward Janeway, and Stephen Smith resigned as consultants to the Board of Health in June, declaring it had lost all independence and become a haven for political hacks. Undaunted, Charles G. Wilson, President of the New York Board of Health, pompously commented, "We passed through the typhus and smallpox epidemics without calling on them for assistance, and can do very well without them."<sup>40</sup> New York politicians and health officers relied on the quarantine establishment in the lower harbor to accommodate, screen, and disinfect more than two-thirds of foreign imports and two-thirds of all immigrants into America, and to guarantee that no diseases would escape from Swinburne Island. This was a tall order considering the quarantine system in the United States had not improved substantially in the seven years since sanitarians had met in Rome to debate the issues that now faced the city. Furthermore, the same political and economic concerns that had stifled national quarantine legislation in 1879 and allowed the

National Board of Health to die of neglect continued to sway decisions in the office of the Port Health Authority. In late summer of 1892, it appeared all of these sins of negligence were coming home to New York City simultaneously.<sup>41</sup>

From August 24, the day New Yorkers learned that cholera was coming, public-minded citizens and the Board of Health worked aggressively to preclude it from gaining a foothold in the city. An emergency fund of \$200,000 was established; special funds for the Health Department were appropriated; Health Commissioner Joseph Bryant began inspections of tenements, the Croton watershed, and reservoirs; and public areas were cleaned. The Chamber of Commerce created an advisory committee of physicians mainly composed of the same doctors that had resigned from the Health Department's advisory board only two months before. On August 30, the day before the *Moravia* arrived with cholera on board, a circular titled "Prevention of Cholera Easier Than Cure" was issued in six languages.<sup>42</sup>

Between August 31 and September 9, the five infected ships had anchored at the lower harbor quarantine station with their steerage decks teeming with passengers anxious to get to the mainland. Before they could be released, each had to undergo medical examination, including the sick and those suspected of incubating the disease would have to be hospitalized at facilities on Swinburne and Hoffman islands, and their clothes and baggage were disinfected. The magnitude of this public health crisis overwhelmed the resources on both islands as well as the capabilities of the Port Health Officer Dr. William Jenkins.<sup>43</sup>

The announcement by Board of Health President Wilson that cholera had been discovered in the city on September 14 and the arrival of another disease-ridden ship, the *Bohemia*, the following day only increased public fear and apprehension. There were now 5,300 immigrants being bathed and disinfected in a quarantine station fitted out for half that number, and a large amount of cargo also had to be disinfected. On September 16, the advisory committee of physicians of the Chamber of Commerce held a lengthy meeting to discuss the detention of passengers and the best method of disinfection to be employed at quarantine. The advisory committee was fully represented, and among others at the meeting were Jenkins; Dr. Joseph J. Kinyoun, representing the Marine Hospital Service; Dr. Edward O. Shakespeare, health officer of the port of Philadelphia; and Sternberg. This appears to be the first time Sternberg's counsel was sought during the crisis. Although Sternberg assisted Hermann Biggs and Prudden in confirming cholera cultures—and most assuredly had opinions on the conduct of the quarantine—he was specifically engaged for his expertise with disinfections. Jenkins requested Sternberg evaluate disinfection methods used on Hoffman Island, specifically, what articles needed disinfection and what method would be most expeditious and economical. The War Department temporarily assigned Sternberg as consulting bacteriologist at the quarantine station.<sup>44</sup>

A symposium to educate community physicians on the science of cholera and quarantine administration was held in the main assembly hall of the New York Academy of Medicine on the evening of September 19. Sternberg presented a paper that reviewed the biological characteristics of cholera and described the



most appropriate cholera disinfectants, carbolic acid and chloride of lime, and how to use them. Two days later, Sternberg and Dr. Ezra Wilson, the new chief of bacteriology at Hoagland, began experiments at the disinfection facility on Hoffman Island.<sup>45</sup>

To test the reliability of steam disinfection chambers, Sternberg placed swatches of cotton soaked in cholera bouillon cultures deep into piles of blankets and clothing brought in from passengers aboard the *Scandia*. After disinfection, Wilson prepared liquid and solid cultures and controls at the Hoagland Laboratory, but neither grew anything indicating they had been destroyed by desiccation. Sternberg commented, "In view of this fact and of the experimental evidence heretofore recorded, the question arises as to whether the exactions made by bacteriologists and sanitarians with reference to the use of steam as a disinfecting agent are not extravagant, and whether there is not some better way of disinfecting clothing, etc., in cholera."<sup>46</sup> To determine whether simple drying was an effective disinfection method, Sternberg put small squares of a cholera-soaked woolen blanket in sunlight and in the darkness of a closet. No growth was obtained after four hours of exposure to sunlight and after 48 hours in the closet. Wilson also tested contaminated articles of clothing in a drying chamber at 60° Celsius for four hours with the same results. Sternberg concluded that "desiccation is a reliable method of destroying the cholera spirillum, and...the International Sanitary Conference of Rome was justified in the conclusion that 'disinfection of merchandise and of the mails is unnecessary' if the merchandise was clean and dry when received on shipboard for transportation, and if it arrives at our ports in the same condition."<sup>47</sup> Furthermore, "disinfection would be accomplished quite as effectually by the free exposure of woolen garments, blankets, etc., in a hot-air drying oven or chamber..."<sup>48</sup> Should disinfection facilities be overwhelmed by a large volume of articles for disinfection, as was currently occurring at quarantine, then Sternberg advocated sun drying as an adequate method, except for soiled undergarments and bed linens. The cholera scare, however, ended before Sternberg's findings could be put to extensive practical use. Bacteriological science did little to preclude the disease spread at quarantine or in the city. Although he and Wilson would continue experiments with cholera into December, Sternberg's special duty with New York Public Health Authorities ended on October 31. A month later, he headed to Madison Barracks at Sackets Harbor, New York, to conduct a thorough sanitary inspection of the post and investigate an outbreak of typhoid fever then in progress.<sup>49</sup>

Madison Barracks was on the shore of Black River Bay, just above the town of Sackets Harbor. Home to six companies of the 9th Infantry, it had a garrison of about 400 soldiers plus ancillary personnel. The barracks were crowded, and the plumbing and sewers were in very poor condition when the index case arrived from the enlistment station at Binghamton, New York, on September 18. It took 4 weeks for the second case to develop. From then until December 13, when the last case was reported, 25 more cases and two deaths occurred. Sternberg arrived on the evening of December 5 with his field bacteriological kit and conducted his investigation

over the next three days. This is the earliest example found by the author of what contemporary army preventive medicine physicians call an epidemiological consultation. Today an epidemiological consultation may be requested by a post commander or his preventive medicine officer when a disease or injury outbreak has occurred on his or her post that requires more expertise and resources than he or she can bring to bear or it may be directed by a higher command authority. Regrettably, when an epidemiological consultation is directed from a higher authority than the post commander, the consultation team is not always received with open arms. One wonders whether Post Surgeon Daniel G. Caldwell and Assistant Surgeon Frank T. Merriwether may have felt a bit under the gun upon the arrival of a deputy surgeon general so well versed in epidemiology and infectious diseases. If so, they worried needlessly. Merriwether, who was acting post surgeon when the first case was diagnosed, implemented all of the correct procedures to preclude the spread of *Salmonella typhi*. He directed all excreta from this patient to be disinfected before being discharged into the sewer, that water from the Black River Bay not be used for drinking, and all other water be boiled before consumption. In his report, Sternberg stated that because of the scattered cases across the post, indicating a common source of infection, he doubted if Merriwether's disinfection orders were carried out quickly enough to preclude contamination of Black River Bay. The fact that 74 percent of cases were in enlisted men also indicated that they disregarded the order to boil their water. Furthermore, even though the sewer discharge pipe was only 500 feet from the drinking water intake well in the bay, he suspected—from talking with local physicians—that contamination may have originated from typhoid cases across the bay and cases in the village of Watertown some 10 miles upstream.<sup>50</sup>

The unexpected and hasty departure of Dr. B. Meade Bolton in early June left the bacteriology department at Hoagland without a chairman.<sup>51</sup> Wilson and a recent graduate of the Long Island College Hospital, then working as a pathologist at the Norwegian Hospital by the name of Richard Slee, applied for the position. Wilson got the job on a part-time basis. Slee, however, had spent a great deal of time as a student working in the lab and had taken the postgraduate course in bacteriology the previous year. He was eager to work with Sternberg and persuaded the director to accept him as a part-time unsalaried assistant. With staffing in place, Sternberg focused on obtaining new equipment, supplies, and sufficient laboratory animals for spring classes. He also submitted plans for the reorganization of the postgraduate course for medical students and a modified course for women at the Pratt Institute in Brooklyn. Women were introduced to bacteriology through an eight-week course, which included routine culture exercises, experimentation with animals, and instruction in photomicrography, an essential skill for any bacteriologist according to Sternberg. The tuition was \$30 and the women worked with nonpathogenic cultures. As the Pratt plan matured, Wilson felt it was appropriate to have a knowledgeable female chaperone for the Pratt students and suggested Mrs. Sternberg. She could take the course with the others because she already knew the basics having been her husband's assistant for 20 years.<sup>52</sup>

Sternberg agreed and Martha proved to be not only a valuable resource for Pratt students, but also an astute laboratory technician. One day while examining drinking water samples, she found what looked like the tubercle bacillus. She realized this was an odd finding, made several cultures, and determined it was probably a contaminant from the inoculating needle. But the puzzle left her unsettled, and she mentioned it to her husband. Sternberg was certain her find could not be the tubercle bacillus, but he accompanied her to the laboratory one afternoon and watched as she prepared another slide of her discovery. He agreed that it did resemble the mycobacterium, but “cautioned against mentioning it lest all Brooklyn be wild to think that the water supply was contaminated.”<sup>53</sup> The following day he determined that she had found a previously undescribed protozoa. She named the new organism after Cornelius Hoagland.<sup>54</sup>

All of these activities drew heavily on Sternberg’s time, but, along with Wilson and Slee, he pressed forward with smallpox research. In a calf shed built behind the laboratory specifically for this work, Wilson pursued investigations with calf antisera upon smallpox virus while Sternberg and Slee worked to improve immunization techniques. The potency of vaccine lymph dried upon points of ivory, bone, or quill was always questionable and frequently contaminated with bacteria. In 1891, Sydney M. Copeman, working in the Institute Pasteur, discovered that the addition of glycerol to the lymph slowly killed any contaminating bacteria, and the shelf life of the vaccine virus lengthened. After reading this development, Sternberg sent Slee to Paris to determine the value of the new method firsthand. The young assistant soon verified both of these sensational results, and together they devised a similar method of lymph preparation at Hoagland.<sup>55</sup>

In December 1892, Sternberg received the first of many compliments on his recently published *Manual of Bacteriology*. The first came from William Welch, and Dr. William Osler called it “magnificent.”<sup>56</sup> Walter Reed wrote from Headquarters, Department of Dakota in St. Paul, “I have your new work...How an Army medical officer, in the midst of daily routine work, could have written so excellent and so exhaustive a work, I can’t understand...it must always stand as a monument to your energy and ability.”<sup>57</sup> Colonel Charles Greenleaf wrote, “I rec’d yesterday from the publishers a copy of your great work on Bacteriology, and in congratulating you...wish to say that I am very proud of knowing as a friend the man who sheds such luster on our Corps & does so much for the advancement of our common interest.”<sup>58</sup> These last laudatory comments from Deputy Surgeon General Greenleaf appear rather insincere when compared with the admonishment he gave two years earlier to budding army surgeon William C. Borden concerning the leisure time Borden spent staring into a microscope. Greenleaf saw no value in it and caustically remarked, “Look at Sternberg, over there in New York, spending all his time with a microscope. Can you tell me one earthly bit of good Sternberg is to the Medical Corps?”<sup>59</sup> Perhaps the deputy surgeon general had experienced a scientific revelation in regard to medicine during the intervening months. It was fortuitous for him if he had because events were transpiring that would require him—at least officially—to acknowledge the bit of good Sternberg was to the corps and medical science as well.



## *Chapter Eleven*

# Surgeon General of the Army

June 1, 1893, the day Surgeon General Charles Sutherland would retire, was prominently marked on many senior army physician calendars. Mrs. Sternberg coyly commented that she and her husband had “heard of the prospective retirement” of Sutherland,<sup>1</sup> and her husband “had learned that other officers of the Corps, junior to him, had forwarded papers and stated reasons for their selection for the office. He therefore submitted his own testimonials and presented his claims....”<sup>2</sup> Sutherland’s retirement was not prospective; it was mandatory based on his age. Many medical corps officers prepared their resumes and selected patrons from the political and business worlds who could bring the greatest influence on their nominations. The winner would become a brigadier general with a secure job until he retired for age at 64 years or died. This procedure, although not condoned, was tolerated by the War Department. Although Sternberg had never been a Washington insider, his reputation as a soldier, physician, and internationally renowned scientist had made him a well-known and respected figure in the nation’s capital, New York, Philadelphia, and Baltimore. He had a politically and militarily powerful circle of friends and colleagues and was not timid to ask for their help. In early 1893, he had no difficulty rallying his supporters once again. Several of them, such as Dr. Samuel B. Ward of Albany, wrote directly to the president-elect, Grover Cleveland. Ward, a close friend and confidante of Cleveland’s, reminded him of Sternberg’s yellow fever investigations during the president’s first term; Cleveland was surprised and gratified that Sternberg had returned about half of his expense appropriation, and he spent most of the night reading the final report.<sup>3</sup>

If Mrs. Sternberg’s recollection is rather disingenuous, the opinion of historian Mary Gillett that “After years of bitter political infighting, during which he had learned how to manipulate legislators and politicians to his own advantage, Sternberg succeeded Sutherland....” is closer to the truth.<sup>4</sup> More accurately, officers contending for the job attempted to secure advantage for a political appointment that became more time critical with each passing surgeon general. It was a cutthroat

game, and Sternberg knew the rules well, the first of which was he who hesitates is lost. He also understood that if he wanted to be surgeon general—and he did—then he would have to outmaneuver a senior, contemporary, and at least one junior officer with powerful connections, Major John Shaw Billings. Sternberg perceived Billings to be his most potent political opponent in this contest and wasted no time in going for the major's jugular. From his Whitehall Street office in New York, he wrote a letter to the Honorable Don M. Dickinson, an influential man on the National Democratic Committee and long-time advisor to Cleveland, which must be quoted at length to fully understand Sternberg's motives:

"My Dear Sir:

"I venture to trespass upon your valuable time...in the belief that you will not be unwilling to give me some advice and assistance with reference to a matter which is of very great importance to me personally.

"I have reliable information that a determined effort will be made by the friends of Major John S. Billings, Surgeon, USA to influence Mr. Cleveland to appoint him Surgeon General of the Army...The effort will be especially made by some medical gentlemen in Philadelphia, who have influence with Mr. Harrity, late Chairman of the National Committee. No doubt also through other channels.

"A similar effort has been made by Dr. Billings's friends whenever a vacancy has occurred during the past ten or twelve years, notwithstanding the fact that he is 24 files from the head of the list. When Surgeon General Moore was retired, three years ago, a strong effort was made by his friends to induce Mr. Harrison to appoint him....

"Dr. Billings has very influential friends owing to the fact that he has been stationed in Washington for the past 25 years, and in his position as Librarian in charge of the library of the Surgeon General's Office he has been able to place many physicians under supposed personal obligations to him by the loan of books and the presentation of Government publications edited by him.

"In self defense I feel called upon to make an effort to prevent the success of this scheme to make one of my juniors...Surgeon General. Dr. Billings is 12 files below me in lineal rank and his appointment would prevent me from ever becoming chief of the corps which I have belonged for 32 years.

"I enclose herewith a document setting forth the principal facts relating to my services as a medical officer of the Army, and my claims for consideration if the President sees fit to make this appointment from among those who have some years to serve, instead of being controlled by seniority alone...there is a general feeling in the corps that President Cleveland will follow the precedent established by himself and will prefer to select someone who has several years to serve. As a result of this feeling there will no doubt be several candidates among the senior medical officers of the Army. It is not my intention to urge my claims as against any one of these, but I shall respectfully present my own claims as against any of my juniors in service.

"Knowing your intimate relations with the President I venture to ask your advice and assistance, and shall take an early opportunity of calling upon you...in New York."<sup>5</sup>

Whether Sternberg made the visit or not is unknown, but his letter was quickly passed on to Daniel S. Lamont, Cleveland's personal secretary and soon-to-be Secretary of War.<sup>6</sup>

In the following weeks, Sternberg also apprised General John M. Schofield of the impertinence of junior officers seeking the surgeon general's office: "I am informed...the friends of at least two medical officers...who are junior to myself will urge their appointment as Surgeon General...I shall respectfully present my

claims...against those of my juniors...The endorsement which you put upon my papers...at that time, was so favorable to this claim & so gratifying to me...that I can not [sic] ask you for anything more. I know...you have consistently favored promotion by seniority & I shall not ask you or any one else to favor my promotion to the prejudice of my seniors. But if the President decides...the interests of the service call for the appointment of some one who has several years to serve, and you are consulted with reference to the matter, I trust...you will feel justified in adhering to the opinion expressed in your endorsement referred to...and will advocate my claims as against any one of my juniors.”<sup>7</sup> On May 16, Sternberg felt confident—or perhaps desperate—enough to write the president personally. Included in a detailed transcript of his service record was the following note: “I do not wish to be considered an applicant for the position to the prejudice of my seniors...But if in your judgment the interests of the service call for appointment of a medical officer who has several years to serve before retirement, I most respectfully ask that my claim receive due consideration.”<sup>8</sup>

On May 29, the president selected Sternberg. Sternberg was in his Whitehall Street office when the telegram arrived. He rushed off to share the news with Mrs. Sternberg. Finding their home empty, he rushed to Hoagland Laboratory, where he found her hunkered over a microscope. “Put up your microscope, my dear,” he directed excitedly, “for I have something to tell you that will cause you to be happy.”<sup>9</sup> She smiled at him and held up a telegram that contained the same news. Fully aware of Sternberg’s daily involvement at Hoagland, the government had taken no chances that the notification would not be received in a timely fashion. Sternberg remained quiet and introspective on their way home, but once alone inside he looked gravely at his wife and said, “I do not know whether I am happy or not. I face great responsibilities and it is not an easy matter to satisfy everybody, and when I make one man happy by recognizing his ability there will be many others disappointed and disgruntled, so I scarcely know if I am to be congratulated or not. But I know the Medical Corps and am proud of the Corps. I have no family and I shall consider the medical officers my family and will give every man a chance. I shall endeavor to promote a truly scientific spirit in the Corps and where I recognize special ability, I will do all I can to aid the respective officer to achieve success.”<sup>10</sup> Sternberg departed immediately for Washington to report to the Secretary of War and begin his new duties.<sup>11</sup>

There was no hyperbole in Sternberg’s comment concerning the responsibilities and attendant difficulties he was about to assume. Should he ever forget why he was chosen he only needed to refer to the congratulatory letters from colleagues that began to arrive on May 30. Dr. William H. Welch wrote: “I consider that you deserve the great honor which has come to you and that the medical department of the army is to be congratulated. I am sure that you will be interested in keeping a high standard of efficiency in all respects and especially will not let the scientific side suffer.”<sup>12</sup> Dr. Hermann Biggs remarked: “You are to be congratulated...not so much on the promotion, as that was deserved, but on the fact that your ability and scientific work have received the recognition they merit. I was delighted to hear

of the appointment and the only regret associated with it is the fact that it takes you away from New York..."<sup>13</sup> Dr. Stephen Smith penned: "I must congratulate you somewhat, the Medical Department of the Army more, and the great sanitary interests of the country most, on your accession to the Surgeon-Generalship. Your appointment is the best act yet performed by the President and deserves...the hearty commendations of medical men the world over. I am glad to see that you have a decade of service—a period which will enable you to effect great reforms not only in your Department, but in the organization of a National Sanitary Service."<sup>14</sup> Dr. John M. Da Costa of Philadelphia commented, "...I only hope your new post will not interfere with the admirable scientific work for which we are all indebted to you."<sup>15</sup> Doctors William Osler, Victor Vaughn, William Jenkins, A. N. Bell, T. Mitchell Prudden, and Walter Wyman also sent congratulatory notes.<sup>16</sup>

Army Medical Department officers and enlisted men also demonstrated their gratification. Letters and telegrams arrived from officers, notably retired Surgeon General William A. Hammond and General Schofield, and hospital stewards he had served with in the Civil War, at Forts Harker, Riley, Barrancas, and Mason, and Governors Island. Captain Walter Reed wrote from the Department of Dakota in St. Paul: "I cannot refrain from writing just a line to express my gratification over the President's handsome tribute to honest merit. When I think...it places at the head of the Corps the one man who preeminently stands forth as the representative of progressive scientific medicine...means...the fossil age has passed...I know what pleasure it will give to Professor Welch, Dr. Abbott and Dr. Councilman, all of whom have so many times spoken of your untiring energy and ability. I shall always remember Dr. Abbott's remark, made to me on one occasion, when he said, 'All that I am and know concerning bacteriology, I owe to...Dr. Sternberg.' Having no favors to ask...I can all the more sincerely congratulate you."<sup>17</sup> Sternberg had been selected not only because of personal military and scientific achievement, but also because he was—as Reed so eloquently pointed out—the uniformed American personification of the new era of progressive, scientific medicine. The fact that he was elevated over 10 senior officers only highlighted this point, and it was not missed by medical and lay periodicals across the country. The editor of the *Denver Medical Times* wrote "...red-tape and precedence were alike disregarded, and the honor conferred upon the man most eminently fitted for the position by his work and capabilities."<sup>18</sup> *The New York Times* commented the president had "...selected an officer standing many numbers on the Register below that of the grade of the incumbent, and one who will not retire by age about the time he has become familiar with the affairs of the corps and knows its needs."<sup>19</sup>

Sternberg's selection was something of a shock to many more traditionally minded officers and physicians around the country, as had been that of Dr. James Rufus Tryon—jumped over 14 senior officers—to succeed John M. Browne as Surgeon General of the Navy three weeks earlier. The editor of the *Journal of the American Medical Association*, Dr. J. C. Culbertson, while not daring to slander Sternberg or Tryon, lamented that these passed-over officers had been "practically court-martialled and reduced in rank and without the semblance of cause or



justification.”<sup>20</sup> But neither selection could have been surprising to astute observers of the new president. Cleveland began his first term in March 1885 with a mandate to improve government efficiency and productivity through administrative reform. In 1893, he began his second term still determined to “do what is right” for the Democrats and the nation.<sup>21</sup> For the medical bureaus of the navy and army, that meant installing leadership that had experience with the line, was medically competent and progressive, and young enough to provide long-term departmental stability. Dr. Ward and long-time friend and personal physician Joseph Bryant probably played a significant role in guiding Cleveland to pick Tryon and Sternberg. Both were relatively young, 56 and 55, respectively, with many years of experience with the line, and they clearly recognized the need and potential for professional growth in their medical departments.

Sternberg had the support of the current administration in Washington and the national medical community at large, but to modernize army medicine and prepare it for war and the century ahead would require the support of those who had been his seniors for the past 32 years. While long-time friend and retired army surgeon, Blencoe E. Fryer, commented, “I would not reflect on the older men in any way, ...they have lost interest in professional matters, & if the Medical Department is to keep up with progress, there must be a progressive man in the lead,” the support Sternberg was eager to secure came in a letter from one of those passed over.<sup>22</sup> Lieutenant Colonel Joseph C. Bailey, then at army headquarters in San Antonio, Texas, remarked: “No one will congratulate you more cheerily than I do. I have no heart-burnings...and am more pleased with the appointment, for the good of the Corps and the Service as well as for your sake. I was only drawn into the contest at a late date by the stories to my detriment which were being circulated apparently in the interest of Greenleaf. I shall with many others rejoice when the office is rid of him and, with him, the Baxter methods. The Corps is being divided pretty much as Baxter did. I have no fear, however, of your being led around by a string as your poor, weak old predecessor was.”<sup>23</sup>

Sternberg took the helm of the Medical Department at a transitional moment for the military and medical professions in the United States. Since the Civil War, practical and theoretical advancements in science and technology had loosened the stifling shackles of Jacksonian philosophy on professional development. No longer considered an elitist, the well-educated professional was becoming the foundation of a modern, progressive society. In the army before 1865, a West Point education was considered wholly adequate for a career officer. But the postwar years included changes in military technology, organization, and tactics, which demanded expertise beyond that obtained at the academy. Army Commanding General William T. Sherman (1869–1883) perceived this need for postgraduate education and training, and for the recognition of army officers as professionals in the same sense as physicians, lawyers, engineers, and the clergy. Sherman also advocated many army reforms that included the establishment of a general staff, an infantry regiment organization conducive to expansion in wartime, and examinations for promotion and lineal promotions. These reforms proved too radical for

the era and were declined by Congress, but Sherman did establish the School of Application for the Infantry and Cavalry at Fort Leavenworth, Kansas, in 1881.<sup>24</sup>

In medicine, Harvard Medical School led this reform movement by instituting a compulsory three-year graded curriculum in 1871. By 1889, 25 percent of American medical schools had followed suit. The establishment of standards for medical education began when 22 schools voluntarily formed the American Medical College Association in 1876. Licensing laws were also reenacted, which required candidates for medical licensure to have diplomas from colleges that met minimum entrance, term length, and length of course requirements. In 1893, the Johns Hopkins University Medical Department was the first school to require a baccalaureate degree. These educational standards were accompanied and stimulated by medical technological advances even more impressive than those of the military. Bacteriology was clarifying the specific nature of infectious diseases, and immunology was promising therapy for the same. Aseptic techniques in conjunction with anesthesia were expanding surgical treatment with better outcomes. Instruments, such as the stethoscope, ophthalmoscope, otoscope, and thermometer were gaining acceptance in routine diagnosis.<sup>25</sup>

This professional growth also directly affected military medicine. By the late 1880s, reports to the surgeon general from medical officers at relatively isolated posts reflected a working knowledge of modern medical science and its relationship to military service. These officers also had the responsibility for the continuing education of a new medical soldier, the hospital corpsman. Established by Congress in March 1887, the Hospital Corps of the Army replaced a small cadre of hospital stewards and a haphazard collection of enlisted medical attendants with a body of physically and mentally qualified and trained hospital stewards, acting hospital stewards, and privates. In 1891, Nicolas Senn, a leading Chicago surgeon, teacher, and researcher, and Surgeon General of the Wisconsin National Guard, recognized the need for a professional corps of National Guard physicians who were also competent military surgeons and proficient military officers. He created the Association of Military Surgeons of the National Guard in September. By 1893, the association was admitting Regular Army and Navy surgeons to its rolls and had changed its name to the Association of Military Surgeons of the United States (AMSUS).<sup>26</sup>

However, the transition that Sternberg and the army encountered in 1893 had a broader scope than professionalism. The conclusion of the Indian Wars, in December 1890, had generated a reduction in posts, 164 to 102 by 1893, and a consolidation of units and their support elements. Congressional appropriations for the army and the Medical Department declined after 1891, and with the nation sliding rapidly into a severe economic depression, were unlikely to increase.<sup>27</sup> Sternberg's budget for fiscal year (FY) 1894, \$416,500, and his personnel, 192 officers and 786 corpsmen, could maintain the Medical Department status quo, but they would be hard pressed to create the department the surgeon general envisioned.<sup>28</sup> For Sternberg it was imperative to have sufficient numbers of medical officers and corpsman whose military and medical education were current and

to have every hospital be state-of-the-art. If this could not be obtained in peacetime, then the Medical Department could never successfully deploy to war. Over the next five years, Sternberg used determination, patience, frugality, and political suasion to achieve a thoroughly competent, modernized department prepared for any medical contingency.

His first act as surgeon general, on June 24, was to establish an Army Medical School. It immediately established one of the themes of his administration—military medical preparedness through education and training—and was an idea that had not seen the light of day since Secretary of War Edwin Stanton quashed Surgeon General William A. Hammond's plans for an army postgraduate medical school in 1863. Sternberg recognized the intellectual atmosphere in medicine, and the army was primed and ready to support the creation of an army graduate school of medicine in 1893. Moreover, he had no personal or political enemies to stand in the way of his academic dreams for the Medical Corps. But, like Hammond, he had precious little funding and was obliged to create the school from existing resources. He recreated Hammond's model almost precisely. Classrooms and laboratories were created in available space at the Army Medical Museum. The faculty was selected from medical officers stationed in Washington, and the four-month course of instruction, beginning November 1 of each year, focused on the duties of medical officers, military surgery, medicine, and hygiene. He added courses in sanitary microscopy, pathological histology, bacteriology, and urinology to this curriculum. Sternberg selected Colonel Charles H. Alden as president of the faculty and lecturer on the duties of medical officers; Lieutenant Colonel William H. Forwood, professor of military surgery; Major John Shaw Billings, professor of military hygiene; Major Charles Smart, professor of military medicine and director of the chemical laboratory; Captain Julian M. Cabell, assistant to Forwood and instructor in Hospital Corps drill; and Captain Walter Reed, professor of clinical and sanitary microscopy and director of the pathological laboratory.<sup>29</sup>

To some extent it was a foregone conclusion that if Sternberg wanted a trained military microscopist in this last position immediately, Reed would be the man. The only course of instruction practically available to military officers was William Welch's at Johns Hopkins, and at this date Reed was the only military medical officer to have completed the training. He discussed Reed's qualifications with Billings, Welch, and others—most likely William T. Councilman, Alexander Abbott, Simon Flexner, and William Halsted—in Welch's laboratory. They provided glowing reports of Reed's aptitude, enthusiasm, and energy for bacteriology and scientific medicine, as well as his genial personality, integrity, and sense of humor. In early July Sternberg wired the following to Reed: "The favorable account I have received of your acquirements and scientific zeal...leads me to anticipate for you a successful career in the new field of duty to which you have been called."<sup>30</sup> Intelligent, competent, articulate, and aggressive, Reed was hungry for the work, experience, and mentoring the surgeon general had to offer. He was exactly the type of man Sternberg wanted for a role that—as surgeon general—he could no longer fill himself. In the coming months and years, Reed would become

Sternberg's protégé in laboratory research and his right arm in disease outbreak investigation in the field.

Sternberg was very clear about the purpose of the school in a note sent to the Secretary of War: "There is no need to teach medicine and surgery to graduates of our medical colleges, but there are certain duties of an army medical officer—which the college course has not prepared them—which are more important than the clinical treatment of individual cases of disease and injury....A special education is needful to prepare a military man to undertake the protection of the public health. The course at the army medical school will prepare him to cope with the questions of practical sanitation that will be presented to him at every turn in his military career."<sup>31</sup> Sternberg considered preventive medicine and public health the foundation for military medical practice, and teaching these principles was the primary function of the school. He also sought to prepare them for their roles as military officers and modern physicians. If medical officers were to be effective in garrison and on the battlefield, then it was imperative that they learn to function and communicate in a military framework. Sternberg expected several of these students to rise to command hospitals in the future where success depended on a thorough understanding of hospital administration, logistics, and military law. Furthermore, the modern medical officer had a responsibility to maintain educational currency, pursue practical research at every opportunity, and share his results with his colleagues.<sup>32</sup>

Stimulating a modern professional commitment to lifelong learning among young medical officers, however, would only begin with classroom and laboratory instruction and mentorship. Its realization would depend on a continuing example from the school and robust support from the Surgeon General's Office. The Medical Museum Laboratory was enlarged and modernized, not only for the benefit of the students, but also to expand its mission to include modern investigative research that would be conducted primarily by Reed and his assistant, Dr. James Carroll. Officers preparing for promotion examinations were posted to stations in or near larger cities where they could take advantage of the advanced clinical and laboratory training available in civilian hospitals, and the most recent texts and literature from the Surgeon General's Library continued to be available to officers engaged in literary research by express mail.<sup>33</sup>

The long hours Sternberg once spent in a laboratory were now spent at his Washington desk or on the road to some distant army post. No task was too mundane or routine for his attention or interest. Although cautioned by friends to let his staff attend to minute details, he felt a keen personal responsibility for every transaction completed and every decision issued from his office. He was also eager to reward intelligent, enthusiastic officers, particularly those in the junior ranks, for exceptional merit. He remained constantly vigilant for outstanding performers, but as Colonel Edward L. Munson recalled, he did not play favorites. Sternberg "leaned backward in his effort not to be influenced by personal preference" and therefore, "had neither friends to reward nor enemies to punish" at the end of the day.<sup>34</sup> The new surgeon general was a man with a vision and a gentleman. He also had

another indispensable quality to a man in his position: the ability to attract bright, able men to him and draw forth their best efforts. Captains Walter Reed, William C. Borden, and Leonard Wood were the first in a long line of medical officers to experience Sternberg's charisma and benefit from his personal interest.

In September 1893, the Pan-American Medical Congress met in Washington with a full agenda. Congress members discussed questions of military medicine and surgery and progress in treating camp diseases and gunshot wounds, debated methods for lifesaving care and evacuation, and compared the effects of new firearms with older, lower velocity weapons. As executive president for the section on military medicine and surgery, Sternberg found it a bully pulpit. These issues, he sagely commented, were of tremendous interest even though "...peace prevails everywhere in the new world...a most friendly feeling exists among North and South America; and...the modern way of settling disputes between nations is by arbitration rather than by resort to arms. But so long as armies exist and deadly weapons are manufactured it will be the duty of the military surgeon to be prepared to render efficient aid to those who fall in battle, and to give the victims of those 'camp diseases' which sap the strength of armies the benefit of the most efficacious treatment."<sup>35</sup> Sternberg emphasized this last duty, sanitary supervision of the command, was overall a larger responsibility than combat trauma management for the regimental medical officer for "...without a doubt, most of the sickness which prevails among soldiers, and especially among new levies of troops, is due to insanitary conditions, and is preventable to a greater or lesser extent according to circumstances."<sup>36</sup> But his main topic was in the realm of combat trauma management, particularly traumatic infections. He predicted in the next conflict, longer range and higher velocity small arms munitions would create a larger ratio of wounded to killed, and first aid rendered by trained hospital corpsmen with immediate evacuation to field hospitals would decrease battlefield mortality. He also cautioned surgeons not to reverse this trend toward increased survivability. In the next war, military surgeons would have to determine to what extent the large mortality from traumatic infections could be prevented by antiseptic methods of treatment. Sternberg reviewed the current knowledge of hospital gangrene, erysipelas, septicemia, and tetanus. These infections, he stated, "...have no longer the terror for us that they had for our predecessors, for the etiology of these traumatic infectious diseases had been elucidated by researches made during the past fifteen years and...the proper measures of prevention are apparent and are systematically applied whenever this is practicable."<sup>37</sup> He considered these measures wholly practicable in a field setting and in the future "there will be no excuse for the occurrence of septicemia after amputations, or for the appearance of erysipelas or hospital gangrene in wounds made by the knife of the surgeon. But how far it may be practicable to prevent such complications in gunshot fractures remains to be seen..."<sup>38</sup>

Although anesthesia and aseptic techniques had allowed surgeons to be more aggressive salvaging limbs and treating penetrating trauma over the past decade, combat variables such as the number and severity of casualties coming from the firing line, availability of secure evacuation to a fixed hospital, and fluidity of the

battle would challenge the surgeon's decision to operate. As surgical textbooks contained no answers and no past experience in the American army existed on which to act, Sternberg concluded his remarks by stating he hoped those gathered would bring their collective wisdom to bear on the issue and arrive at some workable solutions. Science was irrevocably changing medicine as well as the battlefield. Therefore, it was imperative upon the Medical Department to embrace these changes aggressively with its collective talent.<sup>39</sup>

It was a bold challenge, but without a current conflict generating wounded, military surgeons had no clinical material upon which to practice and assess advances in acute trauma care and evacuation. In the civilian medical community, however, experience in trauma management was growing and a few surgeons had demonstrated the advantages of the exploratory laparotomy in cases of visceral perforation when performed by a skilled surgeon, but they also recognized lethal disadvantages when performed by inexperienced or unprepared hands. Both Senn and Sternberg were confident that AMSUS, through annual meetings and published transactions, would be a valuable forum for disseminating new knowledge and techniques.<sup>40</sup>

The 4th annual AMSUS meeting was held in Washington, DC, in early May 1894. Sternberg was elected president, replacing Senn who had served since the organization's inception. The new president was apprehensive that his army duties would preclude him from giving the association the attention it was due. But, if the papers presented are any indication, he took over a very enthusiastic, robust, and self-sustaining 213-member association that was fulfilling the majority of Senn's expectations. Senn's presidential address, "Abdominal Surgery on the Battlefield," at the May meeting was followed by presentations on various methods of evacuation, hospitals, encampments, diet, physical training, antiseptic surgery, weaponry, penetrating wounds of the abdomen and extremities, medical records, and hygienic conditions of enlisted men.<sup>41</sup>

Officers at this and subsequent meetings were tremendously concerned about the organization, equipment, instruction, and fieldwork of the Hospital Corps. Although a vast organizational improvement, the corps was initially regarded with disdain by the line and strong skepticism by medical officers. The improved training system in 1891, a pay increase from \$13 to \$18 per month the following year, and a competitive oral and written examination for promotion ameliorated these feelings somewhat by attracting a better quality enlistee and reducing the post surgeon's burden of training. But determining the appropriate skill sets for corpsmen without a defined doctrine of how these soldiers were to be employed, especially in wartime, was difficult. With Sternberg's prediction that casualty care had been substantially altered by technological advancements in surgery and weaponry ringing in their ears, medical officers reviewed battlefield care methodologies of foreign armies for a doctrinal template and the standing Hospital Corps curriculum. From their discussions over the next 3 years, the modern combat medic began to evolve.<sup>42</sup>

Although Sternberg was—by and large—satisfied with the progress and direction of the Hospital Corps, his concern over its declining numbers—20 lost in FY 1893

and another 19 by the end of FY 1894—and operational expenses motivated him to shift the geographical focus of the corps. Originally, instructional companies had been located in the west to accommodate the Indian fighting army. Hospital Corps recruits, a large percentage of which came from eastern cities, had to be sent west for training and then brought back to assignments along the Atlantic seaboard. To reduce transportation costs, the surgeon general began transitioning the instructional company at Fort D. A. Russell to Washington Barracks in the fall of 1893. Consolidating training assets at two locations allowed for better standardization of training. It also provided a pool of corpsmen for emergency deployment—such as to Chicago during the Pullman strike riots—and allowed corpsmen and medical officers to train together at the Army Medical School.<sup>43</sup>

The economic crisis, which deepened in 1894, put Congress in a cost-cutting mood, and the military establishment was a prime candidate for fiscal surgeons. Sternberg prepared for the inevitable battle on Capitol Hill that would determine whether his plans for the Medical Department would come to fruition or be eliminated as excess. The House Appropriations Committee's cost-saving actions affected the entire War Department, but the proposed cuts dealt the Army Medical Department a double blow: a 12 percent reduction—a loss of 15 positions—in assistant surgeons and a repeal of the option to hire contract surgeons. Since its reorganization in 1869, the Medical Department had been reduced from 150 assistant surgeons and 184 contract—or acting assistant—surgeons to serve 210 military installations and numerous detachments requiring medical support to 125 assistant and 22 contract surgeons to support 120 posts in 1893. For a generation, Congress had based medical officer appropriations on the number of existing military installations while ignoring the medical demands of detachments away from those posts. Therein lie the frustrations of Sternberg and his predecessors.<sup>44</sup>

The Medical Department had never fielded a full contingent of regular medical officers to all army commands and far-flung outposts. Contract surgeons—even without formal military training—had filled in, more or less admirably, ensuring medical care was available for soldiers and dependents alike; malingerers were weeded out; post sanitation was attended to; the hospital staff was disciplined and drilled; and the physical plant was appropriately managed. Congressional lawmakers considered these important ancillary garrison duties as purely incidental in their drive to save a dollar. They had become convinced that an annual savings in salaries of 20 percent to 25 percent could be achieved if medical services were obtained on a per visit basis. While Sternberg granted that in the past year private physicians had provided medical services at a savings to the smaller arsenals, he was horrified that the committee entertained the idea that private physicians could be employed at most garrisons for less than the salary of an assistant surgeon, which was \$133.33 per month. Moreover, he argued, the “principal reason for supporting an army in time of peace is that an efficient organization may be maintained...ready for service in any emergency and serve as a nucleus for the larger army...in case of war. This applies to the Medical Department as well as to the fighting force. The duty of our medical officers is not only to attend to the sick

at their stations; acting at the same time as health officers for the command, but to be prepared, and to prepare their hospital corps detachments, for any emergency, and especially for field service."<sup>45</sup> This view was heartily endorsed in writing by Commanding General Schofield and Generals Oliver O. Howard, Nelson A. Miles, John R. Brooke, Alexander McCook, and Frank Wheaton, virtually all of the Army Department commanders. The debate raged for the entire congressional session, and by July 1894 Sternberg's arguments saved 20 assistant surgeon positions, but made no impact on the loss of contract surgeons. Private physicians would now attend to army personnel and be paid by the government per visit. More devastating to the officers was that pay, allowances, and retirement income were reduced and promotions became even slower.<sup>46</sup>

Sternberg was no stranger to the parsimonious and sometimes quixotic nature of Congress. He had survived it before and was determined it would not interfere with his objectives for the department. Congress had not reduced the Hospital Corps' strength, and officer reductions were allowed to occur through attrition. However, without new accessions, there would not be an 1894–1895 session at the Army Medical School. The first academic session went extremely well. A total of nine students—five newly commissioned assistant surgeons who had been approved by the examining board and four older assistant surgeons—had attended. In addition to the lectures and laboratories given by the regular faculty, ancillary lectures were presented on military law, comparative anatomy, medical jurisprudence, military surgery, and parasitology. Even with his full schedule, Sternberg managed to deliver nine bacteriological lectures. Graduation ceremonies occurred in the afternoon of February 28, 1894, and were highlighted by addresses from Schofield and Dr. William Osler.<sup>47</sup>

Sternberg was tremendously pleased with the success of the school and with the performance of Walter Reed. Promoted to major in early December, Reed had easily taken on the mantle of professor and curator of the medical museum when more critical duties took Billings away from that post. In January 1894, his epidemiological acumen became evident when he investigated a small yellow fever outbreak at Fort Jefferson in Key West, Florida. Upon his return, Sternberg directed him to begin researching the disinfectant value of cresols, which were safer alternative agents to bichloride of mercury and carbolic acid that had come into vogue in Germany. Reed had quickly proved he was a man for all scientific seasons. A close professional and personal relationship soon developed between the two men. Although Reed eagerly absorbed the knowledge and experience of his mentor, the relationship was not unidirectional by any means. Sternberg found in Reed something he had never experienced: a uniformed junior colleague with the inquisitiveness, energy, and mental agility to keep pace with his own medical and scientific plans and aspirations; a scientist he could trust, in the laboratory or field, to be an extension of his own thoughts and actions; and a sounding board for new ideas, but one that reverberated with its own original thoughts. By keeping his chief connected to academia and laboratory bench science, Reed provided a refuge from the stresses incumbent upon the office of surgeon general where



Sternberg could relax among culture plates and reagents, and ponder the science he loved so much.<sup>48</sup>

As he pressed home his vision for improvements in the Medical Department and contended with budget restraints, Sternberg received a call from an old friend in New York City, Dr. Joseph Bryant, a highly skilled surgeon and Cleveland's personal physician. Cleveland, whose health was generally robust for a man so large, had not recovered completely from oral surgery that Bryant performed. The obligation of routinely—let alone emergently—attending to the president from New York was becoming too difficult for Bryant. He asked Sternberg—apparently with Cleveland's approval—to assume this task. Given the opportunity to render service to a man who had supported him in his yellow fever research and his bid to become surgeon general, Sternberg became not only a trusted medical advisor to the president, First Lady, and their family, but also a close friend who had a great deal in common with the chief executive. Both were ministers' sons who enjoyed the outdoors, particularly fishing, and both had a deep fondness for their native upstate New York.<sup>49</sup>

Sternberg's position in medicine, the army, and the inner circles of the government, the overwhelming drive of his multiple interests, compulsive activism, and unrelenting dedication to serve both the local and national communities in which he lived kept him so engaged that one wonders when he found time to exchange pleasantries with Martha. He was an active member of three national medical organizations—the American Medical Association (AMA), American Public Health Association, and AMSUS—and belonged to the Biological, Anthropological, and Philosophical Societies in Washington. All of these organizations sought his leadership and opinions in their governance, at annual meetings, and in their journals. There was barely enough time in the day for him to accomplish all he was obliged to and engage in those projects he wished to pursue. Frugal time management was the key to leading the Medical Department while remaining in the vanguard of American science, and Sternberg demonstrated a phenomenal ability—by nature and nurture from his grandfather Miller—to use every minute to its fullest. Moreover, he was one of those fortunate individuals whose pleasures in life harmonized completely with work, duties, and responsibilities. In the *North American Review*, he advocated once again for the creation of a National Health Bureau; at George Washington University Medical School, he preached against the shoddy grammar and diction of medical school candidates; and in Washington, he assisted materially with the establishment of a new public library. In his free moments, Sternberg concentrated on another first for American medical literature, a textbook of immunology. As with *Malaria and Malarial Diseases* and *A Manual of Bacteriology*, he wrote *Immunity, Protective Inoculations in Infectious Diseases, and Serum-Therapy* for both the clinician and medical researcher.<sup>50</sup>

In January 1895, smallpox flared up in Washington. While the Medical Society of the District of Columbia urged public vaccination, Sternberg saw an opportunity to resume research—with Reed's assistance—into smallpox serum therapy he had to shelve two years earlier. At that time, Sternberg was convinced cowpox and horsepox were genetically related to smallpox, so closely related that cowpox was

the bovine manifestation of human smallpox. Since immune calf serum neutralized vaccinia virus, thereby precluding the development of the characteristic vaccine vesicle in calves, it should do the same thing in unvaccinated humans or in those ill with smallpox. Sternberg tested his hypothesis on children in two Brooklyn orphanages by injecting subcutaneously from one to five cubic centimeters of calf serum at the time of vaccination. His results, like those of other researchers in Europe at the time and afterward, were negative. He remained convinced the theory was correct and suggested to Reed that experiments be conducted to test the curative effects of immune calf serum in smallpox cases. Before Reed could initiate this work, Dr. Joseph J. Kinyoun of the U.S. Marine Hospital Service published the results he and Dr. Lewellyn Elliot obtained testing this very hypothesis on two patients in the smallpox hospital in Washington. The first patient had begun to develop hemorrhagic smallpox, a form of the disease that is nearly 100 percent fatal, before the injections could be initiated and died after receiving 60 milliliters of serum. The second patient presented with a standard case of smallpox. He received a total of 105 milliliters of serum with some good effect, and Elliot noted the disease had been shortened.<sup>51</sup>

Although Sternberg left no opinion of Kinyoun's methods published on January 18, it is evident that he was less than impressed with the results, given that the test population was only two and both patients did not present for treatment until heralding eruptions had begun. However, one died and in the other the injections provoked only a modest change in the disease course. Sternberg still had faith in the hypothesis, but apparently some unknown variable, or variables, had yet to be elucidated. Whether this or some other factor gave him pause can only be speculated, but he decided further human experimentation was too risky to pursue. Fortunately, a reasonable alternative candidate for experimentation, one closer to the human species than the cow and susceptible to vaccination with vaccinia, had been found in the Rhesus monkey. Sternberg quickly redirected Reed to pursue the same research using Rhesus and American primates as test subjects. For the next five months, Reed injected immune and nonimmune Rhesus, Cebus, and Cercopithecus monkeys with immune calf and monkey sera. He verified Sternberg's original results that vaccinated calf serum does contain a substance that destroys vaccine virus—as did immune monkey serum—but he also found the amount of this substance in calf serum was exceedingly small and, therefore, the amount of serum required for treatment of human smallpox was too large to be practical.<sup>52</sup>

Progress in the treatment of infectious diseases would remain slow and tedious, yet not so in the realm of surgery. Advancements in surgical science, such as those commented on by Sternberg at the Pan American Congress, were making surgery a practical therapeutic tool not only on the battlefield, but also in routine practice. After Captain William C. Borden demonstrated in 1894 the advantage of hernia repair in returning disabled soldiers to duty, and thereby reducing army disability payments, the surgeon general designated the newly opened Washington Barracks hospital a center for curable disabilities. Moreover, Sternberg told post surgeons to “set aside in their hospitals a special room as an operating room, or when

necessary to submit estimates for the construction of such a room.<sup>53</sup> This was the beginning of a comprehensive hospital renovation and construction project for which the surgeon general secured funds over the next three years. New hospitals with modern operating rooms and clinical laboratories were erected at Fort Myer, Virginia; Fort McHenry, Maryland; Plattsburg Barracks, New York; Fort Meade, South Dakota; and Fort Harris, Montana in 1895; and at Fort Logan H. Roots, Arkansas, the following year. In 1896, x-ray machines began to be installed in larger facilities. By June 1898, 19 hospitals had been upgraded and Forts Hamilton and Wadsworth, New York; Fort Hancock, New Jersey; Fort Monroe, Virginia; and Fort Spokane, Washington, had new hospitals.<sup>54</sup>

Sternberg made his last comments on vaccinia virus immunity to the attendees of the AMA meeting in Atlanta in the spring of 1896. In his whirlwind tour of the most current immunological knowledge, he still endorsed the erroneous belief that cowpox, horsepox, and smallpox were manifestations of the same disease in different animals. He was closer to the mark in some of his other conclusions concerning variola, vaccinia, and the immune response to them. He assured the audience that both of these agents were definitely not bacteria, but were in a class of microbes all their own. Sternberg speculated from previous researches that the substance in the blood of the immune animal acted as a germicide, rather than as an antitoxin, to destroy the virulence of variola. He also noted a number of the inflammatory complications attendant to vaccination resulted from secondary infection by microbial flora common to the skin, which, he contended, could be eliminated by abandoning the scarification method of vaccination in favor of subcutaneous injections of glycerinated vaccine lymph.<sup>55</sup>

Retrospectively, the efforts of Sternberg, Reed, and their civilian colleagues to advance the frontiers of medical science in the waning years of the 19th century are regarded as critical achievements in modern medical progress. Contemporaneously, they were not always so defined. While segments of the public remained skeptical of the new medical science as they continued to suffer through smallpox, typhoid fever, and diphtheria epidemics, others were actively antagonistic to the experimental methods used to obtain new medical knowledge. Antivivisectionists—those opposed to using live animals in experimental research—closely observed the laboratories of Henry P. Bowditch at Harvard and H. Newell Martin at Johns Hopkins, and even harassed Sternberg—through Mrs. Irvin McDowell—at Fort Mason. Their efforts—for the most part—remained local and lacked cohesiveness, and the dearth of U.S. experimentation left them with little grist for the antivivisection mill. By the mid-1890s, that had changed, particularly in the nation's capital. Washington had emerged as a scientific and intellectual hub, and animal experimentation flourished on the north side of the Potomac.<sup>56</sup>

These activities provided a focus for scrutiny and a target-rich environment for antivivisectionists all within a stone's throw of Capitol Hill. When the Washington Humane Society exposed animal experiments being conducted in Washington schools by instructors they defined as incompetent, antivivisectionists seized it as the foundation for precedent-setting national legislation. Introduced in the Senate as

“A Bill for the Further Prevention of Cruelty to Animals in the District of Columbia,” on January 14, 1896, the restrictive contents of the bill left no doubt the ultimate goal was to stop vivisection in the District of Columbia. Sternberg and other physicians and scientists, such as Dr. Daniel E. Salmon, Chief of the Bureau of Animal Industry; Dr. Charles Wardell Stiles, Head of the Bureau of Animal Industry Zoological Laboratory; Doctors Walter Wyman and Joseph J. Kinyoun of the U.S. Hygienic Laboratory; Acting Secretary of Agriculture, Charles W. Dabney; and Dr. Samuel Busey of the Medical Society of the District of Columbia, defended vivisection in the capital; whereas Daniel C. Gilman, President of Johns Hopkins University; William Henry Welch, now Dean of the Johns Hopkins Medical School; and Dr. William Osler, Johns Hopkins’ most renowned clinician, established national opposition. National antivivisection legislation was eventually stopped, but the battle continued for years.<sup>57</sup>

In July, the Sternbergs retreated to Woods Hole, Massachusetts, for some rest and recreation. Although Sternberg could not decline an invitation to present a couple of lectures at the Marine Biological Laboratory, on most days he explored the abundant variety of aquatic flora and fauna, enjoyed clam bakes, and simply spent time with Martha away from the clamor of Washington. An invitation from President and Mrs. Cleveland took them to Gray Gables, the presidential retreat on Buzzards Bay, for a short visit. Cleveland, recuperating from the Democratic national convention earlier in the month, needed a fishing companion and Sternberg was happy to oblige. He found the president’s fishing ensemble amusing, especially his soft hat festooned with a variety of colorful lures, but Cleveland looked tired and worn. He had entered the White House for the second time just as the economy tumbled into depression. In 1893, more than 15,000 businesses closed their doors. The next year, a large handful of railroad firms went bankrupt, and as the call for steel rails declined so, too, did the fortunes of their manufacturers. Banks began to fail in turn, and unemployment rose to nearly 18 percent. The president received a pummeling from Republicans and Populists for his steadfast conviction that the Sherman Silver Purchase Act and the McKinley Tariff Bill, both passed in 1890, were major contributors to the economic crisis. Regrettably, Cleveland did not provide the leadership required to unify his party on these issues. By the time the national convention was held, silver advocates held sway within the party, but no serious candidate had appeared to challenge the Republicans. Late in the nominations, William Jennings Bryan delivered a dramatic oration on the virtues of silver and the laboring class that unified silver delegates for a Bryan ticket. This was the origin of the chagrin and fatigue Cleveland felt—and Sternberg discerned so clearly—as their lures broke the placid surface of Buzzards Bay.<sup>58</sup>

The presidential election of 1896 brought victory to William McKinley and the Republican Party. Although not the outdoorsman Cleveland was, he and First Lady, Ida, were enthusiastic horticulturists. They delighted in the conservatories to the west of the White House and various hot houses on the grounds that were stocked with a profusion of domestic flowers, ferns and vines, and exotic tropical flowers and fruits. This alone provided ample common ground for the Sternbergs and McKinleys to establish a friendship, and it appears their welcome at the White

House was continuous from one administration to the next. But Sternberg rapidly became more than an occasional friend with a high regard for botanical beauty. Ida had suffered with petit mal epilepsy and depression since the birth of their second child in 1873. She had been treated—sometimes with apparent success and sometimes not—by physicians in Columbus, New York, and Washington. Although she stubbornly remained at her husband's side as the wife of a congressman, First Lady of Ohio, and now First Lady of the Nation, the social stresses and travel kept her on a continual roller coaster of good days and bad. McKinley needed an experienced physician he could trust and call on without hesitation at any time. The White House had an assigned physician, Captain and Assistant Surgeon Leonard Wood, who owed this posting to Sternberg's power of persuasion over Secretary of War Daniel Lamont's strong objections. Whether it was Sternberg's reputation, the fact that Wood was a very busy doctor-in-waiting for all army officers in Washington, or a word of praise in passing from Cleveland to McKinley, Sternberg continued as primary physician to the First Family. While he did not need this extra responsibility, it was a duty he could not refuse, and there were obvious advantages to having the president's ear and undivided attention during professional visits to see Mrs. McKinley.<sup>59</sup>

Deaths, retirements, resignations, and promotions had finally attrited assistant surgeon numbers below 110. Army Medical Department Examination Boards sat in October 1895 and in September 1896. These had been physically stringent and academically demanding since their inception by Surgeon General Lovell in 1833 and also remained trying ordeals for young candidates during Sternberg's administration. Of 50 candidates in 1895, only 5 were found qualified. A better crop of physicians presented themselves the following year with 8 of 41 recommended for appointment. This allowed the Army Medical School to reopen albeit with some change in staffing; however, the faculty remained dedicated to Sternberg's academic vision, and he won approval to extend the course to five months.<sup>60</sup>

He was less successful in obtaining legislation to have the lineal rank of his young officers determined by their academic performance at the school, but the administrative difficulties for this action were seen as too great by the army. The surgeon general remained delighted with the school's progress. However, he was still burdened with an inadequately manned Medical Department. Training small handfuls of officers was not going to achieve the end state he had in mind. Likewise, he could never field a wholly competent Hospital Corps if it continued to hemorrhage trained soldiers. Over the past three years, the corps had lost an average of 3 percent of its strength annually from expiration of term of service, disability, discharges, desertion, and transfers to the line, and the surgeon general was out of incentives for recruiting. Sternberg remained frugal in his administration of the Hospital Corps. The instructional company at Fort Riley was disbanded for distribution to a handful of posts farther west. For FY 1897, Sternberg recommended that the Hospital Corps appropriation be reduced, and Congress compounded his personnel troubles in March 1896 by capping the number of hospital stewards at 100.<sup>61</sup>

By the time of McKinley's inauguration in March 1897, Sternberg held an extraordinarily unique and influential position in Washington, and his influence

permeated the highest levels of the federal government, the army, the national and international medical communities, and Washington's elite society. In this rarified atmosphere of power and privilege, he could have remained, contemplating the city from a bird's eye view, self-satisfied and complacent, until retirement. But Sternberg's character had never been sullied with self-satisfied complacency. As a genuinely concerned citizen, he not only observed the city and the problems that plagued it close up, but also became actively engaged in the growing agitation for social reform in the District. This movement was led by some of Washington's most prominent citizens, including George M. Kober. Kober, professor of hygiene and state medicine at Georgetown University Medical School, was Sternberg's old friend from the Fort Walla Walla days. Kober retired from the service in 1886 and settled in Washington four years later. By the time Sternberg assumed his duties as surgeon general, Kober had become a well-respected public health educator, reformer, and philanthropist in Washington. These reformers, who would be known as Progressives in the not too distant future, recognized Washington was rotting from within and the decay could no longer be hidden behind massive government buildings and ornate mansions. Washington's tremendous growth in the generation since the Civil War was accompanied by a decline in public sanitation, increasing disease rates, inadequate housing, and poverty. None of these evils existed as a solitary entity, but rather as a mutually supporting malevolent complex, and their eradication would entail a prolonged campaign on a broad front.<sup>62</sup>

Washington had outgrown its water supply, provided by a Potomac-fed reservoir above Georgetown and the sewer lines that discharged waste and storm drainage into Rock and James Creeks and the Washington Canal. In 1889, Kober implicated the Potomac as a potent source of annual typhoid visitations in the District from communities upstream. No substantial action was taken until the persistently high typhoid death rates—7 to 8 per 10,000 population—frightened authorities enough in 1892 to allow a fairly broad sanitary campaign; but the issue finally erupted when Major Charles Smart, chemist at the Army Medical Laboratory, found typhoid bacilli in Potomac water in February 1894. A medical society investigating committee substantiated the Potomac as the source of infection and means of its distribution throughout the city. Moreover, the report noted death rates from typhoid fever in the black community were 34 percent higher than in the white population, but recommendations for a complete overhaul of sewage and water supply and distribution systems were tabled because of the severe economic depression.<sup>63</sup>

The doleful effects of improper sanitation affected the entire city, but the urban poor most acutely felt the impact. A committee on housing the people, chaired by George Kober, conducted an in-depth survey of Washington's alley slums. At the time Kober's committee began its work, the alleys were home to 19,000 mainly black Washingtonians. The slums originated in the Reconstruction Era following the Civil War when Washington saw an influx of more than 30,000 ex-slaves. In November 1896, Kober's committee told a lurid tale of human suffering, degradation, and neglect that existed within a few blocks of the Capitol and the elegant mansions on Dupont Circle. High rents, poor maintenance, no sanitation, crime,

vice, and sickness defined the life of alley dwellers. District commissioners at last noticed. That winter, they requested the citizen's relief committee consider ways in which sanitary dwellings could be obtained for wage earners in the city. Sternberg, who presided over the citizen's relief committee, became chairman of the subcommittee on permanent relief and sanitary dwellings for the poor.<sup>64</sup>

Sternberg and his committee conducted their own survey of the alleys and presented their report at a public meeting in February 1897. At this same meeting, attendees were apprised of the most recent attempts at tenement reform and sanitary housing construction in New York City by Dr. Elgin R. L. Gould, president of the City and Suburban Homes Company. With this information and a strong desire to bring rents within the range of the lower wage earner, Sternberg determined that a large, two-story tenement with a central heating plant was the only sensible action. Kober strongly disagreed from an expense standpoint that, when passed on to the renter, would induce overcrowding, sanitation would decline, and disease rates would increase. The laboring family would be no better off than before. Arguing that all the degrading aspects of tenement life would still be present, Kober drove his friend to see Douglas Flats, a two-story tenement raised in the alley between M and N, 25th and 26th Streets, northwest. The tenement had 54 rooms and nearly as many families, and stood as a monument to sanitary and financial failure. Kober advocated building individual homes, but again the expenses incurred would put rentals beyond the reach of those they were trying to assist.<sup>65</sup>

Over the next few days, Sternberg found a compromise to the dilemma and drew up plans for a new type of individual home, the two-flat style. These homes consisted of two independent apartments—one above the other—of three, four, or five rooms with separate entrances, a backyard, small cellar, and an exit to an alley in the rear. This plan, he wrote, “was intended to eliminate all the unpleasant features of tenement houses as they exist in other cities. A good range, with water-back, is placed in the kitchen, and each flat has a well-lighted bathroom, with hot and cold water.”<sup>66</sup> He also created the business structure that would—hopefully— attract private investors and renters. Offering dividends of 5 percent and a rebate of one month's rent to tenants who had not required repairs during the year, the Washington Sanitary Improvement Company was organized in April 1897, and Sternberg was elected president. Although the “best known philanthropists and businessmen” in Washington bought stock in the company, they had little confidence in its success.<sup>67</sup> Sternberg's personality, enthusiasm, and diligent promotional work contributed greatly to overcoming the difficulties in securing the \$25,000 required to begin operations. Land was purchased on Bates Street between P and Q and First and North Capital Streets, and by mid-November the first eight houses were occupied.<sup>68</sup>

In the spring of 1897, the Secretary of State selected Sternberg to be a delegate to the 12th International Medical Congress that was to be held in Moscow in late August.<sup>69</sup> As a senior member of the section on military medicine, Sternberg was obliged to speak on a pertinent topic. If he had a subject in mind before July 3, it

was abruptly upstaged that day by an electrifying article that appeared in the *British Medical Journal*. Professor Guiseppe Sanarelli announced in a lecture at the University of Montevideo on June 10 that he had found the causative agent, *Bacillus icteroides*, of yellow fever. A well-trained and respected Italian scientist from the Royal University in Bologna, Sanarelli had come to the university to study yellow fever at the request of the Uruguayan government the previous year. His astonishing declaration captured the world's attention. Walter Reed noted later, "No more important achievement in scientific investigation had been claimed since Koch's announcement in 1882 of the discovery of the bacillus of tuberculosis."<sup>70</sup> Given Sanarelli's reputation and publishing of his research in the prestigious *Annals of the Pasteur Institute* gave almost immediate validity by the scientific community. Nothing short of a declaration of war could have engaged Sternberg's attention more. He scrutinized Sanarelli's research, compared it with his own, and prepared a lecture for the conference in Moscow.<sup>71</sup>

The medical congress convened on August 19 in one of the large theaters in downtown Moscow. Sternberg thoroughly enjoyed the scientific sessions and interaction with leading scientists and military medical men from around the world. When he was introduced and moved to the lectern, the audience fell silent in anticipation of what the world's leading authority on yellow fever had to say about Sanarelli's discovery. He began his remarks with a recapitulation of the last yellow fever experiments he had conducted with *Bacillus X*. The bacillus killed guinea pigs and rabbits—the gold standard for determining virulence at the time—but Sternberg had only found it in about 50 of the cases at autopsy and, therefore, he had not reported it in the literature. Addressing Sanarelli's *B icteroides*, Sternberg noted that it had the same structure and characteristics as *Bacillus X*, but the Italian researcher had found it in only 58 percent of liver tissue preparations and never in the alimentary tract. "The evidence thus far presented," stated Sternberg, "is strongly in favor of the view that the bacillus of Sanarelli is identical with my bacillus x. And unless this identity is conceded it will be difficult to admit...the bacillus of Sanarelli is the...yellow fever germ, for I made numerous cultures from...cadavers in Havana.... If the bacillus icteroides of Sanarelli was present in the blood or tissues of yellow fever patients...I could not have failed to find it, as it grows readily in the culture-media employed in my investigations; but unless it is identical with my bacillus x, it was not present in the blood and tissues of the...cadavers examined... during my extended researches in Havana."<sup>72</sup> Proceeding with the hypothesis that the two bacilli were identical, Sternberg then called "attention to the experimental evidence...opposed to the view that yellow fever results from the presence of this bacillus in the blood and tissues of those attacked with the disease."<sup>73</sup> Both he and Sanarelli had shown the bacillus was lethal to guinea pigs and rabbits. Therefore, if the bacillus was in the blood and livers of yellow fever patients, injections of these tissues into laboratory animals should also be fatal, but experiments conducted by Sternberg in Havana had demonstrated this was not the case. Although Sanarelli stated large or small amounts of the bacillus proved fatal when injected into guinea pigs and rabbits, Sternberg found injections of less than 1 milliliter were not



invariably fatal. However, he had to admit it was possible he had missed some positive cases because he had not observed his animals for up to eight to 10 days—as Sanarelli had—before recording a negative result. Moreover, Sanarelli had gone further in his research than Sternberg by injecting dogs, monkeys, sheep, and even humans with cultures of his bacillus, all of which Sanarelli confirmed had demonstrated symptomatological and pathological changes consistent with yellow fever. Sternberg found Sanarelli's research with animals so compelling that he admitted if he had obtained these results he would not have hesitated to announce the discovery to the world either. He concluded his remarks with the sincere hope that Sanarelli's results could be confirmed by subsequent investigations that Sternberg promised to resume immediately with *Bacillus X*.<sup>74</sup>

Reed and members of the Yellow Fever Board would ultimately disprove Sanarelli's claim in Cuba in the summer and fall of 1900. When this fact is combined with Sternberg's well-earned reputation as a destroyer of yellow fever theories, it is tempting to conclude from his Moscow paper that it was his original intention to dispose of Sanarelli's hypothesis as he had those of Freire, Carmona y Valle, and Finley. Nothing could be further from the truth. In Sanarelli's research, Sternberg heard not a death knell for *Bacillus X*, but the glorious sound of trumpets heralding the resuscitation of a long moribund idea. Sternberg realized that if both he and Sanarelli were correct, the jury would remain out until one or the other had demonstrated statistically that the hypothesis was true. The first order of business was to show conclusively the two organisms were one and the same. Once this was completed, definitive experiments on a variety of laboratory animals could be performed relatively quickly. Sanarelli was a bit ahead of him, but it was not too late to achieve the prize. Sternberg had found the bacillus first, and he was determined to prevent Sanarelli from upstaging him as Pasteur had done with the *Streptococcus*. Furthermore, Sanarelli did not have a culture of *Bacillus X*, but Sternberg was reasonably sure of where he could obtain a sample of *B icteroides*. The excitement and anticipation of the investigative work that had to be accomplished made him anxious to return home after the conference. The journey home took Sternberg through Paris where he visited the Institut Pasteur. It was imperative for Sternberg to obtain a culture of *B icteroides* if he were to proceed with these studies. Since Sanarelli had trained there and had his paper on yellow fever published by the institute, Sternberg correctly suspected he could find a pure culture of the bacillus in one of the its incubating chambers. The institute had recently received a fresh culture from Sanarelli, and Dr. Emil Roux gave him a sample.<sup>75</sup>

As Sternberg sailed home in late September, he looked forward to the investigations he and Reed would pursue with *B icteroides*, the maturing of the Army Medical School, and his term as president of the AMA. This last honor was bestowed on him in June at the 50th AMA meeting in Philadelphia. Although he had led the American Public Health Association and the fledgling AMSUS, and actively participated in a wide variety of national and international scientific and medical organizations, none gave him more lasting satisfaction than this most recent recognition by his medical peers. The failed practice on Long Island, a tragic cholera epidemic in Kansas, and the days of exile in California must have seemed distant

to him, if he recalled them at all. He had climbed to professional heights in the army and in medical science that had never been ascended to by an army surgeon before and have never been reached since. In four and a half years, he had—by virtue of his achievements as a soldier, clinician, and scientist, and by the sheer energy of his personality and will—given the Army Medical Department a new direction for the future and remained a preeminent figure in American medical science. Four and a half more years remained for him to consolidate these gains before retirement, and at 59 years, Sternberg's physical energy and stamina still kept pace with an intellect that never slept. For the optimistic Sternberg, the future was always an open book of military and medical challenges waiting to be accomplished by careful analysis, deliberate action, and perseverance.<sup>76</sup>

In seven months, he would need all the optimism, energy, and perseverance he could muster. The Cuban rebellion against Spain, which began in late February 1895, continued to seethe and intensify like a slowly forming tropical storm and threatened—with each passing week in the fall and early winter of 1897–1898—to bring the United States into its vortex. When the storm finally came, Sternberg would be in its very eye. Heavily engaged in providing medical support for an expanded army on two widely separated fronts, he would also fight a rear guard action against vocal and vociferous critics that would threaten not only his prestige as surgeon general, but also his reputation as a scientist.

## Chapter Twelve

# War with Spain

Over the past three years, Spain had attempted to crush the Cuban insurgency with fire, sword, and the mass relocation of entire provincial populations—known as reconcentration—for easier observation and control. Such draconian methods only succeeded in hardening rebel resolve, restricting American trade with Cuban sugar and mining industries, and provoking U.S. public indignation. Journalists, such as Richard Harding Davis and Stephen Bonsal, filled leading newspapers with poignant accounts of Spanish atrocities perpetrated on the Cuban people and valiant patriots risking everything for independence. President William McKinley's firm diplomatic efforts and a change in the Spanish government in 1897 led to an easing of reconcentration policy, amnesty for political prisoners, and a grant of autonomy for Cuba from Madrid. However, the new Spanish government feared a coup d'état should it give up the Caribbean colony or those in revolt in the Philippines. Unable to quell the rebellion by military force and unwilling to grant independence, Spain played for time while the new Cuban colonial government organized itself. On December 6, McKinley, in his first annual address to Congress, would not recognize Cuban belligerency or independence, and rejected calls for U.S. intervention, believing the issue could be resolved diplomatically. But in mid-January, Cuban loyalists and insurrectionists clashed in Havana. Congressional interest in recognizing Cuban belligerency revived, and the battleship *USS Maine* was sent from Key West to provide protection and refuge for Americans in case violence escalated. The *USS Maine* steamed into Havana Harbor on January 25. Three weeks later, an explosion heaved the ship from its berth, killing 200 of the crew. The American public reacted with intense outrage, holding Spain responsible for a cowardly act of sabotage. While newspapers across the country called for an immediate armed response, McKinley remained hopeful for a peaceful resolution through uncompromising diplomacy and fiscal intimidation. He demanded Madrid cease its reconcentration policy, proclaim an armistice, and agree to Cuban independence with Washington as arbitrator in the forthcoming

negotiations. On March 7, McKinley introduced a \$50,000,000 appropriation bill for “National defense and for each and every purpose connected therewith to be expended at the discretion of the President.”<sup>1</sup> Intended to impress and awe Spain with the vast financial resources the United States could instantly commit to its military, the bill was not meant as a preliminary move toward mobilization. Nevertheless, strategic operational planning for a war against Spain began in earnest on March 10, the day after the Fifty Million Dollar Bill passed.<sup>2</sup>

Navy and War Department assessments painted a bleak picture of Spanish forces on the island. Consisting of some 150,000 regulars and 80,000 Cuban loyalists, the garrison was impressive on paper only. The majority of these troops were young, inexperienced, and not appropriately trained or disciplined. Units were spread thin across the countryside without adequate roads or railways for effective communication or force concentration. Defensive positions would not withstand a determined artillery assault. Supplies of ammunition, food, clothing, and medicines, all of which had to come from Spain, were scarce and difficult to distribute because of a shortage of transportation. Furthermore, the entire contingent had been ravaged by malaria, dysentery, and yellow fever to the point where Consul General Fitzhugh Lee doubted if more than 55,000 soldiers on the island were combat effective. With the Spanish army on Cuba slowly deteriorating—kept alive only by naval transports from the mother country—strategic planners concluded the most efficient strategy was a naval blockade to cut off the garrison’s lifeline. This gave the navy the lead role and, therefore, the lion’s share—\$29,000,000—of the new funding bill. The army bolstered coastal defenses and assisted operations in the Caribbean by supplying and advising the Cuban rebels in their last campaign. This supporting role, however, required the 25,000-man army to be increased three- and possibly four-fold. The War Department divided the remaining \$19,000,000 by operational priority: \$15,000,000 was given to the Corps of Engineers and Ordnance Department for coastal defense, and the remaining \$4,000,000 was distributed to the other army departments and bureaus. The Medical Department received a grand total of \$20,000.<sup>3</sup>

Although Sternberg left no comments on what he thought of this pittance, he must have wondered what Congress was thinking. From 1894–1898, his budget to run the Medical Department had decreased by 5.4 percent annually while supply spending had increased 7 percent and the cost for medical attendance and drugs had risen, mainly resulting from the loss of assistant and contract surgeon positions, 166 percent over fiscal year (FY) 1890–1893 levels. In March, he had been appropriated only \$115,000, which was \$20,200 less than in FY 1898, to support the Medical Department in 1899. The \$20,000 he received from the president’s emergency package did not replace this annual loss of funds. Moreover, it would not equip field medical assets for an army of 75,000 to 100,000 men in peacetime nor when engaged in combat.<sup>4</sup>

The surgeon general had endeavored to live within the means Congress provided, but the Medical Department lived from year to year, a circumstance that precluded the stockpiling of medicines or equipment for emergency use. When Secretary

of War Russell A. Alger directed Sternberg—on March 12—to prepare for large emergency purchases of medical supplies, an absurd situation became ridiculous. Alger interpreted the president’s “for the national defense” wording of the bill literally, which precluded the Medical Department from purchasing or even contracting for any materials or personnel required for offensive action until war was declared. Alger’s idea of preparation, therefore, was a fairly sedentary business of making lists of required equipment and supplies. The surgeon general already knew how to spend \$20,000, but what he yearned for was the authority to do so. Sternberg perceived preparation as an active process. Alger’s directive was merely a warning order and led him to comment later, “Prior to the declaration of war no preparation for the approaching conflict had been made by the Medical Department.”<sup>5</sup> This was true from the standpoint of gathering consumable medical supplies, equipment, and personnel, but Sternberg knew that medical support to a campaigning army entailed a great deal more than pure combat trauma management. Sternberg and his staff began preparing for the coming conflict as best they could. Two days after the defense bill was passed, the surgeon general requested Alger to ask Congress for an additional 15 assistant surgeon positions. Over the next two weeks, he lobbied the military committee chairmen in the House and Senate for the same and, in time of emergency, authority to hire as many contract physicians as he required. Under Sternberg’s personal direction, existing medical equipment and field chests were reconfigured, inventory lists were revised, and essential items were purchased with funds remaining from the current fiscal year. A first-aid packet for the individual soldier, which contained antiseptic dressings, was created and stocked. He also authorized purveying officers at supply depots in New York, St. Louis, and San Francisco to increase their work force and secure additional workspace to assemble these items and distribute them liberally to units in the field. Late in March Sternberg, with the assistance of Acting Assistant Surgeon Juan Guiteras, submitted a disease threat estimate for Cuban operations to Alger in which he cautioned against a summer campaign. The document is—for the era—an accurate assessment of the health threats to be encountered by assault forces and precautions to avoid them. While typhoid and yellow fevers, malaria, and dysentery are all mentioned, it is evident from the lengthy epidemiological discussion and emphasis on prevention and containment measures regarding yellow fever that this disease was the major anticipated threat. Sternberg reviewed the incidence of the disease in Cuba over the past 50 years and concluded no appreciable endemic difference existed between seaports and inland towns. Yellow fever occurred annually or every other year in most of them. Although country villages were less risky, they were subject to epidemics from the disease being generated in noxious refuse heaps or imported from infected areas on clothing, baggage, and other articles. On April 25, Circular No. 1 was issued to all medical officers, and recommended soldiers were to stay out of the cities as much as possible; and supplies, baggage, mail, and prisoners of war were to be disinfected before entry into the United States. It also gave instructions for camp, latrine, and refuse pit locations; disinfection techniques; appropriate clothing and nutrition; and the timing of daily fatigue details and marches.<sup>6</sup>

Sternberg also began looking for civilian transport ships suitable for conversion to hospital ships and floating medical supply depots for ground forces. The army had not required strategic water evacuation capabilities since the Civil War, and, therefore, he and the Quartermaster Department had to create this asset from scratch with limited funds. The most expedient and least expensive way was to charter and refit an existing vessel. On April 23, after discussions with Navy Surgeon General Marion Rixey, Sternberg recommended the relatively new 3,000-ton steamship *John Englis* be chartered for these purposes. Assistant Secretary of War G. D. Meikeljohn immediately denied the request based on cost and told the surgeon general to keep looking for a more reasonably priced vessel. Early in the first week of May, Sternberg directed Major George H. Torney, then surgeon at the U.S. Military Academy and a former Navy Surgeon, to search the piers in New York City for an appropriate candidate. Torney inspected several craft, but always returned to the *John Englis*. The difficulty lie not only in finding a suitable ship, but also because shipowners hesitated to charter a vessel that would be drastically altered and might become infected with yellow fever and other diseases. Hence, charter prices remained high. Meikeljohn, however, was adamant that the War Department would not purchase a ship for hospital or transportation purposes.<sup>7</sup>

Although the Office of the Surgeon General struggled to secure a hospital ship and continued to develop and refine plans to support 100,000 regular army soldiers in a potential fall invasion of Cuba, events transpired through April and the first few days of May that radically altered this initial strategy and put the administration's strategic planning into a state of flux. Madrid was undeterred by McKinley's demands or his defense appropriations. McKinley heard the national cry to throw Spain forcibly from the island and, fearful he might lose control of Congress as an increasing number of Republicans joined in the chorus, asked for authority to use force to resolve the dispute. Congress granted his wish on April 19, and two days later a naval blockade was ordered. Spain ignored the threat and declared war on the United States. On April 25, one last request was made for Spain to remove itself from the island. When Spain refused, McKinley asked Congress for a declaration of war.<sup>8</sup>

By this time McKinley's strategy for the conduct of the war had changed significantly. He agreed with Army Commanding General Nelson A. Miles that a major invasion of the island, with Havana as its primary objective, should be postponed until after the fever season had passed and the Navy had destroyed the Spanish fleet. Nevertheless, he directed regular army units to camps at Chickamauga Park, Georgia, and Tampa, Florida, to prepare to assist Cuban rebels before a general assault on the island. He also agreed to call up 175,000 volunteers. These men were to be clothed, equipped, trained, and armed in their state camps. Only after this had been accomplished would volunteer regiments assemble at Camp Thomas in Chickamauga Park; Camp Alger in northern Virginia; and smaller camps located in San Francisco, Tampa, San Antonio, New Orleans, and Mobile. This decision gave the War Department extra planning time, but nearly doubled the size of the force for which it was planning. Bureau chiefs were requested to submit cost

estimates to sustain regular and volunteer forces for a year. Sternberg estimated another \$800,000 would be required. Then on May 1, Admiral Dewey's unanticipated destruction of the Spanish fleet in Manila Bay led McKinley to alter strategic objectives once again. Still concerned that European powers might assist Spain, McKinley wanted to secure his toehold in the Philippines and gain one quickly on Cuba. The following day, he gathered Secretary of War Alger, Navy Secretary John D. Long, and their uniformed advisors in the White House and announced a more aggressive plan of action. A 5,000-man force would deploy to the Philippines to sustain Dewey's victory, and 40,000 to 50,000 would prepare for an assault on Havana through the port of Mariel by mid-May. Major General Wesley Merritt would lead the Philippine force, soon to be designated the Eighth Corps, and Major General William Shafter would command the Fifth Corps preparing in Tampa. These decisions relieved the navy of continuing a blockade as the hurricane season approached, but shocked Army Commanding General Nelson A. Miles.<sup>9</sup>

McKinley, the War Department, Miles, and particularly Sternberg initially feared a summer campaign because of the disease threat on the island. Miles still feared a rainy season campaign, but his position on the issue seems to have been undermined by a reassessment of the situation by Sternberg and Guiteras based on reports from U.S. residents and Cuban physicians on the island. Just when this reassessment was conducted and if it truly affected the president's decision is unclear, but on May 6, Guiteras made an inexplicable and unwise comment to a *New York Times* reporter when he said "there was no reason for alarm about yellow fever."<sup>10</sup> His follow-on remark to the same reporter that "malarial fevers are not dangerous" would come back to haunt him and the surgeon general in July.<sup>11</sup> Mosquito transmission of malaria was just being worked out by Indian Medical Service Major Ronald Ross and Italian researcher Giovanni Grassi.<sup>12</sup> For the moment, some medical authorities—Sternberg among them—believed that malaria, like typhoid and dysentery, was probably transmitted by water, and soldiers could avoid these infections by boiling their drinking water. Sternberg provided no description of malaria epidemiology in Cuba and may have believed—as Guiteras did—that malarial fevers encountered on the island were not dangerous because they had no potential to incapacitate an army on campaign. However, Sternberg did direct the use of 3 to 5 grains of quinine taken in the early morning as prophylaxis "in decidedly malarious localities...but the taking of quinine as a routine practice should only be recommended under exceptional circumstances."<sup>13</sup> These instructions, however, were ambiguous as he declined to advise on how such localities were to be determined or define what he meant by exceptional circumstances. In any event, the message he conveyed to McKinley mitigated the Commander-in-Chief's primary reservation—epidemic yellow fever—to a summer deployment. By not steadfastly supporting Miles in his opposition to a summer campaign, the surgeon general actively assisted in shortening the War Department's planning and execution timeline.<sup>14</sup>

Since April 21, Sternberg and his staff had worked furiously not only to make up for lost planning and execution time, but also to keep pace with increasing operational

demands for personnel, hospital and evacuation capabilities, and medical materiel. Colonel Charles Greenleaf was assigned as chief surgeon of troops in the field on Miles' staff, and Lieutenant Colonels Benjamin Pope and Henry Lippincott reported to Shafter and Merritt, respectively, as corps surgeons. On the day war was declared, 177 medical officers and 791 hospital corpsmen were authorized for duty. Administrative, purveying, and hospital duties and physical disability immediately reduced the number of deployable physicians to 100. In mid-March, Congress magnanimously returned the 15 assistant surgeon positions removed in 1894, but did not give Sternberg the authority to fill them until May 12. An applicant for the hastily convened medical examination boards had to be a graduate of a recognized medical college with one year of hospital practice and pass the high standards of an army medical examining board. Sternberg, an advocate for raising the academic bar for medical school candidates and the stringent standards for graduation from the Army Medical School, would not betray these standards for political or military expediency. However, this was not the case for the state medical examiners. Although medical officers in volunteer regimental staff positions were appointed by the president without sitting for medical examination, they were approved by Sternberg, and included some of the most capable and competent physicians in the country. State examination boards, however, approved all regimental surgeons. As Sternberg recalled later, their selections spanned the spectrum of medical competency and aptitude for military service. He also recognized as surgeons they may save lives on the battlefield, but virtually none of them knew how the army or the Medical Department operated on a daily basis. Until they became familiar with military medical administration and healthcare practices in the field, their learning curve would be steep and efficiency impaired. To alleviate this problem, Sternberg assigned five experienced regular army medical officers as chief surgeons of army corps and 36 as brigade surgeons of volunteers. The remainder was assigned to regular units. Sternberg also received approval to hire a large number of contract surgeons. He did his best to find qualified physicians, but had neither the staff nor the time to examine each candidate thoroughly. He selected men with hospital experience, 34 to 40 years of age, to ensure they were experienced and not too set in antiquated medical practices, based on the endorsements provided by their peers. He recognized that it was an imperfect selection process; but, left with no alternative, he had to trust in his own judgment and the mentoring abilities of the regular medical officers to guarantee soldiers received adequate care.<sup>15</sup>

Success or failure of wartime medical care did not devolve solely on the number of physicians in the field. Hospital corpsmen were required to provide immediate first aid on the firing line, evacuate the wounded, and provide nursing duties, as well as a variety of administrative and logistical functions. The Medical Department had a little less than 800 corpsmen, including 99 hospital stewards, 100 acting hospital stewards, and 592 privates, which was far too few for the coming conflict. Sternberg requested the law capping hospital stewards at 100 be rescinded in March, but Congress did not do so until June 2. Regrettably, while each volunteer battalion had a hospital steward, Congress made no provision for a volunteer



hospital corps. To obtain the large number of medics needed, men were allowed to transfer from line regiments to the hospital corps, and recruiting officers were urged to search for suitable candidates. Many medical students, pharmacists, and young medical graduates enlisted in the corps for the duration of the war. However, medics in the large and fairly well trained National Guard Hospital Corps enlisted primarily as line soldiers in volunteer units rather than as corpsmen.<sup>16</sup>

Ironically, Congress did authorize—at the surgeon general's request—the employment of male and female contract nurses during the busy March sessions. However, this put Sternberg in a rather trying and unenviable situation by mid-April. Although a circular soliciting enlistments in the Hospital Corps was distributed to many training schools for male nurses, few applied to recruiting officers. Sternberg was forced to accept the services of a largely female nursing profession because he was unable to obtain enough corpsmen for nursing duties. This constellation of events was a turning point in the history of the Medical Department. Although the surgeon general envisioned only a small number of nurses would be needed and their use would be limited, the female army nurse had been conceived. In response to congressional actions to authorize the use of female nurses in general hospitals, Sternberg told the Secretary of War, "In my opinion it would be very unwise legislation. Trained female nurses are out of place as regular attendants of sick and wounded soldiers in the wards of a general hospital. They may be useful in certain cases and especially in the preparation and serving of special diet.... It is my intention to employ trained female nurses to such an extent as may be necessary and desirable, but the passage of this bill would greatly embarrass me in the administration of our general hospitals."<sup>17</sup> His position was not attributable to any lack of appreciation for women's professional skills, which he freely admitted nurses had demonstrated over the past 20 years, but because he believed they would be an encumbrance to the army.<sup>18</sup> His assumption—one that would change by war's end—was completely valid at the time. The U.S. Army of 1898 was not organized, equipped, or trained to integrate women into its operations while on campaign. Furthermore, Sternberg was a man of his era. Victorian men did not consider a military campaign—with its crudities and harshness—an appropriate environment for a woman, nor did they believe a "proper" woman—nurse or not—should be tending to naked or half-clad male strangers. Sternberg did not expound on this belief publicly, but Colonel and Surgeon Dallas Bache did, commenting that the Spartan conditions, fatigue, and privation of a camp were unfit for a female. Bache also remarked corpsmen were "soldiers first and nurses afterward,"<sup>19</sup> and he saw "much expense, idleness, risk of friction, and a certain disquietude about immorality, in this innovation, without commensurate gain."<sup>20</sup>

The nursing profession at large did not share Sternberg's worries concerning the campaign-worthiness of women and the reception they would receive from medical officers in the field. As with previous wars, applications from trained nurses deluged the Surgeon General's Office. All requests were politely refused with the statement that the Medical Department had no authority to hire them, but, according to Sternberg, the office continued to be "overwhelmed with applications

from women across the country who wanted to nurse the soldiers.”<sup>21</sup> Sternberg finally relented to the pressure, at least for assigning nurses to army general hospitals in the states. However, as with contract surgeons, his office did not have the resources to review each applicant thoroughly. In this regard, he received help from an unexpected quarter. Dr. Anita Newcomb McGee, a prominent Washington gynecologist and Vice-President General of the National Society of the Daughters of the American Revolution (DAR), suggested on April 27 that the DAR create an examining board to relieve Sternberg from approving nurses for army service. Sternberg readily agreed, and the following day asked Congress for authority to hire as many nurses as required, paying them \$30 per month and a daily ration. Before the end of the month, the DAR Hospital Corps had been organized with the 34-year-old McGee as director. Following the surgeon general’s instructions, only graduate-trained nurses were accepted. The nursing selection committee, which included—among other notables in Washington society—Martha Sternberg and Mrs. Russell Alger, reviewed thousands of applications from patriotic white, black, American Indian, female and male nurses, and many in religious orders.<sup>22</sup>

Although the furor over female nurses that Sternberg anticipated among members of the Medical Corps never materialized to any significant extent, publication of Circular No. 3 describing the duties of medical officers in the field generated an indignant and unexpected outcry from volunteer regimental surgeons and their commanders. The regimental surgeon’s primary duties were to ensure the sanitary security of the camp, advise the commander on such matters, provide combat trauma care and stabilization at first aid stations, and attend to the reporting of the same. The document contained no mention of the regimental hospital. The sick and wounded were to be expeditiously evacuated to division hospitals, where the surgeon in charge was responsible for their care on the march and in camp.<sup>23</sup> Indignation intensified when orders were received from the surgeon general to turn in regimental medical outfits to the division hospital, make a requisition for the supplies they needed, and have two of every three regimental surgeons report to the division hospital commander for duty. As the surgeon general stated later, “so long as a regiment constitutes a separate command, its surgeon and assistants remain with it, but when a regiment... becomes part of a division, a redistribution of the duties of...medical officers of... regiments constituting the division is needful to meet the exigencies of war service.”<sup>24</sup> Commanders saw this action as impinging on their command authority. Regimental surgeons interpreted it as being demoted to glorified hospital corpsmen operating a dispensary. Contrary to popular belief at the time, Sternberg had not abolished the regimental hospital—that had been done in 1862—but rather created a more practical and efficient use of medical equipment and supplies organic to volunteer regiments.<sup>25</sup> Maintaining seriously ill and injured men with a maneuvering army led to poor medical care and slowed operational movements. Furthermore, the most experienced field surgeons—medical officers of the regular army—would be located at division hospitals. The sooner casualties could be placed in their hands, the better. Sternberg refused to have these facts ignored based on the ignorance or parochialism of volunteer regimental commanders and their surgeons.

To accommodate men too seriously ill to deploy forward and the inevitable invasion of more casualties, Sternberg designated six general hospitals—Key West, Florida; Fort Thomas, Kentucky; Fort Myer, Virginia; Fort McPherson and Chickamauga Park, Georgia; and Fort Monroe, Virginia—between April 30 and June 26. These facilities were established in whatever space could be found and eventually provided 3,137 beds. To evacuate sick and wounded soldiers from Tampa and the camps, a hospital train was chartered from the Pullman Company and positioned at Tampa. Although these facilities were adequately equipped with furniture, linens, clothing, medicines, hospital stores, and disinfectants, they were not properly staffed until late in the summer. Early on, Sternberg did not have enough physicians or hospital corpsmen to fill administrative, corpsman, and nursing roles in support of deploying forces and the general hospitals simultaneously. Recruiting, examining, and training these individuals were horribly slow and, therefore, these needs were met over many weeks. Ironically—and contrary to his later statements—Sternberg hesitated to employ female nurses—an asset he had in abundance by his own admission—in effective numbers at general hospitals until after mid-July. From experience, Sternberg knew he would never have enough corpsmen to provide competent nursing services at all of the divisional and general hospitals. But he also recognized clearly that Bache's opinion of female nurses was preeminent among physicians in general. Whether resulting from his own sense of female propriety, or the fear that he might create a rebellious attitude within the Medical Corps, Sternberg remained unwilling to assign nurses to hospitals unless the surgeon in charge specifically requested them.<sup>26</sup>

McKinley's optimism for a May invasion was soon dashed on the sharp rocks of false promises and military realities. The pompous political boastings that defeated the Hull Bill and guaranteed a massive turnout of trained and equipped National Guardsmen proved to be an illusion. Although the volunteer army did contain a large number of guardsmen, they were primarily new recruits. One-third to one-half of the peacetime National Guard force either refused to enlist or could not pass physical examinations. Moreover, the states could neither clothe nor equip their forces. These logistical difficulties were compounded by the fact that, after arming the Philippine expedition, the country's arsenals did not have enough cartridges for the 25,000 men who were to comprise the Cuban assault force.<sup>27</sup>

Sternberg was relieved when he heard about the postponement. To keep pace with the shifting operational demands and a tremendously expanded army, he ordered all medical officers deploying with regular army regiments to take what medical supplies and equipment they had at their home stations. Purveying officers at medical supply depots were directed to arrange supplies for 100,000 men for six months, and a new field supply table was quickly prepared to meet field contingencies.<sup>28</sup> Congress gave Sternberg authority to obtain bulk orders of medications and many expendable items on the open market, but—to his disgust and frustration—bids had to be invited from national manufacturers for the purchase of durables and high-cost items such as medical and surgical chests, litters, field operating cases, etc. This process required time he did not have. Sternberg realized

by May 3 that he could not wait on deliveries if he expected to have medical units equipped by the time the expeditionary force sailed. He asked governors of several states to give National Guard medical equipment and supplies to the state volunteer regiments. Once they received army orders to proceed, they could requisition new supplies from the government. The majority of governors who had medical equipment readily complied, but Sternberg was dismayed to learn that many states had only limited quantities and 16 had no medical equipment. To deal with this dilemma, he provided supply depots with a prescribed list of medical and surgical items, hospital stores, and miscellaneous articles that were packed and shipped to the assembly camps.<sup>29</sup> While this was a reasonable measure, it did not solve a difficult and growing problem.

The Surgeon General's Office continued to conduct medical supply operations in the usual manner, that is, it approved all requests for purchases of supplies and equipment received from surgeons in the field and informed the nearest supply depot of the order. Given a continual shortage of storage space, the depot obtained and packed only the items requested. These parcels were then given to the Quartermaster Department for shipment by rail. Although this system ensured checks were in place to preclude fraud and wasteful expenditures, the current crisis demonstrated its dreadful inefficiency. Requisitions passed through too many hands. No stockpiles of equipment and supplies were obtained. Packages, although properly addressed to the receiving surgeon, were placed in boxcars without inventory lists; therefore, finding shipments became difficult and tracking lost shipments was nearly impossible. Moreover, the army logistics system moved on railroads overburdened with the massive requirements of mobilization. In Tampa, only two railroads supplied the town from the north; only a single track extended from the town to the port 10 miles to the south and its rail yard was congested with hundreds of boxcars in various states of unloading. If medical shipments did get through, they had to be ferreted out from huge mountains of supplies and equipment. Throughout May, Pope and his staff labored valiantly and successfully provided routine medical care and evacuation to the V Corps, immunized its growing numbers against smallpox, and supplied and equipped four divisional and all regimental hospitals for combat operations. But, as more volunteer regiments arrived in Tampa, Pope found his supplies dwindling, and the replenishing pipeline was not so much empty as it was constipated. Sternberg had been force-feeding supplies to V Corps throughout the month, but he either did not recognize the system was so incredibly fouled up or was loathe to deviate from routine procedures until May 28 when he authorized Pope to buy whatever he needed locally. He cautioned the corps surgeon that a large stock of supplies would not be necessary "because additional supplies will be sent upon the hospital ship which I expect to have fully equipped to follow the expedition...."<sup>30</sup>

As the Medical Department dealt with these problems, the Spanish fleet, under the command of Admiral Pascual de Cervera, eluded American warships in the Caribbean and steamed into Santiago Harbor on May 19. Admiral William T. Sampson, who was made aware of the situation that day, left his lighter vessels to

maintain the blockade around Cuba and sailed his battleships and cruisers at once to Cuba's southern coast arriving June 1. Sampson was eager to pry out Cervera, but did not dare to enter the narrow, twisting three-mile channel that led into the harbor because it was filled with mines and surrounded by well-fortified heights. The navy suggested that the army shift its objective to Santiago where the small, isolated garrison could be easily reduced, leaving the Spanish fleet defenseless. An earlier strike appealed to McKinley and the War Cabinet. In late May, strategy in the Caribbean changed once more. In Tampa, Shafter's V Corps was rapidly reinforced with battle-ready regulars and volunteers from camps in Mobile and Chickamauga. Shafter was to embark immediately for an assault on Santiago, and Miles would follow with an expedition to Puerto Rico.<sup>31</sup>

McKinley's final directive to Shafter—like earlier strategic alterations—required the Medical Department and the other combat service support bureaus to react rapidly to a new and expanding situation. However, unlike the others, it also altered assumptions concerning delivery of that support and the use of auxiliary resources available in Cuba. Sternberg had assumed the following:

1. sufficient medical supplies, equipment, tents, ambulances, wagons, horses, and pack animals planned for would arrive on the island;
2. they would all disembark at the fixed port facilities at Mariel;
3. they would move medical assets to the front with organic transportation; and
4. time was still available to outfit a hospital ship.

The slow acquisition and preparation of a hospital ship for strategic evacuation leads one to believe also that Sternberg assumed the 2,000-bed Alfonso XIII military hospital in Havana could be used as a general hospital and holding facility for soldiers awaiting medical evacuation back to the states. McKinley's change in plans made the last three of Sternberg's planning assumptions obsolete, and it significantly increased the pressure on him to have a hospital ship ready by the time the invasion force sailed. Torney's search for a better and less expensive ship than the *John Englis* had been fruitless. Sternberg told McKinley that he should buy the \$450,000 ship outright with emergency funds and begin the necessary refitting without further delay. McKinley did so on May 18. Sternberg intended the ship, renamed the *Relief*, to be a general hospital and a supply depot for medical assets on the island. He placed Torney in command, with Major William C. Gorgas as his executive officer. Torney's navy experience allowed him to direct renovations and buy the equipment required for a modern floating hospital, and he was demanding in his specifications. Bunks and water closets had to be properly equipped and spaced; a steam laundry, ice machine, disinfecting apparatus, and electric lighting throughout the ship were absolute requirements as were steam launches for moving supplies ashore. Haggling over cost estimates consumed another two weeks. It was June 1 before the Assistant Secretary of War approved all of the \$185,000 required to renovate the *Relief*, and refitting commenced.<sup>32</sup>

From his office in Washington, Sternberg urged Torney to expedite the work on the *Relief* and assisted as much as he could in pushing supplies to V Corps. Shafter, who had intended to sail on June 4, experienced loading difficulties and delays in the arrival of troops from Chattanooga and Mobile, thereby precluding his departure for another 10 days. The delay was fortunate for the V Corps Surgeon because he received a shipment of 200 packages of sorely needed supplies the following day and distributed them before loading on the transports on June 9. By this time, however, Shafter was aware he had too few transports for the task. To put a sufficient fighting force on the island as expeditiously as directed, he had to be judicious with supply distribution on the ships. Moreover, Shafter was certain the campaign would have to be brought to a rapid conclusion if he were to avoid having his army destroyed by disease. This could be accomplished, Shafter believed, because he also assumed Spanish resistance would be light and quickly overcome. Therefore, the entire medical package assembled in Tampa would not be necessary. His first three priorities—and rightly so—were (1) men, (2) ammunition, and (3) rations. The fourth priority was medical support—and only enough of that for the immediate and essential treatment of sick and injured soldiers. To Pope's chagrin, a large amount of the supplies, ambulances, litters, horses, and pack animals he had worked so diligently to procure and distribute appropriately to regimental and divisional hospitals were left on the docks in Tampa. However, according to Pope's executive officer, Captain Edward L. Munson, "Drugs, medicines, dressings, instruments, hospital tentage, and supplies were loaded on the transports at Tampa in sufficient quantities to meet the needs of the Santiago expedition."<sup>33</sup>

The Cuban expeditionary force sailed out of Tampa Bay into the Gulf of Mexico's tranquil waters on June 13–14, and arrived off of Daiquiri a week later. With the exception of Santiago Bay, the southern coast of Cuba offered no ports or protected harbors from which to disembark. Unloading began at Daiquiri, but was soon shifted to a relatively better location at Siboney, seven miles to the west, the following day. Hasty loading had been done with more thought to balancing the ships than organized disembarkation. Medical equipment and supplies were difficult to locate, and hospital tents were deep in the holds. Pope and his colleagues were low on the priority list for getting a hospital established in Siboney, a tiny, dilapidated, rural village clinging to the jagged, jungle-covered cliffs of the coast. Pope directed the conversion of the few filthy huts and clapboard shacks in the village into wards for sick and injured soldiers until they could be transferred to a hospital ship. He also designated the *Olivette*, a water carrier and distribution vessel for the transports, as his hospital ship, and he directed Major Aaron Appel to establish the Second Division Hospital in the large, electrically lit state and ward rooms of this ship.<sup>34</sup>

As these events unfolded, the Medical Department was losing the race against time to provide a hospital ship before V Corps engaged the Spaniards. With troops loaded on transports in Tampa, Greenleaf wired on July 11, "How long before the hospital ship and railway train will be available? The ship should go if possible with the expedition...if it cannot shall I call on the Red Cross Association ship?"<sup>35</sup>

Sternberg replied the *Relief* would sail as soon as possible—hopefully in seven to 10 days—and the Navy ambulance ship *Solace* would arrive at the station from Guantanamo. As to asking for Red Cross assistance, the surgeon general told Greenleaf to use his own judgment, but “I had hoped...this might not be necessary as it will be considered by many as a reflection upon the Medical Department of the Army.”<sup>36</sup> In compliance with instructions from the Secretary of War, Sternberg had directed his corps and division surgeons to cooperate with Red Cross authorities, but it was a bitter pill. Sternberg had supreme faith and confidence in every member of his department, which for the most part was not misplaced. Moreover, he remembered the embarrassment the Medical Department had suffered when the U.S. Sanitary Commission had taken virtual control of medical operations after the Peninsula Campaign in 1862.<sup>37</sup>

Adamant that this would not happen again, Sternberg continued to badger Torney. Refitting of the *Relief's* interior had been completed on June 16, and loading of supplies and provisions had begun. The surgeon general told Greenleaf he expected the ship to sail no later than June 22, but delays, apparently in loading as well as obtaining steam launches for unloading at Siboney, precluded this. Three days later, the Secretary of War directed the ship to sail as soon as practicable. Under pressure, Sternberg told Torney not to wait on the launches even though he was aware of the transportation shortage at the front. He also gave the major a few specific instructions concerning his mission. Torney was to proceed directly to Santiago and report his arrival to Shafter. Command and administration procedures would be followed just as if the ship were a land-based general hospital, and Sternberg emphasized Torney was to guard his command authority jealously. The ship was to anchor as close to active operations as possible and take on both army and navy casualties to full capacity before departing for home waters. Torney was to maintain communications with the surgeon general as was practicable. On June 27, Sternberg sent these last additional instructions: “You should keep in view the fact that the *Relief* is a well-equipped floating hospital and a depot of supplies for troops in the field. It is important...she should not be taken away from the scene of active operations unless it is absolutely necessary for the purpose of landing the sick and wounded at a home port. You should avail yourself of every opportunity to send proper cases by the navy ambulance ship, the *Solace*, or by army transports returning to home ports. As a rule, the more serious cases of injury and sickness should be retained on your ship, as the disturbance incident to a sea voyage would be injurious to them. Convalescents and those sick and wounded who can be transported without injury...and who are not likely to be fit for duty within a short time, should be sent to a home port whenever the opportunity offers.”<sup>38</sup> The *Relief* departed New York Harbor on July 3, fully staffed and provisioned, with 250 beds, 700 tons of medical supplies, the first U.S. deployed x-ray machine, and the first six female nurses to be officially sent to a combat zone by the U.S. government.<sup>39</sup>

Sternberg had little influence on the decisions that disrupted Medical Department planning and could only watch from Washington as his subordinates played the hand they were dealt. In this regard, the army, the Medical Department, and the

soldiers in the field were fortunate. Lieutenant Colonel Pope, Captain Edward L. Munson (Pope's executive officer), Division Hospital Commanders Majors Marshall W. Wood, Aaron H. Appel, Louis A. LaGarde, and Valery Havard were all energetic and resourceful medical officers. Their ability to organize and lead not only junior medical officers and corpsmen, but also the large number of volunteer and contract surgeons deployed turned a desperate, chaotic situation into one of relative order and efficiency as the campaign progressed. On June 27, Wood loaded his First Division Hospital on the horses and litters he had available, and the backs of his staff, and followed maneuver elements up the Siboney-Sevilla Road. Two days later, the Red Cross ship *State of Texas* arrived. Aboard were Miss Clara Barton, a host of surgeons and nurses, and tons of supplies for Cuban refugee relief—all eager to perform whatever duties were required by the army and share their supplies. Sternberg had directed his surgeons to accept Red Cross services earlier in the month, but LaGarde and his colleagues—although courteous—hesitated to put female nurses in the wards. As the ensuing engagement neared, however, LaGarde swallowed his reservations and a gratified Barton put Red Cross personnel and supplies ashore. By the time Shafter engaged the Spanish Army at El Caney and on San Juan Heights four days later, the First Division Hospital was established 1,200 yards behind the front in a protected bend of the San Juan River, and LaGarde's Third Division Hospital—known as the base hospital—had shifted as many patients as possible to the *Iroquois* and *Olivette* in preparation for casualties. Over the next four days, nearly 1,000 soldiers arrived at the First Division Hospital on makeshift litters, wagons, and the three ambulances that initially made it from Tampa. Most wounds required only a dressing change or fracture restabilization. Surgeons were impressed that the individual first aid packets had not only been used, but also carefully applied to a large number of wounds. They were also mindful of triage priorities and Sternberg's pre-war warning of their responsibility to operate only emergently under the septic conditions of the battlefield environment. For the most part, soldiers requiring major operations were evacuated over a trail nearly axle deep in mud as expeditiously as possible to Siboney, a task made somewhat easier by the arrival of 10 more ambulances on July 2.<sup>40</sup>

After the battles at San Juan Heights and El Caney, the base hospital and the *Olivette* were overwhelmed by the wounded that descended upon them. There were nearly 500 patients at the base hospital when the *Relief* arrived at Siboney on July 7. To complicate matters further, the first five cases of yellow fever had been diagnosed the previous day. Torney's arrival was followed a couple of days later by Miles and Greenleaf aboard the *USS Yale* and bound for Puerto Rico. At Siboney, Greenleaf found a bad situation deteriorating into one of desperation. From the distribution of the mounting yellow fever cases, it appeared the entire army had been exposed and Siboney was a focus of infection. LaGarde had established a separate hospital and detention facility for yellow fever cases two miles from the base hospital along the rail line to Firmesa, but he had inadequate numbers of personnel to staff them appropriately and those he had were all physically exhausted. His supplies, as well as those of the Red Cross, were nearly gone, and



Torney could not replenish them quickly because he had no launches. Greenleaf swiftly brought his medical authority and relationship with the commanding general to bear forcefully on all aspects of the situation. Supplies and tents began to flow off of the *Relief*. Gorgas, immune to yellow fever, was put in charge of the yellow fever hospital. Colonel Nicholas Senn, Chief Surgeon, U.S. Volunteers, and other surgeons aboard the *Relief* relieved base hospital surgeons at operating tables, giving them a much needed rest. Miles ordered a recalcitrant Shafter to send the entire 24th Infantry to LaGarde for nursing and guard duties, and, upon Greenleaf's recommendation, directed Siboney be burned to the ground to eliminate it as a source of infection.<sup>41</sup>

After the Spanish capitulated on July 14, Sternberg recommended all V Corps troops move out of their trenches to higher, more salubrious ground north of Santiago, but "within easy reach of their base of supplies. The camps should be well separated, and any regiment which remains in such fresh camp for five days without having any cases of yellow fever...could be put on a transport..."<sup>42</sup> There had been only 250 cases of yellow fever in a total force of about 17,000 men, and, although the numbers were increasing daily, only five deaths had occurred. This extremely low mortality rate indicated to the surgeons on the island that the yellow fever they encountered was a "mild" type. When this was considered in light of the current military situation, the most prudent action was to change campsites and contend with the fever there.<sup>43</sup>

Since Sternberg had been kept well informed of these developments, he recognized that Greenleaf had performed a minor miracle. Granted it was through the power of Miles, who still feared an epidemic conflagration, but the Medical Department fat had been retrieved from the fire—at least momentarily—just the same. Greenleaf, however, had requested two more hospital ships abundantly staffed, a supply ship with 1,400 tons of medical supplies, 1,000 hospital tents, and sufficient clothing and bedding for 10,000 patients. Sternberg appears not to have even flinched when he read the telegram. It was a large request for a small outbreak of disease that was to be controlled by proper field sanitation and hygiene techniques, but a large number of diseased Spanish prisoners and Cuban refugees also needed attention. The supplies and equipment could be gathered quickly relative to Greenleaf's other requests because of the infusion of \$504,000 into department coffers on July 7.<sup>44</sup> Hospital ships and immune personnel were another matter. The *Missouri*, accepted by the government gratis from Mr. B. N. Baker, president of the Atlantic Transport Line, on July 1, was what Sternberg had hoped would be a rapidly serviceable sister ship to the *Relief*, but her refitting was progressing at an agonizingly slow pace. Although he had contract nurses in abundance, few were immune to yellow fever and therefore could not be sent to Siboney. Trusted agents were searching New Orleans and other southern cities for immune nurses and any other immune women willing to perform nursing duties in Cuba.<sup>45</sup> It would all take time, and that was a commodity Sternberg feared he had too little of. He hoped the relocation of V Corps onto higher ground away from Santiago, into proper tents, with regular rest, decent rations, and appropriate sanitation would end the outbreak

before the disease gained a foothold in the mostly nonimmune army and generate panic in Cuba and in the United States.<sup>46</sup> These issues burdened his mind as he packed for the train to New York City, where he would greet the *Olivette's* arrival.

The *Olivette* anchored off the quarantine station at 8:00 p.m. on Saturday, July 16. Sternberg accompanied Health Officers William Doty and E. R. Sanborn and other officials to welcome her home. Major Appel reported the majority of his 279 patients had improved since departing Santiago. Fully one-third of the men aboard were alive, thanks to modern surgical techniques now practiced on the battlefield. Furthermore, no yellow fever or contagious disease was on board. Sternberg was elated. It was the first truly good news he had had since March and the last he would enjoy for some time. A series of events began to transpire that would culminate not only in harsh criticism of Medical Department competence, but also in personal attacks on Sternberg's abilities and fitness as a leader and administrator, which would linger in histories of the war forever.<sup>47</sup>

On July 19, the day Sternberg approved the *Relief's* departure from Cuba with 255 patients aboard, the sensational story of medical mismanagement aboard the transport steamer *Seneca* hit the newsstands. According to witnesses, the ship had had no medical inspection before taking on patients. It was dirty and overcrowded, its water cisterns were polluted and stinking, only coarse regular army rations were available to feed the sick, and few medical supplies were to be found, except those obtained from the Red Cross. McKinley was outraged. Alger issued a warning to Shafter to avoid further embarrassments of this nature and ordered Sternberg to investigate. The V Corps Surgeon reported to the surgeon general he had quickly embarked patients on the *Seneca* to clear his wards for the large number of casualties expected to result from Shafter's planned attack on Santiago on July 13. Torney verified this and commented that all of the patients aboard were able to take care of themselves. One of the two physicians aboard the *Seneca*, Dr. Hicks, assured Sternberg personally he had obtained sufficient supplies and foodstuffs from the *Relief*, and none of the soldiers evacuated were in a serious condition upon embarkation. Before the month ended, however, the *Concho*, *Rio Grande*, *Alamo*, and *Leona* would all dock at Fort Monroe or New York laden with sick and wounded soldiers, and reporters eager to sell papers with their stories of suffering due to medical neglect. When the sick and wounded accumulated after the Las Guasimas skirmish, Pope found his own urgent priorities dictated that he employ unsuitable transports to clear the increasing congestion at the base hospital. He had followed surgeon general guidance for this type of evacuation. Only convalescents who were well enough to withstand the voyage, able to eat regular rations, and required only limited if any medical care had been selected. Hence, the need for a robust medical staff and supply chest was obviated. Although patients had been evacuated on nine transports without noticeable difficulty or censure, by the time the *Seneca* and other transports embarked malaria had begun to make an impact. Sick soldiers who appeared well enough to travel after a single cycle of fever often relapsed. Those who were recovering from wounds often developed malaria, typhoid, or measles on the voyage home.

Some soldiers who were too sick to sail, but desperate to escape the island occasionally became stowaways who were found only after the vessel was at sea.<sup>48</sup>

The tremendous influx of patients at Fort Monroe stretched human resources and consumed supplies at a terrific rate. The Red Cross delivered \$115,000 worth of much appreciated supplies, but Sternberg chafed at the organization's continued pressure for him to accept more female nurses. While locating adequate living quarters for the nurses was a major problem, he was quoted in the newspaper as refusing to allow Red Cross nurses on military posts because the society had overstepped its bounds and wished not only to take charge at the front, but also at all government hospitals in the east. Comments in the newspapers from Clara Barton that the Red Cross was well organized, had fed all of the wounded at the front, and was now helping them home only added insult to injury.<sup>49</sup>

The outcome reflected poorly on the Medical Department and gave credence to the idea that there had been insufficient medical personnel and materiel when Shafter landed in Cuba. Criticism for this state of affairs quickly descended on Sternberg. He was forthright—yet defensive—in his responses to *New York Times* reporters on July 30, and his words carried the curt edginess of a man holding back a flood of frustration and indignation. He stated simply that the department was not responsible in any way for the supplies and equipment being left in Tampa. To the question of why this occurred, Sternberg could not say. He carefully avoided dispensing blame on the Quartermaster Corps or the V Corps commander at this juncture, but added “General Shafter wanted to get there with his fighting men, I suppose, ....”<sup>50</sup> Sternberg, an officer with 37 years of experience in multiple campaigns, could not have had any suppositions about what Shafter was trying to accomplish. Like the surgeon general, the V Corps commander had been reacting to McKinley's vacillating war plans since late April. Although Shafter suffered from the same malady that many line officers of his generation did—a lack of confidence in, and respect for, the Medical Department—his decision to leave medical assets behind was not influenced by this so much as that he had insufficient transportation. Even so, enough medical supplies and equipment made it aboard the transports for the campaign, but could not be taken off at Siboney—once again—for lack of transportation. Sternberg failed to make this point to the reporters, as well as his comment above, which suggests there was some other underlying irritation with Shafter that he was unwilling to divulge publicly. That irritation had its genesis early in the preceding week when Shafter requested 500 hospital attendants, 100 nurses, a large contingent of doctors, and two regiments of soldiers—all immune to yellow fever—be immediately dispatched to Cuba.<sup>51</sup> This action garnered the War Department's full attention. Secretary of War Alger, who was confident in the reports provided by Sternberg that the epidemic had been checked by moving troops to higher ground, became alarmed and demanded an estimate of yellow fever cases within the V Corps by regiment. Shafter responded on July 22 that he was not certain, but believed that fever cases were increasing. The following day, he estimated 1,500 men had fever, with yellow fever accounting for only about 150 cases; every regiment was affected. However, two days later, he

telegrammed Corbin, “Notwithstanding figures, the situation somewhat improving.”<sup>52</sup> Shafter was frustrated and fearful that Alger would refuse to let his army return home if the epidemic expanded, so he did not relay the true magnitude of the growing crisis to Washington until July 28 when sick call reports demonstrated that 4,270 soldiers—nearly a quarter of his men—were sick, 85 percent with fever. As the V Corps commander grasped the enormity of the problem, he began to panic. He complained he had too few doctors and intimated to Corbin that the surgeon general did not fully appreciate the gravity of the situation. This peeved Sternberg, who replied publicly that he was well aware of V Corps difficulties. Sixty-five immune physicians and 120 immune nurses had already arrived, and another 25 doctors and 65 nurses would depart over the next two days. He also advised Shafter to employ those recovered from yellow fever as hospital attendants.<sup>53</sup>

The wisest course of action to contend with yellow fever was to change campsites frequently, treat patients in place, and allow the outbreak to burn out before sending troops home, thereby precluding its introduction into the United States. Shafter complied with moving campsites. However, Acting Chief Surgeon Valery Havard wrote to Sternberg on July 31: “The sanitary condition of the army is far from being satisfactory; in fact it is quite bad; at least 20 per cent. of all troops present are totally unfit for duty, while 5 to 10 per cent more, although not excused from duty would be incapable to march or do any hard work.”<sup>54</sup> He attributed this condition to a “peculiar form of malarial fever” that “lasted five to six days without distinct remissions or intermission, and responds to very large doses of quinine, 20-40 grains a day,” and would frequently recur multiple times over a two-week interval.<sup>55</sup> Havard identified the real medical issue on the island precisely: malaria cases had eclipsed those of yellow fever. While both *Plasmodium falciparum* and *Plasmodium vivax* were endemic on the island, it was the nonfatal *P vivax* that predominated and accounted for the vast majority of fevers. *P vivax* has an average incubation period of 17 days. Therefore, it was not until July 22 that it began to affect the V Corps.

Shafter and the V Corps wanted to come home. Alger permitted—upon Shafter’s recommendation and Sternberg’s concurrence—a portion of the dismounted cavalry division to embark for the planned recuperation camp at Montauk Point, Long Island, on August 1. This was based on the fact the division had been camped on high elevation, and all suspicious fever cases would be held back. The War Department had initiated the establishment of rest and recuperation camp at Montauk Point on June 3. Alger had assumed a leisurely pace in establishing the camp because Shafter had not registered any real alarm over the health of his command up until the end of July. That changed on August 2. Shafter informed Adjutant General Corbin, “I am told that at any time an epidemic of yellow fever is liable to occur. I advise the troops be moved as rapidly as possible while the sickness is of the mild type.”<sup>56</sup> Furthermore, medical supplies were nearly exhausted. Alarm again raced through the halls of the State and Navy building, and an emergency meeting was held in the White House to discuss a course of action. Sternberg reaffirmed his belief that it was safe to bring the army home because of the mild nature of yellow

fever encountered and the isolated, northern location of Montauk Point. If the military situation would not permit this, then he insisted the army could be moved to higher elevations in the interior, where yellow fever did not exist, and Shafter's fears would be groundless. His opinion carried the day. McKinley and Alger were not yet confident the military situation was stable enough for forces to be removed from the island, so Shafter was directed to move his command once again, this time into the mountains at the end of the San Luis railroad.<sup>57</sup>

Upon receipt of this order, Shafter prepared a lengthy report detailing the true state of his command. Moving camps had had no effect on yellow fever incidence, but had only further fatigued his soldiers who were already weakened by malaria. He claimed 75 percent of his army had malaria, and they were "really an army of convalescents."<sup>58</sup> Shafter concluded by stating the only reasonable action was to bring the army home immediately. Before sending the report forward, he conferred with his subordinate commanders and surgeons who not only gave verbal concurrence, but also drafted a memorandum in support of their commander's decision. All surgeons involved agreed the prevailing malarial fevers had reduced the army to its current pathetic state.<sup>59</sup>

This document would become the infamous "round robin" letter. It was read in the major U.S. newspapers on August 5 almost as quickly as it was read in the War Department. The letter astounded the American public with the first description it received of the true state of health affairs in the Caribbean. The administration in Washington was angered and embarrassed not only because the letter had been leaked to the press—perhaps with Shafter's assistance—but also because it was printed alongside the announcement that the army would be coming home immediately. While the decision was based on Shafter's communiqué, the perception across the country was that an insensitive bureaucracy had reacted to the crisis only after it realized the plight of the army would be made public. In truth, Sternberg had issued a directive concerning the proper organization, equipment, and manning for medical transports on August 3, and Secretary of War Alger issued orders for V Corps to embark to Montauk Point the following day. Shafter attempted to mitigate the damage of the "round robin" letter afterward by stating fresh and well-supplied troops would encounter little risk from diseases in Cuba; however, he bolstered animosity toward the Medical Department by declaring Sternberg solely responsible for the lack of medical supplies and attendants, and the horrible incidents on the transports.<sup>60</sup>

The administration's knee-jerk reaction was to have Shafter begin loading his soldiers on transports and hope the reception camp would be prepared enough to receive them when they arrived. Alger put Brigadier General Samuel M. B. Young in command of the Montauk Point site, named Camp Wikoff in honor of Colonel Charles Wikoff, 21st Infantry Commander, who had been killed at San Juan Hill. Sternberg gave Colonel and Assistant Surgeon General Henry Forwood the chief surgeon duties. In his instructions to Forwood on August 6, he envisioned a detention camp for 4,000 to 5,000 troops placed near the landing with a supporting 250-bed hospital, in addition to the 500-bed hospital already staked out. Soldiers

arriving on ships with confirmed or suspected cases of yellow fever would go into the detention camp, and suspected cases would go into the hospital for observation. Sternberg ordered a steam disinfector from the Marine Hospital Service, gave specific instructions for building a disinfection facility, and promised to find a yellow fever expert for duty at the camp. He also cautioned Forwood, "Let us try and do this thing in such a way that there may be no criticism of the Medical Department."<sup>61</sup>

At the time he penned these words to his old friend, Sternberg was feeling such criticism acutely. The previous week Dr. George F. Shradly, editor of the *Medical Record*, published two scathing editorials that branded the Medical Department as disorganized and incompetent in regard to the transports and an utter failure in providing for the sick and wounded in Cuba while praising the Red Cross. Sternberg was incensed and wired the following to Nicolas Senn: "I depend upon you to answer Shradly's unfair editorials in the *Medical Record*. . . . Talk with Torney about it."<sup>62</sup> Four days later, Sternberg sent a long telegram to the *Medical Record*: "Large quantities of additional supplies, dressings, etc., sent to Tampa. Have objected to sending female nurses to camps of instruction or with troops to Cuba. We have trained Corps of non-combatants enlisted to care for the sick and wounded. . . . Have gladly accepted services of trained female nurses for General Hospitals and think highly of them. Red Cross and other volunteer organizations should furnish their own transportation. They are constantly applying for transportation for their agents and female nurses. I have not refused their assistance when needed. Shradly came to my office with a Committee from New York. I told them an emergency might arise in which they could be very useful, and advised them to equip a Hospital Ship and send to Cuba. The assistance they have rendered is trifling compared with the work done by our Medical Officers and Hospital Corps. They ignore this and magnify the importance of their own service. They send a female newspaper reporter as a Red Cross nurse and she writes sensational articles for the *New York Sun*."<sup>63</sup> Sternberg sent more composed replies, addressing each of these topics, to the *Medical Record* and *Medical News*, which were immediately published.<sup>64</sup>

The transport dilemma, however, continued to plague the surgeon general as if it had a life of its own. The *Concho* docked at New York on the evening of July 31 with 183 patients, one physician, and eight Red Cross nurses. Colonel Charles C. Byrne, Chief Surgeon, Department of the East, inspected the ship and reported to Sternberg, "...I saw enough to satisfy me that things were not as they should have been. . . . Six patients died and several others appeared to be in a hopeless condition."<sup>65</sup> A few days later, the transport *Santiago* brought not only embarrassment, but also anger when the *New York Times* responded with a professional and personal attack on the surgeon general. The *Santiago*, with 180 convalescents aboard, had docked at Egmont Key, the quarantine station for Tampa, which had been prohibited by Sternberg as a convalescent landing point because no medical facilities existed there to receive them. Sternberg responded to questions by stating, "I did not know. . . . the *Santiago* was coming with sick or convalescent soldiers. If I had heard. . . . she was making for Egmont Key I should have directed. . . . my former orders be obeyed. . . . But the shipment of convalescents and returning men

is matter with the line officers at Santiago or Siboney. They may send back whom they please, and the Medical Department cannot prevent it.”<sup>66</sup> But the correspondent, Stanhope Sams, clearly intended to indict Sternberg for this error. Sams did a bit of nosing about the War Department until he found an officer “familiar with the relations of the line and medical officers,” who was glad to put the knife into Sternberg and Alger and slap the Quartermaster Department in the process.<sup>67</sup> He commented that “some quartermaster, anxious to get the job off his hands, hurried them [the convalescents] on board...and dispatched the ship to the first point suggested.... The trouble with the Medical Department of the Army is that unless it has a very strong, bustling, forcible head, and the War Department has a head that will work in with the head of the Medical Department, it can accomplish little.... It does not make any difference how fine and accurate a scientist or theorist the Surgeon General is...unless he can also be an executive officer. It does not do to write an order and think that something has been done. The chances are that it will not be done unless...the officer is a man of sufficient force, impressiveness of address, and persistency to badger the Secretary of War until his requests have been attended to — not merely promised.”<sup>68</sup> For all of his supposed familiarity with the interactions of Medical Corps and line, the anonymous officer demonstrated a remarkable ignorance of them, army administrative procedure, and the events of the past three months.

Sternberg kept his finger on the pulse of activities at Montauk Point as rumors circulated that Alger was going to force his resignation.<sup>69</sup> He was in daily telegraphic contact with Forwood, coaching and advising without micromanaging. To cut red tape early on, the surgeon general authorized him to purchase supplies directly from the New York depot, contract for physicians and nurses as required, buy and use disinfectants lavishly, push hard to get a laundry facility built, and have 100 hospital tents available for immediate use while hospital construction was underway. Sternberg also reminded him the Secretary of War ordered no pains or expenses to be spared in establishing these medical facilities and obtaining everything necessary for the patients. With this in mind, the surgeon general asked for an additional \$500,000, which he received on September 8, to complete the project. But avoiding criticism was impossible. As with every other operation during the war, at Camp Wikoff too much was expected too fast from limited resources. From the outset, the single-track railroad and its terminus at Montauk Point were too small to handle the large amount of material being delivered. The Quartermaster Department could not provide sufficient wagons and animals to transfer these materials to the various construction sites. Boring wells in the rocky terrain made obtaining ample water a major problem; therefore, drift wells had to be dug, the water had to be slowly pumped into storage tanks, and every drop boiled before consumption. Late on August 7, 3,500 men from the 6th cavalry with a couple thousand horses and mules began to descend on the camp without tents, baggage, or any provisions. The 6th Cavalry, which was left behind at Tampa in June for want of transports, was now believed to be at risk for a typhoid epidemic. The War Department directed the cavalry to Camp Wikoff, hoping it

could assist with construction, but in reality it only became another burden for General Young and his chief surgeon.<sup>70</sup>

Finding enough skilled carpenters, haggling over wages, and rain caused the construction of the pavilion-style hospitals to progress by starts and stops. Each ward consisted of six joined tents and accommodated 30 patients. Forwood reported he had “all kinds of medical and hospital property in abundance and under cover,” but what he really needed was more physicians and nurses.<sup>71</sup> Sternberg successfully opened a pipeline for personnel by contracting physicians and nurses as rapidly as he could, and female nurses began to arrive on this day. Help was accepted from the Marine Hospital Service, Red Cross, American National Relief Association, and Sisters of Charity. He brought Major William Borden with a group of contract physicians, female nurses, and corpsmen from Key West and deployed more corpsmen from the hospitals at West Point and Washington Barracks.<sup>72</sup>

Hordes of reporters, physicians, philanthropists, and tradesmen descended on the camp. Although eager to help, they only added to the congestion and fanned the flames of impending disaster in the newspapers. Others—like Governor Frank S. Black of New York—were more focused on what infections arriving troops brought with them to Montauk Point’s shores. While yellow fever was the most terrifying disease to the public, the danger of a typhoid fever epidemic on Long Island generated tremendous angst. By August 11, the day Black sent his health officer, Dr. Alvah H. Doty, to visit Forwood, the papers were buzzing with typhoid tales from the mobilization camps, and the *Relief* was on its way carrying 260 sick soldiers, mostly typhoid cases. The governor doubted the Medical Department’s ability to contain the disease. Doty was supposed to pressure Forwood into sending all typhoid patients to New York and Brooklyn hospitals or else he would quarantine the entire camp. However, Forwood said no. From experience, both Forwood and Sternberg agreed typhoid patients fared better in tents rather than in fixed general hospitals. Furthermore, sending diagnosed patients elsewhere would not preclude typhoid from entering the camp, and the surgeon general had confidence that disinfection of excreta would keep it from escaping. For Sternberg and Forwood, the real issues were providing proper patient care and maintaining enough bed space. Civilian and military hospitals closer to New York Harbor would shorten evacuation and provide extra bed space. Sternberg gave Forwood total decision-making authority at Montauk Point, but he directed Colonel Byrne to send all typhoid cases from the *Relief* to New York and Brooklyn. Then he informed the governor and his health officer that he would not be dictated to on the subject as they had no jurisdiction over a federal encampment.<sup>73</sup>

On August 18, the day the general hospital was completed and construction of a 500-bed annex immediately began, 730 patients were receiving care and another 500 were waiting on transports. Forwood’s hospital census reports and the scheduled arrival times of transports made Sternberg concerned that the medical facilities would soon be overrun. Had he and Forwood significantly underestimated the V Corps sick rolls? To keep beds open, convalescents would have to be furloughed or



evacuated to other facilities. Medical officers had been given approval to furlough those well enough to travel the previous week. To provide care for typhoid cases and convalescents still too weak to travel long distances, Sternberg coordinated for the use of facilities at Forts Hamilton, Wadsworth, and Columbus as well as local New York, Boston, New Haven, and Philadelphia hospitals. Sternberg advised Forwood to keep patients aboard the *Olivette* until steamers could begin transferring patients out. The rapid construction of annex wards by August 20, however, appears to have relieved the pressure enough for Forwood to telegraph "I feel confident I can take sick as fast as they come."<sup>74</sup> And they came. By August 24, there were nearly 1,500 patients in the detention and general hospitals and the hospital annex that was still under construction. At least 500 patients had been evacuated to city hospitals, and the steamer *Catania* was inbound with another 410 patients aboard.<sup>75</sup>

By late August, patients were being continuously received, evaluated, treated, and shipped out by scores of doctors, nurses, and corpsmen. Under Forwood's competent administration and leadership, medical operations slowly, but steadily, improved. This was noted by the *New York Times*, but never expanded upon.<sup>76</sup>

The last of Shafter's troops docked at Montauk Point during the first week of September. On September 10, Forwood told Sternberg "There are over 1,000 vacant beds in the three hospitals. Everything is running smoothly.... There is nothing for me to do here now...."<sup>77</sup> Forwood was exhausted. The surgeon general replaced him with Greenleaf, who directed operations until the camp closed in October. The camp had processed 14,000 patients, and of these only 257 died.<sup>78</sup> No typhoid epidemic had occurred as predicted by the governor, Doty, and even Colonel Nicholas Senn; nor had yellow fever made a viable presence in the camp.

Until early August, public attention had been focused on the army and its difficulties in Cuba. Miles' three-pronged assault on Puerto Rico that started on July 25 attracted little adverse comment. The redeployment of the V Corps to the United States, however, shifted public attention not only to Camp Wikoff, but also to the other camps where the majority of volunteers had spent the war. On August 6 and 7, the *New York Times* informed its readers that typhoid fever had broken out at Camps Alger and Thomas. Three days later, one of its first front-page articles covered the status of medical care in Camp Thomas at Chickamauga Park, Georgia. The heartrending story, given by Captain William F. Morris of the 9th New York Volunteers, told of sick soldiers languishing under poor medical care and their fear of the hospital. According to Morris, the camp was "a modern Andersonville."<sup>79</sup> If the content of the article did not generate indignation among its readers, the comparison of a contemporary mobilization and training camp to the infamous Confederate prison most certainly did.

Unlike Camp Wikoff, the major mobilization camps—Alger near Falls Church, Virginia, Thomas at Chickamauga Park, Georgia, and Cuba Libre near Jacksonville, Florida—had been selected in April and May by a three-man commission appointed by Alger without input from the surgeon general. With the exception of Camp Alger, however, it is doubtful Sternberg would have balked at the selections. Camps

Thomas and Cuba Libre were spacious and had abundant pure water sources. What turned these camps into the pestholes—described by reporters in August—was the massive influx of inexperienced and undisciplined volunteer soldiers. In the government's rush to war, Sternberg noted a repetition of Civil War era mobilization practices that should have been altered by current medical knowledge and past experience. The haste in which recruiting was accomplished precluded proper medical examinations and, therefore, men sick with typhoid and other infectious diseases were accepted for service. They became the nidus for various camp infections. This problem was compounded by a reduction in the recruiting age to 18 years. These militarily and immunologically unseasoned boys swelled the ranks and the sick call lists with cases of measles, chickenpox, upper respiratory infections, and, as the summer progressed, typhoid fever. Sternberg was under no illusion that typhoid fever could be kept out of the mobilizing army entirely. The disease was endemic throughout the United States, and even a careful medical examination would not reveal those incubating the disease. Although William Budd had described the transmission of typhoid through infected feces and soiled hands and the role of disinfectants in halting this transmission in 1873, appropriate camp sanitation would not preclude occasional local outbreaks, but it would at least reduce the impact of typhoid and other diseases. Guidance provided by Sternberg in Circular No. 1 was based on these principles. Regrettably, the majority of line officers were no more experienced or disciplined than the recruits, and many volunteer and contract physicians were ignorant of the medical science upon which the circular was based. Sternberg's guidance was met with indifference or it was ignored. Camps became overcrowded, bivouac sites were poorly located, company latrines and refuse pits were placed too close to living quarters, and bathing facilities were inadequate. Soldiers defecated promiscuously about the camps, quenched their thirst from the nearest water source, and ate indiscriminately from local food vendors.<sup>80</sup>

Sternberg was aware of the potential, but never expected the large epidemics that engulfed Camps Alger and Thomas. The volume of work in his office was overwhelming. He read many sanitary reports, but could not possibly keep all of the information at hand on a daily basis. Furthermore, some sanitary reports that should have been made through command channels never reached the Surgeon General's Office or, if they did, were filed before Sternberg had read them. By his own admission, he was not aware of the unsanitary conditions of these two camps until the newspapers brought it to light. At the end of July, he sent Walter Reed on a whirlwind investigative tour of general and division hospitals at Camps Alger and Thomas, Forts Thomas, McPherson, and Monroe to discern the cause of these administrative deficiencies. Although sent to put paper trails in order, Reed's keen eye undoubtedly also assessed the sanitary status of the camps for his chief. The following week, Lieutenant Colonel Alfred A. Woodhull was dispatched to Camp Thomas to make a thorough sanitary inspection. His report reached the surgeon general on August 7. Once apprised of the true state of affairs in the camps, Sternberg believed the epidemics were in large part resulting from the undisciplined behavior of individual soldiers and disregard of his original directives concerning camp sanitation by inexperienced officers. He opined

the situation at Camp Alger to be serious, but not alarming, and this was confirmed a week later when surgeons there reported the epidemic was under control. However, this was not the case for Chickamauga. The epidemic continued there unabated until hospitals overflowed and services were stretched to the breaking point.<sup>81</sup>

On August 6, Adjutant General Corbin directed a sanitary investigation be conducted. The board consisted of three brigadier generals of volunteers, J. P. Sanger, Charles P. Mattocks, and Charles F. Roe, but medical representation was conspicuously absent. Their report of August 15 was a well-written, but weak defense of the volunteer officer corps at Chickamauga. While admitting that before August 1 general sanitation and policing of the camps had been less than desirable due to inexperience in the field, the board concluded the following:

1. if the Quartermaster Department had provided enough kettles and barrels for boiling and storing, then water transmission via this medium would have been stopped; and
2. had the Medical Department not stripped the regiments of surgeons, then general sanitation would have been attended to and patients would have been better cared for.<sup>82</sup>

Sternberg disagreed strongly with both of these conclusions. Three days after Sanger submitted his report, Sternberg established the Typhoid Board to conduct an epidemiological investigation of the disease in the major camps. Although the timing is interesting, the findings of Reed and Woodhull earlier in the month and the increasing number of typhoid cases and deaths motivated the creation of the board, rather than Sanger's report. Sternberg also recognized typhoid was becoming another in an expanding list of Medical Department scandals. Therefore, he selected the board's membership carefully. The indefatigable and experienced Reed was put in charge with Victor C. Vaughn and Edward O. Shakespeare to assist him. Sternberg shared a long professional history with all of them. Vaughn and Shakespeare were not only accomplished bacteriologists, but also experienced and trusted civilian public health experts. Their presence would lend credibility to the investigation and preclude accusations of a government cover-up.<sup>83</sup>

From August 20 to October 10, the Typhoid Board members visited the camps. They collected 1,000 pages of testimony from a large number of medical officers and carefully recorded their own observations on every detail of camp sanitation and hygiene. Upon their return to Washington, they made a thorough study of monthly sick and wounded reports for 118 regiments compiled in the Surgeon General's Office. Although the final report of the board would not appear until 1900, its initial findings were significant. Typhoid in the camps did not result from impure water as was commonly believed and reported in the newspapers, but rather from a disregard for personal and unit sanitation and hygiene. Soldiers had brought the disease with them from civilian life. These carriers deposited typhoid bacilli in the latrines and on the ground before they became ill, and then, by way of soiled hands and flies, the disease was transmitted to kitchens and dining tables. Moreover, medical officers, particularly among the civilian volunteers, were

failing to recognize half of the typhoid cases encountered, calling them malarial or typhomalarial. To preclude further diagnostic errors, the board recommended each camp be equipped to perform blood examinations for malaria and to use the Widal test for typhoid fever.<sup>84</sup>

By the end of August, Sternberg was weary. The medical fiasco on Cuba and his tiff with Shafter had led to printed rumors that Alger was ready to relieve him. He had to continually explain he was not hostile to the American Red Cross, but truly did appreciate its efforts. Newspaper editorials labeled him an incompetent and a murderer, indicted him for an unending litany of medical failures based largely on emotion, placed unrealistic responsibilities on him while wholly ignorant of military command procedures and combat realities, and labeled his bacteriological work a distraction that led to unnecessary suffering and death. His home was no longer a haven for rest and recuperation, but had become a second office where he answered phone calls and telegrams constantly and consoled a continual parade of distressed relatives. In his heart and mind, Sternberg knew he had done everything in his power to ensure appropriate medical support had been provided on two foreign fronts and in the stateside training camps as quickly as the crisis permitted. Sternberg felt it was a stunning and hurtful blow that the American public felt this was not enough and that trust in him had been misplaced and abused. Mrs. Sternberg felt her husband's emotions acutely, and the editorials cut her to the quick. The early excitement of the war had been reminiscent of those long ago days at Fort Lapwai. Then she worried about his physical safety; now she fretted over his psychological well-being and his apparent precarious status within the administration. She became so upset over the criticism that she stopped making her routine visits to the First Lady. When McKinley learned of this, he told Sternberg to bring her to the White House for a "needed lesson in politics."<sup>85</sup> McKinley regretted tremendously that she had taken press accounts so much to heart. He reminded her most of the criticism was only for political effect and "history would reveal that we had all done our duty, and in the meantime we had at least the approval of our conscience."<sup>86</sup>

Although McKinley's words relieved Mrs. Sternberg's fears that the war had splintered their friendship, they did nothing to allay Sternberg's intense indignation. He had remained confident that he and his supporters could adequately explain their position through the lay and professional press and defend himself from what he considered—and historical investigation bears out—was unduly harsh professional and personal criticism. But the American public was not listening. Sternberg recognized only through an open and thorough inquiry by a disinterested committee that he and the Medical Department would be cleared of misconduct and neglect. On August 27, he asked Alger for a general investigation of the Medical Department and five days later made public his readiness and desire for the same whenever the War Department saw fit to do so. On September 8, he received his wish. McKinley directed the appointment of a commission to thoroughly investigate the army's management of the war. Retired General Grenville M. Dodge, an Iowa businessman prominent in

the Republican Party who had publicly defended the Army over the previous months, accepted the chairmanship. Through the fall, the commission scrutinized every aspect of army administration. The Secretary of War and all the bureau chiefs were minutely questioned. Officers, enlisted men, nurses, physicians, charity workers, and concerned citizens provided testimony, and army camps were inspected.<sup>87</sup>

With the Dodge Commission, Sternberg saw an opportunity for vindication. When directives arrived on his desk from the Dodge Commission later in the month, he directed his staff to prepare answers on Medical Department organization, staffing, logistics, hospitals, and evacuation, and he invited the commission to visit his office to assess its organization and work practices. He, too, prepared comprehensive memoranda of his department's execution of the medical mission. Regrettably, there were no solid preliminary conclusions from the Typhoid Board to assist in the defense as Sternberg prepared to give his testimony on December 8. It proved to be a long and grueling day. He answered 370 questions that covered every aspect of medical activity from personnel and equipment to rations and reports of physician drunkenness. Toward the end, fatigue set in and his temper began to rise, but he quickly rallied from the former and gained control of the latter. When he left the Lemon Building in downtown Washington, Sternberg was satisfied that he had honestly defended the Medical Department, his officers, and himself to the best of his ability.<sup>88</sup>

In its report of February 1899, the commission was satisfied the problems experienced by the Medical Department during the war did not result from improper management and wanton neglect. Its most damning conclusion was the department had failed in its primary duty to protect the health of the soldier by not having a corps of medical inspectors and/or insisting on timely sanitary reports. But the impact of this statement faded significantly when placed alongside the other seven conclusions concerning the Medical Department. The commission found, as a result of poor administrative methods and cost-containment initiatives that had developed over a generation, that Sternberg had been precluded from preparing for—or responding to—the 10-fold expansion of the army with men or materiel in a timely fashion. The demands made on the department were “much greater than had been anticipated,” and it had been “seriously crippled in its efforts” to provide all medical and hospital supplies.<sup>89</sup> While the commission chided the surgeon general for not employing female nurses early on, it recognized the lack of a sufficient nursing force resulted from congressional failure to authorize the establishment of a hospital corps in the volunteers. The commission also noted that “a vast deal of good work was done by medical officers, high and low, regular and volunteer, and there were unusually few deaths among the wounded and the sick.”<sup>90</sup> The commission recommended the surgeon general be granted the authority to increase the number of commissioned medical officers, establish a volunteer hospital corps during wartime and a reserve corps of trained women nurses, stockpile a year's supply of medical stores for four times the actual army strength, manage Medical Department transportation, and simplify administrative paperwork for increased efficiency.<sup>91</sup>

To Sternberg, the facts had been presented to an unbiased panel of judges who had deliberated on the evidence, rendered their verdict, and made the proceedings available to the public at large. He and the Medical Department had been—for the most part—vindicated and that was the end of it. This was true, at least contemporaneously. Republicans maintained control of Congress in November, Alger remained as Secretary of War, Sternberg continued as surgeon general, and the McKinley administration would win reelection in 1900. While the public did not demand a sacrificial lamb or two from the administration, the War, or Medical Departments, historians would not be so kind.

Sternberg has been painted as a brilliant, but austere, obstructive, and lazy man who was “authoritative and disdainful of contradiction” and detached from other human beings or their suffering.<sup>92</sup> He was seen as unaggressive, wholly innocent of army politics and administration, and ignorant of military organization and his duties as surgeon general. These assessments of Sternberg lack a genuine grasp and appreciation of his personality; his character as a man, physician, and soldier; and his abilities as a military officer. Moreover, they fail to consider the limitations of his office in the overall command and staff structure of the army and the boundaries of his personal span of control. Historians have perpetuated a myth while ignoring the genuine flaws in Sternberg’s decision-making and their origins.<sup>93</sup>

Sternberg’s failures in the spring and summer of 1898 have their origins in his almost 40 years of experience with the traditional organization, regulations, and procedures of the 19th century army. He and nearly all of the line commanders and bureau chiefs were Civil War veterans. With the exception of Joseph Wheeler, none of them had commanded anything larger than a regiment or—in Sternberg’s case—a general hospital during wartime. The post-Civil War army was an extremely small and scattered constabulary that for the most part fought skirmishes, not battles, fell into a routine that changed little from year to year, and could be administered from Washington without significant difficulty. Sternberg and his peers had been doing the same thing, in the same place, with the same tools and austere budgets for so long that to think and act with vision on a broader scale—as the campaigns of 1898 demanded—was impossible within the timeframe of the conflict. Sternberg acted as rapidly and effectively as could be expected under the circumstances to advise the army concerning disease threats and build the robust Medical Department required. However, his judgment failed him significantly four times. Although each of these decisions was made independently early on, they all came home to roost in August.

First, he and Juan Guiteras erred when they vacillated on the threat posed to the army by yellow fever and malaria. Sternberg had the trust and confidence of the president on all medical matters. He was an internationally renowned subject matter expert on both maladies. He knew both diseases were endemic on the island and had an intimate understanding of the impact of these diseases on past armies. It is almost inconceivable that he would allow any doubt to shadow McKinley’s mind over the inevitable consequences of a summer campaign, but apparently he did. If Sternberg had remained immovable on this issue with Miles, then it is possible—

although unlikely—that the president may have opted to postpone the invasion while continuing with a naval blockade.

Second, Sternberg failed to recommend the general use of quinine for malaria chemoprophylaxis. This is also difficult to understand. Although quinine is a poor chemoprophylactic agent—acting to suppress rather than eliminate the disease—it was the only one available at the time. He was familiar with the success of quinine prophylaxis among Civil War surgeons as well as those of the British Army and Navy on African station and the French Army in Algeria over the past 40 years. He had written favorably of quinine prophylaxis in 1883 and was aware that leading medical experts, such as William Osler and Patrick Manson, both advocated its use in malarious areas.<sup>94</sup> Furthermore, quinine was always abundantly available to the army surgeons in Cuba.<sup>95</sup> Its use may have precluded the development of an army of convalescents, and hence the precipitous embarkation of V Corps to an unprepared Camp Montauk.

Sternberg's third and fourth errors—losing sight of the health status of the training camps through poor reporting and not deploying a sufficient number of female nurses—appear at first blush to stem from a reluctance to break with traditional army practices and procedures. Although reporting procedures from field surgeons to the surgeon general went through a logical and appropriate command chain and army nursing was the province of men, these are thin excuses for the medical misadventures in the training camps. Sternberg was cognizant of the endemic nature and epidemic potential of typhoid fever, the immunogenic naiveté of 18-year-old recruits, the undisciplined inexperience of volunteers in camp, the unfamiliarity of volunteer surgeons with regular army healthcare practices, the shortage of hospital corpsmen for nursing duties, and the fact that he had too few officers on his staff to conduct routine inspections of the camps. Forearmed with this knowledge, he should have had a higher index of suspicion for problems in the camps and should have required a weekly status report be sent directly to him from the chief surgeon of each camp. Sternberg expected the regular army medical officers he put in positions of authority in the camps to perform division-level administration, patient treatment, and training of a large number of volunteer and contract surgeons in army administration and field sanitation. These expectations were unrealistic. While some novice army surgeons resisted the training, others and their commanders refused to let the traditional regimental hospital system die. If Sternberg had demanded more frequent and direct communications from his chief surgeons, then he would have realized he was asking too much from too few, and the resistance to proper sanitation and hospital management had primed the camps for a medical disaster, most likely in the form of typhoid fever.

Tied directly to the foregoing is Sternberg's failure to employ female nurses until the typhoid wave had crested and broken on the camps. With inadequate numbers of regular army hospital corpsmen, Congress' refusal to support a volunteer hospital corps, and the tendency for National Guard corpsmen to serve in nonmedical roles, the surgeon general had only two options for providing nursing care: he could hope recruiting efforts for competent corpsmen improved and filled the

ranks rapidly, or he could employ appropriately trained and eager female nurses immediately.<sup>96</sup> Regrettably, Sternberg chose the former solution and sent nurses only when requested by the hospital commander. His decision does not appear to be related to a lack of faith in their abilities or that women would be exposed to the realities of army camp life, but rather to the animosity held by a number of his medical officers for female nurses in general. While Sternberg's respect for the autonomy of the hospital commander is commendable, in this instance it proved to be disastrous to mission accomplishment. Had he exerted his authority as surgeon general on this issue earlier, general and division hospitals would have provided better care, and the sharp criticism he received in reducing the capabilities of the regimental hospital would have been—to some extent—blunted.

It has been said the war destroyed Sternberg's reputation as an eminent epidemiologist and bacteriologist.<sup>97</sup> This, too, is a myth. Whereas he was severely misunderstood by a medically and militarily uneducated or uninformed public, neither the military nor civilian medical communities lost faith in his abilities as a physician and scientist, nor did the officers of the Medical Department as a whole feel their trust in him as a leader had been misplaced. Sternberg successfully applied knowledge gained from the hard lessons of the Cuban campaign to a new insurgency war in the Philippines. Moreover, he immediately recognized the projection of American influence into the Caribbean and South Pacific held great potential for the advancement of medical science through the auspices of the U.S. Army Medical Department.



## Chapter Thirteen

# Empire and Insurrection

Admiral George Dewey's victory over the Spanish fleet in Manila Bay was a decisive moment in American history. While the seizure of Manila was a valuable bargaining chip for the McKinley administration in its efforts to liberate Cuba, a secure port there forged another link in a chain of Pacific Islands leading to Asian trade markets. President William McKinley, however, was extremely hesitant to commit the nation to a policy of annexation, and this led to ambiguous and confusing directives from the White House. American authority would be absolute in protecting the people of Manila and their property and individual rights, assisting in resuming trade, and ensuring local laws were upheld; but no recognition was to be extended to Emilio Aguinaldo's rebel government. Whether the expeditionary force was to subdue and secure only Manila or all of the Philippine Islands was never made clear. It was a situation that condemned Major General Wesley Merritt, commander of the Expeditionary Force to the Philippines, and his successor, Major General Elwell S. Otis, to a reactionary mission execution strategy.<sup>1</sup>

The Expeditionary Force to the Philippines, the Eighth Army Corps, landed at Cavite and established Camp Dewey near the village of Tambo some four and a half miles south of Manila at the end of June. Merritt convinced the Spanish commander to surrender after a sham engagement to satisfy Spanish honor and keep the Filipinos from entering the city on August 13. This left an irate Filipino army in the surrounding suburbs. Clashes between U.S. forces and Filipinos began almost immediately. Merritt worked aggressively with Aguinaldo to diffuse an extremely explosive situation and get Washington to define its mission and specify rules of engagement for self-defense. To complicate matters, General Nelson A. Miles continued to limit the size, composition, and duties of the Eighth Corps. Tired, frustrated, and in ill health, Merritt asked to be relieved and was replaced by Otis at the end of August.<sup>2</sup>

On the other side of the globe in Paris, Spanish diplomats—without bargaining options—agreed to American terms for peace. The United States held Cuba in trust and put her on the road to independence, but Spain assumed the Cuban

war debt. Puerto Rico and Guam became American islands, and Spain ceded the entire Philippine archipelago to the United States for \$20 million. The Treaty of Paris, signed on December 10, ended hostilities with Spain and gave America a new colonial empire.

For Major General John R. Brooke, the new military governor of Cuba, and General Guy V. Henry, commander of the Department of Puerto Rico, instructions from the president were clear: the interests of the indigenous populations were paramount, administration was to be based on laws not military force, and the end stage was an environment that provided Cuba an independent government and a stable civil government on Puerto Rico. For Otis, the president's intent was not so obvious. McKinley and his advisors minimized the risk of war with Filipino nationalists and regarded a secure Manila as a sufficient start point for the expansion of U.S. sovereignty based on an overly optimistic and naive belief that once Filipinos experienced the benefits of the American way of life, annexation would be accepted and conflict would be avoided. Essentially, this was the president's benevolent assimilation policy, but little guidance for its implementation was forthcoming.<sup>3</sup>

Otis, a moody, undiplomatic, cantankerous, and parsimonious man, would become a much-maligned commander. However, he had the intellect to grasp the civil and military missions he had inherited and the managerial experience to see them accomplished. The first priority was to expand the American perimeter around the city. Otis, through the threat of violence rather than diplomacy, pushed Aguinaldo's Army of Liberation out of the suburbs. Although the Army of Liberation contested some areas now held by the Eighth Corps, Otis recognized he could only keep the peace by eliminating insurgents from Manila and, thereby, more easily implement McKinley's plan of benevolent assimilation. This larger task, centered upon cleaning up the city and maintaining the health and discipline of the soldiers, demanded a multidisciplinary approach for success. The provost marshal, Brigadier General Robert P. Hughes, employed three regiments and the engineer contingent to reestablish a police force, organize public works and sanitation programs with inspection teams, and create a public education system. A public health department was established under Hughes' command, and Henry Lippincott expanded medical services. The old Spanish hospital beyond the walls of Manila was refurbished and enlarged with tents to become the First Reserve Hospital with 800 beds. A female seminary was converted into the Second Reserve Hospital of 300 beds, and on Corregidor Island a Convalescent Hospital of 280 beds was established. The original hospital facilities in Cavite became a District Hospital for use by the regiment and smaller commands in that town. The Medical Department had ample funds and abundant supplies from the states as well as some procured locally and sufficient space for storage. Transportation for the sick and wounded was also more than adequate.<sup>4</sup>

As a new year dawned, the Medical Department faced challenges equal to—if not greater than—those of April 1898. Sternberg addressed these challenges from a position of strength and experience that he did not have before the war. With a budget exceeding \$2.7 million, he built and generously supplied and equipped

hospitals in both active theaters and in the continental United States. During the year, four general hospitals were established in the Philippines, four in Cuba, one in Puerto Rico, and one in Honolulu. Each of these hospitals, in conjunction with the regimental and departmental hospitals, was prepared to treat 15 percent of the command in-house and equipped to diagnose malaria, typhoid, and yellow fever by state-of-the-art methods. The hospital ships *Relief* and *Missouri* provided backup holding and treatment support, and the Army Transport Service, established in mid-November, guaranteed the safe evacuation of soldiers to the United States under the care of qualified physicians on well-supplied vessels designated for this purpose. Sternberg assigned Colonel Charles Greenleaf as medical inspector of the army and required a weekly sanitary report from all surgeons in the field and at temporary stations. Medical Department manpower remained a tenuous issue. Large numbers of contract surgeons and corpsmen, who had signed up for the duration of the war, would be leaving the service, and nurse's contracts also were being annulled. For the moment, however, no serious deficiencies threatened army healthcare.<sup>5</sup>

With this essential healthcare infrastructure in place and well funded, Sternberg evaluated the public health situations in the Pacific and the Caribbean. Public health—both for the soldiers and the civilian populations in America's new possessions—would play a major and interdependent role in accomplishing McKinley's goals. Ravaged by war and the departing Spanish armies, whatever public health infrastructure had existed on any of these islands was in a shambles. A board of health had already been established in Manila under the direction of Major and Surgeon Guy L. Edie. Edie, a laboratory student in the first class of the Army Medical School, and his staff would perform heroic work with little support from their commanding general. In Cuba and Puerto Rico, the modest services that had kept some municipal water clean and removed human and animal waste and garbage had been poorly administered by the Spanish and had come almost to a standstill since the Cuban rebellion. These filthy conditions had the potential to preclude McKinley's experiment in exporting democracy to the Caribbean and sicken thousands of the nonimmune regulars destined for the islands in the coming year with typhoid, dysentery, malaria, and yellow fever. Priority of effort went to the Caribbean.<sup>6</sup>

To prepare for occupying forces and obtain a broad understanding of existing public health conditions in Cuba and Puerto Rico, Sternberg directed medical officers to conduct inspections of hospitals and various towns where soldiers were to be quartered to determine their sanitary conditions and disease status and locate potential campsites should units need to move to escape disease. At the same time, he sent Lieutenant Colonel Robert M. O'Reilly to Jamaica to study British field sanitation techniques. The British experience there in reducing morbidity and mortality from all diseases over the past seven decades had been one of continued success. O'Reilly reported the British put a premium on landing healthy, well-disciplined, and appropriately clad soldiers after the end of the rainy season in November and quartering these unacclimated troops at stations located

at higher elevations. These stations had been cleared of underbrush, surface drains and earth-closet system latrines constructed, and clean water supplies established. Barracks were elevated over cement foundations, well ventilated, and not allowed to become overcrowded. Personal hygiene was a priority, and the introduction of the canteen, where soldiers could obtain beer, reduced drunkenness from spirituous liquors. O'Reilly included all of these tenets in some form in his report to Sternberg. Since American troops would not have the luxury of being acclimated, he recommended that "troops for service in Cuba should, as far as possible, be recruited from the Southern States, and a large proportion of these troops should be colored with white officers."<sup>7</sup>

With this combined intelligence, Sternberg had sent recommendations to Adjutant General Henry Corbin at the end of December. The size of the occupation force should be no larger than necessary to accomplish the mission and composed predominantly of southern black soldiers or Cuban natives, as these soldiers were considered more likely to be immune to yellow fever. Unacclimated troops should not be stationed or even be allowed to visit yellow fever infected cities, and they should be on the islands and quartered in fixed barracks before the end of spring when the malaria and yellow fever seasons began. Sternberg included extracts from Circular No. 1 issued in April concerning sanitary precautions and was specific in his recommendations concerning fevers. "Every case of fever should receive prompt attention. If albumin is found in the urine of a patient with fever it should be considered suspicious [of yellow fever] and he should be placed in an isolated tent. The discharges of patients with fever should always be disinfected at once.... No doubt typhoid fever, camp diarrhea, and probably yellow fever are frequently communicated to soldiers in camp through the agency of flies, which swarm about fecal matter and filth of all kinds...and directly convey infectious material attached to their feet or contained in their excreta to food which is exposed.... Whenever a case of yellow fever occurs in camp the troops should be promptly moved to a fresh camping ground located a mile or more from the infected camp.... When cases of yellow fever occur in a camp or barracks under such circumstances as to indicate...the locality is infected the troops should at once be removed. The disastrous mistake has frequently been made of removing the sick and leaving the well in an infected locality."<sup>8</sup>

Sternberg's malaria chemoprophylaxis remained unchanged from the previous year, and he did not mention mosquito bars. Ronald Ross had completed his work describing avian *Plasmodium* species in May, sent Sternberg a copy of it the following month, and wrote him about further experimental results obtained in July and August 1898. He stated plainly: "I do not think that there is much probability in favour of infection by any other means than the bite of mosquitoes of the proper species, e.g. by air or drinking water.... My object in writing this letter may appear rather startling to you. It is to suggest the use of mosquito nets, when practicable for your troops in Cuba and elsewhere, where I understand they are suffering severely from malarial fever."<sup>9</sup>

While these documents did not arrive early enough to preclude the summer fiasco in Cuba, Sternberg had read them prior to the post-war occupation. He, like many of Ross' British colleagues, remained skeptical of the mosquito's role in malaria transmission. Even Ross' mentor, Patrick Manson, believed the mosquito transmitted *Bancroftian filariasis* through water contamination and not through its bite. Sternberg still believed malaria was waterborne, and, if the mosquito was involved, it was because the insect deposited parasites in water that were later consumed by soldiers.<sup>10</sup>

Sternberg, accompanied by Captain Edward L. Munson, made an inspection tour of Havana in the second week of January. They met with Brooke at his headquarters in the Hotel Iglatera located on Havana's main plaza, visited the army medical staff in the city, and toured the Alphonso XIII Hospital, now designated Military Hospital No. 1. The primary concern at this early stage of the occupation was for the continuing health of the incoming U.S. forces. The rainy season would begin in May, bringing with it an increased threat of yellow fever and malaria. Sternberg strenuously recommended to Brooke and his departmental commanders to expedite the cleaning and disinfection of identified barrack facilities so soldiers would be out of tents by that time. Otherwise, commanders would spend more time moving from one uninfected camp to another than assisting the Cubans with nation building. More pressing, however, was another outbreak of typhoid fever, this time in the garrisons scattered over the island. The 8th Infantry Regiment, camped at Quemados, six miles southwest of Havana, had brought typhoid fever with it from the United States; and regimental surgeon Albert E. Truby found his regimental hospital overrun with cases until Military Hospital No. 1 was ready for occupancy. Sternberg feared a repetition of the previous summer and urged a rapid refurbishing of Cuban hospitals for army use and the construction of new army hospitals in provincial towns where none existed.<sup>11</sup>

As to the health of U.S. forces in the Philippines, Sternberg reported to the Senate on February 4 that the sick rate among the Eighth Corps, which had been as high as 17 percent, was now 10 percent, with the large majority of illnesses being only slight ailments. The comparatively large admission rate—3,016 per 1,000 soldiers<sup>12</sup>—was “due mainly to malarial diseases which are climatic and to diarrheal diseases which are no doubt in large part due to errors and irregularities of diet on the part of the affected individuals.”<sup>13</sup> Although venereal disease rates—82 per 1,000—slightly exceeded those in U.S. garrisons—and according to Sternberg most assuredly were underreported—respiratory ailments and overall injuries were far less. The mortality rate from July through October was 9.6 per 1,000 men, only a little more than what was seen in U.S. garrisons during peacetime. Typhoid and smallpox generated the highest death rates, but neither disease gained a substantial foothold within the regiments, and the malaria encountered proved to be nonfatal.<sup>14</sup>

The Philippine Expedition had been for the most part ignored by the American public. This was all about to change. Tensions created by the stalemated negotiations between Otis and Aguinaldo, as the latter attempted to maintain control of

his Army of Liberation and establish a viable government, came to a fever pitch in February. On the same day Sternberg sent the Eighth Corps health report to Congress, Filipino rebels launched a night attack in and around Manila. While the timing may have caught some of the officers and men momentarily off guard, the eruption of hostilities had been long anticipated. Firefights throughout the night varied from sporadic to desperate, and regimental command posts—situated to guard the most likely avenues of approach to the city—were precluded from supporting each other by distance and terrain. The uprising, however, was poorly coordinated in its execution. The defensive perimeter was held throughout the night. The following morning, Major General Arthur MacArthur counterattacked, securing Santa Mesa Ridge, and Anderson's First Division pushed the Filipinos out of the villages of Pasay and San Pedro. By the close of February 5, the largest and bloodiest battle of the Philippine Insurrection was over. One hundred ninety-four Americans had been wounded and 44 had been killed or died of wounds.<sup>15</sup>

The Medical Department again proved equal to its task. Lippincott reported to the surgeon general that the department had been “in fine condition from the moment of the first fire and continued to improve from day to day, so that there never was a delay in securing excellent attention for the wounded.”<sup>16</sup> His “division surgeons and medical officers of regiments were alert,”<sup>17</sup> and had prepared “for all emergencies.... Litters, [first aid] pouches, medical and surgical chests were in readiness, easily prepared articles of food, stimulants, and water were on hand, and our ambulance company... did, and is still doing excellent service.”<sup>18</sup>

The Second Battle of Manila nearly split the Army of Liberation in two. The Filipino leader and his forces retreated north to their capital at Malolos, while the southern half remained south of the Pasig River. Otis severed the two forces completely and secured his southern and eastern fronts, and then launched a northern offensive along the Manila-Dagupan Railway to crush Aguinaldo. From the beginning, Otis faced personnel, logistical, and environmental problems for which his experience and parsimonious nature were not prepared. He did not have a large enough army to keep rebels in the south in check, screen Manila, and pursue Aguinaldo, but he stubbornly refused to significantly increase manpower estimates sent to Washington. Campaigning in the jungles and rice paddies was slow, tedious, and debilitating work. In only a few weeks, chronic diarrhea, skin diseases, fatigue, heat injuries, various fevers, and depression took a large toll on Otis' effective strength. Logistically tied to the Manila-Dagupan Railway, he struggled with caraboa carts and porters to supply food and ammunition to forward elements beyond the reach of the railway. Compounding these difficulties was the mustering out of volunteer regiments in April. On March 2, Congress attempted to improve this situation by passing an army bill that extended state regiment duty in the Philippines, increased the Regular Army to 65,000 men, and recruited a 35,000-man volunteer force for service in the islands; but effects of this legislation would not be felt until late summer.<sup>19</sup>

Back in Washington, this same congressional legislation left the surgeon general in a state of frustrated despair. Talk in the War Department and on Capitol Hill

since late 1898 gave Sternberg the impression that the 50,000-man army then authorized would soon be expanded to an end strength of 100,000 enlisted men. To support such a force, he submitted a Medical Department organizational memorandum to Secretary of War Russell Alger on November 30, 1898 calling for one surgeon general with the rank of major general, one assistant surgeon general and one medical inspector general with the rank of brigadier general, 20 surgeons with the rank of colonel, 40 surgeons with the rank of lieutenant colonel, 150 surgeons with the rank of major, 309 assistant surgeons, and a Hospital Corps of 4,750 men. Limited to 400 contract surgeons, Sternberg also requested the authority to appoint as many contract surgeons as circumstances required and pay them up to \$150 per month.<sup>20</sup> When the House ignored his proposal, he pleaded with Alger to recommend a compromise to the Senate for an increase of 310 medical officers, but stated, "This will by no means be an adequate provision...for an army of 50,000 men and will call for the employment of a considerable number of acting assistant surgeons..." Congress only granted the Medical Department an additional 43 medical officers and, while it increased the pay for contract surgeons, it did not increase their numbers or those of the Hospital Corps.<sup>21</sup>

On May 16, the capture of San Isidro ended Otis' rather disappointing spring campaign. Although his army had pushed 40 miles north into the Balucan Province, it had not destroyed the Filipino army nor forced the rebel government to surrender. In the process, Otis had exhausted his army, supplies, and medical support. Lippincott managed to sustain effective medical support to the Eighth Corps throughout the campaign. While he had fairly stripped the regiments of their surgeons for work in the hospitals before February, he reversed the process at the beginning of the campaign and was able to keep enough surgeons with the troops. But by May, a long logistical and evacuation line and burgeoning sick rolls, which included many medical officers and hospital corpsmen, had stretched medical capabilities to the breaking point. Old age and ill health brought on by the stresses of the campaign brought Lippincott to the breaking point as well and, in mid-May, Lieutenant Colonel Alfred Woodhull inherited this unenviable situation.<sup>22</sup>

In the first of numerous reports to Sternberg, Woodhull poured out his frustrations in concise detail. There were too few hospital beds and medical officers to attend to them. The spring campaign had filled the fixed hospitals in Manila, Corregidor, and later at Malolos to overflowing, a situation Woodhull attempted to relieve by sending patients to the *Relief* and Morgan City in between their voyages to the states. The campaign had spawned a growing number of regimental hospitals, which Woodhull considered "pernicious" because they could not all be manned by physicians as U.S. forces advanced north.<sup>23</sup> Otis denied Woodhull's request for a field hospital at Malolos to support MacArthur's advancing division, declaring hospital facilities in Manila were sufficient, and intimated that the surgeons were holding on to men who were well enough to be at the front. MacArthur soon convinced his commander that a field hospital was required when the Second Division headquarters was established at San Fernando, but it did not significantly relieve Woodhull's burden in Manila. In addition to too few beds, the chief surgeon

commented “the administrative work shows great lack of system and of energy. The hospital grounds have been in a wretched state of police; the Hospital Corps seems to have neither system nor order for its control; there is no dining room, no proper facilities for the preparation of food or its distribution...the wards which I have incidentally passed through are dirty and in poor order, they are horribly over-crowded and insufficiently manned both as to medical officers and attendants.”<sup>24</sup> The candle was being burned from both ends, and disease was eating at it from the middle. To compound the problem, Woodhull had to struggle with Otis’ parsimonious caution and disregard of the Medical Department to obtain the personnel, facilities, and operational intelligence he needed. Otis approved all telegraphic communications from the command and, therefore, Woodhull could only accurately communicate with the Surgeon General’s Office by mail, which took five to seven weeks. After rigorous debate, Otis permitted Woodhull to wire for 10 medical officers, when two to three times that number were required. Furthermore, Otis’ distrust of medical officers precluded his chief surgeon from participating in operational planning. As Woodhull told Sternberg, “Expeditions are sent out with no knowledge on the part of this office and...it is only by the very energetic and efficient work done by the division and brigade surgeons that disaster to the Medical Department is averted.”<sup>25</sup>

By June 1899, the majority of army units on Cuba were in fixed quarters. Hospitals had been established or were under construction in Havana, Pinar del Rio, Guanajay, Camp Columbia, Matanzas, Paso Caballo, and Sagua la Grande. However, typhoid fever continued to generate concern during the winter and spring of 1899. An extensive outbreak among regiments of the 8th Cavalry and 15th Infantry near Puerto Principe led Sternberg to dispatch Walter Reed to the city in mid-April to conduct a sanitary inspection of the camps, barracks, and hospitals in the area as well as an investigation of the typhoid outbreak. In his instructions, Sternberg stated, “If this can be traced to a neglect upon the part of medical officers to make proper sanitary recommendations, or of Commanding Officers to enforce such regulations, or of Quartermasters to supply the necessary shelter and appliances for the protection of the health of our troops, you will endeavor...to fix...responsibility for such neglect. You will also ascertain whether the sick have been properly cared for and whether there has been any deficiency in the supply of suitable food or necessary medicines, or other articles necessary for their comfort and recovery.”<sup>26</sup> As in 1898, Reed found that inexperienced surgeons did not recognize early cases and, as a result, failed to recommend measures to preclude further spread of typhoid.<sup>27</sup>

Sternberg recognized this continuing dilemma could only be rectified by education, not only of regular army medical officers, but also of a large corps of trained volunteer and National Guard medical officers who would swell the ranks of the Medical Department during wartime. If this idea became reality, it would require the formal sanction of the American Medical Association. Presented to this body at its annual meeting in Columbus, Ohio, in June, “Sanitary Lessons of the War” gave a concise review of the army’s experience with the disease since the Civil War;



described field hygiene techniques for prevention; eliminated future diagnostic confusion between typhoid fever and malaria based on epidemiological differences, clinical presentation, simple laboratory tests, and therapeutic response; and noted a regrettable deficiency in preventive medicine education in U.S. medical schools. Not only was it a vision of what future military medical education should be, but also it was a lesson plan in how to get there.<sup>28</sup>

While typhoid fever and relapsing cases of vivax malaria, and camp and hospital facility inspections were the main drivers for Reed's spring visit and a return trip in July, he also observed for cases of yellow fever and gathered information on the progress of yellow fever investigations being conducted by Doctors Eugene Wasdin and Henry Geddings of the Marine Hospital Service. These investigators had been in Havana since November 1897 and were making inroads toward confirming Giuseppe Sanarelli's *Bacillus icteroides* as the etiologic agent of the disease. Sternberg was very concerned. Upon returning from Paris with a culture of the bacillus in the fall of that same year, Sternberg had turned it over to Reed and James Carroll for further investigation and comparison with *Bacillus X*. Their experiments demonstrated many differences between the two microorganisms, but both caused the same symptoms in dogs. In January 1898, Sternberg dismissed the differences in culturing the organisms and concluded "it is possible...bacillus [x] is concerned with the etiology of yellow fever."<sup>29</sup> Clearly, he was clinging to the hope he would be confirmed in the continued observations of Reed and Carroll, but the war interrupted their research. By the time occupation forces were taking over from the Spanish in December, he had lost touch with the work of Dr. Eugene Wasdin and Dr. H. D. Geddings. Anxious that they may have stolen a march on him, Sternberg sent Contract Surgeon Aristides Agramonte, a pathologist, to conduct autopsies and laboratory work at Military Hospital No. 1 and keep him informed of their activities.<sup>30</sup>

Epidemiologically speaking, 1899 was a slow year for yellow fever in Cuba. Outbreaks remained small and isolated, which put a damper on Wasdin's and Geddings' research. To obtain enough autopsy numbers, Wasdin had no qualms about performing a deception or two. In early February, an autopsy on an 8th Infantry soldier supposedly dead with yellow fever was performed by Agramonte, with William Gorgas, Carlos Finlay, Albert Truby, Wasdin, and Geddings in attendance, which revealed ulcerated lesions in the small intestine—an obvious typhoid death—but Wasdin counted it among his yellow fever cases. Agramonte wrote to Sternberg, "Their conclusions have not surprised me.... I appreciated that they had been formulated probably even before their appointment to make the investigation. What really amazed me not a little is...their impertinence in insisting that Patrick Smith was a yellow fever case in spite of all evidence to the contrary..."<sup>31</sup>

In June, Wasdin and Geddings presented results—14 Havana and 21 New Orleans cases, 92 percent and 85 percent positive for *B icteroides*, respectively—that confirmed Sanarelli's results. Moreover, they claimed their investigations and Sanarelli's had satisfied all of Robert Koch's postulates. It was a powerful argument, but Sternberg remained unimpressed. Although Koch's method was the gold

standard, results obtained by it could be interpreted erroneously. They had found an organism in sufficient numbers to justify their claim; however, preliminary evidence provided by Reed and Carroll suggested that neither *B icteroides* nor *Bacillus X* was the organism they sought. *Bacillus X* was found to be a common colon organism. More importantly, they had shown that *B icteroides* was identical to the hog cholera bacillus, and serum of animals immunized with *B icteroides* caused hog cholera bacilli to agglutinate or clump in a test tube, a clear indication the two organisms were closely related, if not identical. Sternberg had stated his skepticism in the validity of *B icteroides* to Wasdin and Geddings during his January inspection tour. He observed that there was no satisfactory evidence that lower animals ever contracted yellow fever during an epidemic, and multiple experiments over the past 20 years had failed to demonstrate any susceptibility in various laboratory animals. Moreover, man was extremely susceptible to yellow fever; but throughout all of his experiments and those conducted since, no laboratory epidemic had ever occurred. Although Sternberg had Agramonte continue his experiments with both organisms and monitor the Marine Health Service investigators, it was becoming obvious that he and Sanarelli had been fooled by the plethora of microbes that reside in the intestinal tract.<sup>32</sup>

Sternberg made no direct public comment on the report of Wasdin and Geddings published in June, likely a reflection of his contempt for shoddy and dishonest research, but an article by Sanarelli that appeared in the *Medical News* in August received a prompt reply. The Italian professor's condescending tone, paragraphs filled with invective for Sternberg's earlier work and the recent investigations of Reed and Carroll, and a reproach for not admitting the validity of his claim were clearly contentious and intended to generate a similar response. The somewhat obsequious editorial by Dr. J. Riddle Goffe in the same issue only added fuel to Sternberg's already burning indignation. However, Sternberg did not let his emotions cast an unprofessional shadow over his summary of accumulated evidence against *B icteroides* prepared for the *Medical News*. There was no need to do so. The bacteriological and immunological experiments of Reed and Carroll—in which Sternberg had implicit faith—had made the *Bacillus* an untenable contender as the etiology of yellow fever. Furthermore, clinicians in Rio de Janeiro and New Orleans provided supporting evidence that Sanarelli's antitoxic serum was also worthless. *B icteroides* was down and nearly out, and neither Sanarelli's stinging comments nor Wasdin's deceit would revive it. From a professional and humanitarian standpoint, Sternberg could only lament the results of his own laboratory. The world would have been better had either he or Sanarelli been correct, but he still had hope the Army Medical Department would discover the etiologic agent.<sup>33</sup>

With the exception of one campaign in the southern Philippines, the army remained on the defensive throughout the summer of 1899. The withdrawal of state regiments, which were well supplied with medical officers, and the arrival of regular and volunteer units during July and August created a shortfall of all officers that—with increasing disease rates—finally captured Otis' attention. He endorsed Woodhull's early August request for more regular medical officers. At that time,

18 percent of the Medical Corps were on duty in Luzon, but illness significantly reduced their effectiveness. Woodhull pleaded for more regular medical officers because of their ability to implement practical preventive medicine, but cautioned Sternberg not to send Cuban veterans for fear malarial relapses would render them ineffective. Once the army had grown to sufficient size and the summer rains ended, Otis would launch a campaign to quash Aguinaldo's rebellion for good. To support this campaign and accommodate the large number of sick would require 3,000 hospital beds.<sup>34</sup>

As Woodhull's letters made their way to Washington, Sternberg conducted a personal inspection tour of medical assets at the Presidio and other western posts. The Medical Supply Depot at San Francisco was expanding to hold supplies for 100,000 men for six months. To allow Purveyor, Lieutenant Colonel J. V. D. Middleton to focus on Philippine demands, Sternberg reduced the depot's responsibility to 20 posts in the Departments of California and Columbia, and restricted depot operations in New York to support operations in Cuba and Puerto Rico and provide backup services to San Francisco. Colonel Forwood, now Chief Surgeon at the Presidio, had been sent by Sternberg to oversee the construction of a new hospital, the development of a reception camp for volunteers that would accommodate five regiments, and the establishment of a quarantine camp and school of instruction for the Hospital Corps on Angel Island. Forwood conducted business with the same efficiency as at Camp Wikoff, and Sternberg was pleased with the progress.<sup>35</sup>

The downhill spiral of medical activities described in the missals from Manila, however, was an eye opener for the surgeon general. The nature of active operations and diseases on Luzon, and stateside medical support activities were consuming Sternberg's resources at a phenomenal rate, faster than he could acquire and deploy them. Seventeen regular medical officers and 29 contract surgeons had been deployed in late January, and another seven regulars and nine contract surgeons had been sent in June. Nurses—both contract and Red Cross—also had been sent. When the General Hospital at the Presidio opened in July, it was immediately filled to capacity, and Forwood began requesting more medical officers for the hospital and reception camp. Sternberg assured Woodhull he would continue to send physicians and nurses. The hospital ship *Missouri* would sail from San Francisco after repairs were completed in August, with a full load of supplies, 100 hospital corpsmen, stewards and acting stewards, and two Edison type x-ray machines. He sent a short telegram to Forwood that there were "plenty of doctors on orders for the Department of California."<sup>36</sup>

To free up more Medical Department resources, Sternberg closed the newly completed general hospitals at Fort Monroe and in Savannah. However, he declined to halt new hospital construction. Four new hospitals were opened and ground was broken for eight more during fiscal year 1900, and the surgeon general had been eyeing Fort Bayard, an old fort due for closure, in southwestern New Mexico as a suitable site for a tuberculosis sanitarium. The new Secretary of War, Elihu Root, who had replaced Alger in late July, approved the plan and the \$9,000 required to make it inhabitable.<sup>37</sup>

Root's support for a project Sternberg considered extremely important for army health was gratifying. Root, a lawyer with no military experience, was rumored to be rather stern and harsh. In time, his selection to the post would prove to be one of President McKinley's best decisions. Root found the War Department—split between the Secretary's power of the purse, the commanding general's visions of command, and bureau chiefs jealous of their prerogatives—an inefficient, chaotic mess. Root formulated a series of reforms that would reverse the current situation. These reforms became the foundation for America's 20th century army. However, in 1899, Root moved cautiously, aware of the tremendous resistance to any organizational or operational change in the army.<sup>38</sup>

Although Root soon clashed with Commanding General Miles and may have had his difficulties with some of the bureau chiefs, it appears that he and the surgeon general developed a strong relationship early on and he admired Sternberg as a soldier and scientist. Throughout August and September, Sternberg worked with Corbin and Root to provide sufficient hospital beds, supplies, and ancillary staff to the Eighth Corps. A pavilion-style hospital was the most desirable accommodation, but the six-month construction time made it impracticable. Therefore, the surgeon general advised Woodhull to obtain as many available buildings as possible and rely on the 500 hospital tents that were being sent. Twenty nurses sailed aboard the *Relief*, and an additional 150 hospital corpsmen were on the *Missouri*. Sternberg wrote to Woodhull on September 23: "The Secretary of War fully agrees with me that you should have ample hospital accommodations and that there should be at all times at least 500 vacant beds ready for any emergency.... We are prepared to send you all the supplies and money necessary to enable you to provide for the care and comfort of the sick and wounded.... One hundred tons of medical supplies were lost upon the 'Morgan City.' Orders have been given...to duplicate these supplies and forward them to you as soon as practicable. I expected the Hospital Ship 'Missouri' would have been able to sail several weeks since, but she has been delayed by the extensive improvements considered necessary to fit her thoroughly for the work expected of her. She will sail within a few days and carries a full load of medical supplies.... I have been sending a large number of medical officers; and, so far as medical officers of the Regular Army are concerned, it will not be practicable to send any more at present."<sup>39</sup> Casting a critical eye on the Presidio, the surgeon general told Forwood and Major Alfred Girard, commander of the general hospital, that they had too many medical officers and contract surgeons. He directed them to send more to Manila or send them home. By the time Woodhull received the letter, Sternberg found 13 more medical officers and 40 additional contract surgeons for Philippine service, and sent more nurses.<sup>40</sup>

Otis' northern offensive, begun on October 9, suffered from a lack of logistical support, torrential rain, and the treacherous Philippine terrain. By the end of November, however, the Army of Liberation had been shattered, and Aguinaldo was sent fleeing into the jungles of the far northern provinces. Although Otis and his division commanders basked in their victory, the American logistical chain—extending nearly 200 miles from Manila as General Young cleared Filipino

resistance from the Ilocano provinces—stretched medical support to the breaking point. Woodhull reported to Sternberg on November 13 that “the battalions of the new regiments are not only serving separately but some of these are already being split up for garrison purposes.... The campaign in progress will undoubtedly lead to the serious incapacity of medical officers and also to the necessity for distributing them at various small stations which there is every reason to suppose will now be held.”<sup>41</sup> Three days later, Woodhull wrote to his chief again of the relatively large field hospitals being established, staffed, and supplied along the American line of advance. He also related that hospital rolls were burgeoning—2,197 inpatients by the third week of November. Presuming these numbers would continue to climb, Woodhull urgently requested more medical officers, worked to expand both of the reserve hospitals and the newly opened Santa Mesa facility, and begged his commander for money to complete the physical plant on Corregidor. But Otis remained obtuse. He was secure with the 257 physicians he had in theater, so he declared no funds were available for hospital work and no more hospitals would be established in Manila.<sup>42</sup>

Otis was convinced the scattering of the Army of Liberation into the northern hills signaled an end to major resistance to American authority. Declaring the war was over and “all we have to do now is protect the Filipinos against themselves,” he concentrated on apprehending dispersed bands of Filipino rebels and occupying larger cities and towns in the north.<sup>43</sup> McKinley, who was gratified at this success, created a second Philippine Commission with broad legislative authority to establish municipal and provincial governments in preparation for the transfer of power from military to colonial administration. The president selected William Howard Taft, a federal circuit court judge from Ohio, to head the commission beginning September 1.<sup>44</sup>

Operations in the Philippines had stretched Medical Department personnel thin across Luzon and promised to strain them further in the southern provinces. The transition from combat action to stabilization duties on Luzon, however, would reduce the medical emphasis on casualty care, evacuation, and diseases inherent to long campaigns, and allow the Medical Department to focus on routine care and public health. Public health had remained a paramount concern for the welfare of the soldiers and the Filipino population, even at the height of the insurrection. Now the time appeared right to strengthen the public health infrastructure in Manila and expand its operations. In the wide variety of diseases—malaria, dysentery, dengue fever, plague, beriberi, tuberculosis, smallpox—endemic to the archipelago, Sternberg saw a tremendous potential for practical medical research. With this in mind, he created in January 1900 the first board for the study of tropical diseases. A formal board would continue to foster the atmosphere of academic excellence and achievement Sternberg had initiated with the creation of the Army Medical School and expansion of laboratory activities in 1893. That atmosphere had already begun to accrue dividends by the time the Tropical Disease Board was organized. With only basic laboratory equipment and a zeal for medical science reminiscent of their chief's days at isolated western posts, young medical officers were

contributing steadily to an ever-increasing fund of medical knowledge. Assistant Surgeon Walter Cox described Malta fever (brucellosis) at a southwestern post in 1898, and Assistant Surgeon Baily K. Ashford demonstrated that Puerto Rican anemia resulted from the hookworm, *Necator americanus*, the following November. In the Philippines, Lieutenant Richard Strong had already begun studying dysentery in the First Reserve Hospital; and, after bubonic plague broke out in Manila's Chinese slums in January 1900, Lieutenant William Calvert prepared an instructional text outlining methods to control and eradicate the disease that included poisoning rats, although this vector had not yet been proven.<sup>45</sup>

In his report to the Secretary of War for 1900, Sternberg stated: "It was my desire that this board should be given all the appliances and assistance necessary for conducting their researches and every opportunity for obtaining access to cases and making autopsies, etc. In my letter of instruction to the chief surgeon I stated ...the members of the board need not necessarily work in the same laboratory, and while pursuing their general investigations they could make blood examinations and bacteriological researches for the purpose of clinical diagnosis as well as with a view to the promotion of our knowledge of infectious diseases.... Each member should make an independent report of investigations conducted by him and of the general result of his blood examinations, etc. A quarterly report of progress should be made by each member of the board, which should indicate the nature of the work in which he has been engaged and the results attained.... Special attention should be given to tropical dysentery, to the malarial fevers...to beri-beri, to intestinal parasites, and in general to all tropical diseases the etiology of which has not been completely worked out."<sup>46</sup> Complete laboratory facilities to support this grand plan had been established at the First Reserve Hospital by the time Sternberg created the board. In addition, hospital ships *Relief* and *Missouri* had laboratory capabilities that frequently functioned effectively as portable labs, and the Manila Board of Health was awaiting a full complement of bacteriological apparatus, which would make it an independent laboratory. All these assets provided valuable assistance to local hospitals and commanders; however, Sternberg's instructions defined a larger, more autonomous and permanent goal: the establishment of a professional, productive, and enduring research capability in the Army Medical Department.<sup>47</sup>

As the Tropical Disease Board became established and clarified its role in assisting Otis' overall pacification program, Filipino rebels began to mock Otis' efforts. Aguinaldo had called for an insurgency war throughout the archipelago. Theirs would be a war of attrition, one in which they would hopefully destroy the American will to remain. According to Aguinaldo's calculations, he had 11 good months in which to wear down that will. Then the American electorate would supply the coup de grace at the polls and hail William Jennings Bryan as President.<sup>48</sup>

Greenleaf, who replaced Woodhull as chief surgeon on December 22, faced a challenge of greater magnitude and complexity than either of his predecessors. As he explained to Sternberg in mid-February: "The military situation...has changed materially within the past three months, the policy being to occupy all important

strategic points with comparatively large bodies of troops, and a good many... points of minor military importance with small bodies of troops. While many of these stations are on the line of railroad or comparatively near each other on the sea coast, there is a large number...so completely isolated, or approachable only over mountain trails or almost impassable roads, that communication for the purpose of supply is exceedingly difficult and infrequent.... The military conditions above...affect equally, and perhaps more seriously, the personnel of the Medical Department, since any of these detached commands is liable to be attacked by, or to themselves attack the insurgents who infest their immediate neighborhood, and have more or less wounded requiring medical attendance. The number of Medical Officers now in these islands is entirely inadequate to meet these conditions, and we have...in the several Divisions and Military Districts, 80 stations without doctors.... In many cases there are neither Hospital Stewards nor members of the Hospital Corps, and in several instances these commands have been in contact with the enemy and had wounded men who could not receive any medical attendance.”<sup>49</sup> Greenleaf’s difficulties were compounded by illness among medical officers; transportation delays from stateside that left arriving contract physicians with only a few months of service; a desire on the part of these physicians, since the conventional war was finished, to annul their contracts and go home; and the expensive manpower costs associated with the Manila hospitals. To relieve this situation, he directed medical officers to treat their sick and wounded in available field, division, and base hospitals. He gave medical officers responsibility for multiple outposts, spread his corpsmen as thinly as possible among the regiments, and fashioned lighter medical and surgical chests for each detachment that could be more easily carried by native porters. And, more medical officers were requested. Greenleaf estimated a total of 360 surgeons were needed to keep the Medical Department from embarrassment. He cabled his requirements to the Surgeon General’s Office, but apparently Sternberg questioned the validity of his thinking in these short, concise statements from Manila.<sup>50</sup>

Greenleaf, an experienced soldier, was not afraid to take charge and make decisions without waiting for the blessing of the surgeon general’s office if circumstances demanded. Nor was he afraid to speak frankly to the surgeon general. “I deem it my duty,” Greenleaf told his chief, “to ask that...any requisitions I make, either for men, money, or materials, may be acted upon in their entirety, or...if disapproved in whole or in part, I be notified of your action by cablegram. In arriving at the necessity for these items I am particularly careful to investigate thoroughly all the circumstances connected with them, and do not make requests unless it is deemed necessary, and then state exactly what I think is needed. The distance which separates us is so great.... I cannot in many instances wait for the mail to explain my reasons for making requests...and have assumed...my knowledge of the situation and...experience in the service would be sufficient to warrant you in acting favorably on any that I may send.”<sup>51</sup> He noted that 28 officers were sick, a number that would undoubtedly increase with active campaigning. He also noted that the remaining officers were stretched so thin that some were attending up to

five field stations and that “this state of affairs has produced much unfavorable comment from line officers regarding the administration of the Medical Department.”<sup>52</sup>

Sternberg’s hesitancy in approving all of Greenleaf’s requests does not appear to come from any distrust of motives or actions, but rather from difficulty in understanding the rapidly changing events in the archipelago. Sternberg worked diligently to stay current with operations in two theaters, but suffered from not having firsthand knowledge of the fluid conditions in the Philippines. Greenleaf noted that time and distance delayed correspondence for weeks. This left an inevitable—and extremely frustrating—disconnect between Manila and Washington in which the surgeon general tried to keep up with and control real-time events through cablegrams and letters. The Spanish–American War experience had honed and tempered his ability to communicate with subordinates in a clear and concise manner, rapidly synthesize and distill operational and administrative data, make decisions, and project power from his Washington office. The conventional war with Spain, however, had not prepared him—or the Medical Department—to support operations in an intensifying insurgency war. With a larger budget and—apparently—a better working relationship with Root’s War Department, obtaining, replacing, and moving supplies and equipment was less problematic. However, despite Sternberg’s lobbying efforts with Root and McKinley, Congress denied his request for an additional 124 regular medical officers in February 1900, leaving him with 192 regular and 78 volunteer surgeons, and roughly 390 of the authorized 400 contract surgeons. Further lobbying efforts obtained authorizations for another 80 contract surgeons for fiscal year 1901.<sup>53</sup>

Sternberg extended regular and contract service to two years and required all contract surgeons to serve a full 12 months in theater. Officers and hospital corpsmen were plucked from army hospitals across the United States and shifted from the Caribbean theater of operations. Advertisements for more contract surgeons appeared in many leading medical journals, medical examining boards sat almost continuously, and a steady stream of assignment orders flowed from the typewriters in the Surgeon General’s Office. The weak link in the movement chain was the Army Transport Service. It had performed admirably as a safe, dependable strategic medical evacuation asset since its creation, but failed as a rapid and flexible means of putting physicians in theater due to refit and resupply time. During February, a total of 45 commissioned and contract surgeons had received orders, but by mid-March only nine had sailed.<sup>54</sup>

Nurses were also needed in ever-increasing numbers. Fortunately for the Medical Department, enthusiasm for Philippine service was high. Dr. Anita Newcomb McGee, Director of the Provisional Army Nurse Corps (Female), said “applications...pour into the office in a steady stream. It seems...as though almost every nurse who has had a taste of the army wishes to return to it.”<sup>55</sup> Finding suitable, well-trained nurses whose conduct would be dignified and discreet was always of prime concern. McGee sought the finest, but despite her efforts some slovenly nurses and a few with less than stellar moral character and no nursing ambitions arrived in Manila in late 1899. Nurses in the Philippines needed more direct supervision. To this



end, the surgeon general directed Greenleaf to temporarily assign Miss Mary J. McCloud, Chief Nurse at the First Reserve Hospital, as inspector of nursing services for all hospitals with nursing personnel and on the *Relief*. Her visits were to be followed by a complete report that addressed a comprehensive range of issues. Sternberg wanted to know if the nursing was “in all respects equal to that of the best civil hospitals?”<sup>56</sup> If not, where were the defects? Were duty hours strictly kept; were nurses neatly dressed? Did the chief nurse have executive ability, tact, and suitability for her position? Were the nurse’s quarters and rations adequate; was there a proper sense of discipline; what was the status of morale; and how did the climate affect the health of the nurses? And lastly, did McCloud have any recommendations for increasing the efficiency of the corps?<sup>57</sup>

McCloud—probably recommended by McGee—was a good choice for the work Sternberg had in mind. She had brought organization, discipline, and efficiency to the First Reserve Hospital nursing service since her arrival the previous summer. But when Greenleaf read Sternberg’s directive, he was aghast. “Believing... the conditions in the Archipelago are not fully understood by you, and the extension of the nursing service unknown to you at the date of the letter, I respectfully submit the following statement.... Contract nurses are now on duty at the following named hospitals: First Reserve and Santa Mesa in Manila; Corregidor Island, Manila Bay; Tayabas, Province of Laguna; Calamba, Province of Cavite; Dagupan, Province of Pangasinan; Vigan, Province of Ilocos Sur; Aparri, Province of Ilocos Norte; Iloilo, Island of Panay; and the Hospital Ship ‘Relief.’ In the present unsettled state of affairs travel by land or by sea is not only uncomfortable and trying to one’s physical strength, but in certain places on land is unsafe by reason of the constant presence of prowling band of insurrectos or landrones, and can only be accomplished with safety when the traveler is protected by a large military escort.... The railroad from Manila to Dagupan, 122 miles long, is in a bad state of repair, the carriages without upholstering, toilet or other conveniences and very uncomfortable, the trains are crowded...and the official time consumed...is nine hours, but...is oftener twelve hours with occasional wrecks, in which lives are often lost.”<sup>58</sup>

Sternberg responded to Greenleaf’s real concerns for McCloud’s safety by stating it was not his desire “she should be placed in danger for the sake of making such inspections,” but hoped she could visit hospitals in Manila, on Corregidor, and the *Relief*.<sup>59</sup> Written on June 30—presumably the earliest date he could have responded—this episode illustrates Sternberg’s difficulties in staying on top of events in the Philippines, and his changing attitude toward the status of nursing in general. Although forced by circumstances to accept the services of female nurses in early 1898, by the end of the year Sternberg and McGee agreed with members of the civilian Committee to Secure by Act of Congress the Employment of Graduate Women Nurses in the Hospital Service of the U.S. Army that nurses should be integrated into the army. However, neither Sternberg nor McGee could support the committee’s integration plans that included a semi-civilian nursing service commission in the chain of authority over nurses and hospital corpsmen. The surgeon

general was also concerned about the numbers of nurses authorized by law, their pay, and funding for construction of quarters and so forth. While female nurses still posed a moral dilemma for the Medical Department, in the spring of 1900 female nurses could boast of 20 months of dedicated professional service in fixed facilities, tent hospitals, and aboard hospital ships and transports in three theaters of operations, and for the past year in a burgeoning insurgency war. Their skills were appreciated and now demanded in nearly every army hospital. To Sternberg's credit, he realized neither a few bad apples nor his angst over women being exposed to the rigors of an army in the field altered the fact that female nursing services were required by the Medical Department. His orders made McCloud the chief nurse for the Eighth Army Corps, and the standards he expected her to maintain reflected this changing attitude.<sup>60</sup>

Sternberg also recognized the potential for trained nurses to instruct hospital corpsmen in practical nursing on the wards, thereby extending nursing services. Congress was paring down the Hospital Corps, which had been expanded for the war with Spain. In June 1900, Congress appropriated monies for 200 hospital stewards, 356 acting hospital stewards, and 3,500 privates, forcing the surgeon general to set allowances for each theater of operations. The Philippines received the majority, but experience and quality were wanting. In Manila, Hospital No. 3 opened a school of instruction for these partially trained corpsmen coming from the states and those transferring from the line. Sternberg also suggested to his hospital commanders that female nurses should be engaged in instructing corpsmen in ward work, cooking, and so forth. With the exception of Major Valery Havard, who suggested a trained male nurse corps, the concept appears to have been well received. By the following spring, nurses were providing advanced training to corpsmen on all aspects of ward nursing in most of the army's major hospitals.<sup>61</sup>

By April 1900, American pacification efforts and Filipino resistance had created a confusing collage of success and failure throughout the archipelago. Civic action programs had established municipal governments in many towns, roads and bridges were being built, schools and new marketplaces opened, telegraph lines strung, and public sanitation improved. These enclaves of Filipino support for American sovereignty, however, had become islands surrounded—and infiltrated—by a sea of guerilla resistance, and insurgents came to rely on supplies from towns and villages to sustain them in the field and intelligence provided on American activities. Attacks were made on these garrisons and the patrols and scouting parties dispatched from them. Otis, now labeled by the press as wholly inept, remained committed to the virtues of pacification by civic action, but the pressures of this deteriorating situation took their toll on him. With casualties mounting in a shadow war he could not comprehend, and soon to be saddled with a new Philippine Commission chairman, Otis asked McKinley to relieve him so he could attend to neglected personal matters back home.<sup>62</sup>

MacArthur, who assumed command from Otis on May 5, had been critical of Otis' less than aggressive military posture for months. Yet, while his military instincts may have urged him to intensify operations against the guerrillas, his

political conscience advocated caution. He saw himself as the scapegoat should Otis' policies fail, and Taft would be a constant reminder the president had little confidence in his abilities. These considerations, plus the fact that the monsoons had started once again, led MacArthur to proceed with the policy of conciliation and civic action, which increased the number of military stations outside of Luzon by a third.<sup>63</sup>

For Greenleaf, the expansion of garrisons meant begging the surgeon general for more physicians and corpsmen, but through the first six months of 1900, his burden in supporting benevolent pacification had taken on a new and unplanned medical dimension. Wherever army units patrolled or established stations, their surgeons found sick and wounded Filipinos of all ages imploring them for relief. Medical officers—unwilling to refuse—soon had a growing indigent medical practice that contributed significantly to pacification efforts, but was not only officially unfunded, but also against army regulations. Both Philippine commanders had tended to ignore this point in prosecuting McKinley's policies and gave Greenleaf meager funding to continue the unofficial mission. Greenleaf was in a difficult position, but apparently did not inform Sternberg of these events. Instead, he requisitioned large supply orders—such as 3,600 pounds of pearl barley, 3,600 pounds of farina, and six tons of malted milk—and continued to demand unquestioning support from the Surgeon General's Office. When Sternberg informed him that six tons of malted milk cost \$13,000, and he was apprehensive that “there may be unauthorized use of these supplies by persons not entitled to them,”<sup>64</sup> Greenleaf understood which way the wind was blowing from Washington and took his case to what he thought was a higher court in the office of the new Philippine commissioner.<sup>65</sup>

The corps surgeon, who was committed to benevolent assimilation, presented a good and honest case to Taft. He noted the war had taken a terrible toll on Filipinos and providing for the sick was very important. “Our troops are now occupying nearly all of the towns of any importance in the Islands.... Medical officers on duty with them...are constantly appealed to by these people for relief of both medical and surgical cases, and the natural instincts of humanity...have led them to respond to these appeals almost unanimously. The effect of this humane work...has been marked, and numerous instances have been brought to my notice where Medical Officers possessed more influence with the natives than any other class of Americans in the neighborhood.”<sup>66</sup> However, there was precious little funding for the humanitarian effort, and “Medical Officers have drawn from the supplies furnished to them for the use of the troops, to meet the obvious necessities of the case.”<sup>67</sup> Greenleaf concluded his appeal by declaring “the average American doctor...cannot and will not resist appeals to his humanity, and will take whatever comes handy to relieve suffering and distress; this fact should receive due consideration by the medical authorities at the War Department.”<sup>68</sup> Wanting to help, Taft added an endorsement to the letter recommending “the supply of medicines be not reduced for...nothing helps more in the pacification of the Islands than such benefits as are thus conferred upon the natives,” and forwarded it to the Secretary of War.<sup>69</sup>

Whether Greenleaf was confused as to the date—September 1—on which Taft

assumed authority in the archipelago from MacArthur remains a mystery, but Adjutant General Henry Corbin clearly understood who was in command. Corbin redirected the letter to MacArthur with a second endorsement: "Respectfully referred to the Commanding General Division of the Philippines for report as to whether the recent large requisitions for medicines and medical supplies...was in fact...designed not merely for use in the military service but also for use and distribution among the people of the Philippine Islands."<sup>70</sup> Corbin reminded MacArthur that "no requisition for such purpose should be made without stating the fact,"<sup>71</sup> that Greenleaf's letter should have been sent through MacArthur and not the president of the Philippine Commission, and finally that if MacArthur desired "to use medical supplies for the relief of the people of the Islands, his application for authority to do so will receive full consideration."<sup>72</sup> The surgeon general probably felt a certain sense of vindication in Corbin's directives to Manila, but he had precious little time to bask in it.

## Chapter Fourteen

# Yellow Fever Loses Its Mystique

In the late winter of 1900, yellow fever began making its rounds in Havana. Just a few weeks earlier, Major General Leonard Wood, one-time commander of the Rough Riders and commander of the Department of Santiago, had replaced General John R. Brooke as military governor of Cuba. Aggressive and energetic, Wood was a superb soldier and military administrator, and according to Teddy Roosevelt, a born diplomat. He was also a physician. Wood had first contended with yellow fever during his tenure in Santiago, where the disease seemed to thrive predominantly on American soldiers and citizens. Then he had quarantined the city, cleaned it from one end to the other, moved regiments to higher ground, and watched the fever disappear. When Wood put the same strenuous sanitary methods into effect in Havana, yellow jack continued to smolder among nonimmune Americans and struck hard at equally nonimmune Spanish laborers. Wood was baffled and apprised Sternberg of his dilemma and asked for a special commission to pursue the elusive etiology of yellow fever.<sup>1</sup>

That Sternberg did not establish a Tropical Disease Board in Havana simultaneously with that in Manila is enigmatic. The facilities and manpower were already in place, and Cuba provided a plethora of endemic maladies suitable for study. Wood's request, which was timely for Sternberg, made it a moot point. Walter Reed and James Carroll had confirmed their preliminary experiments in regard to the nature of *Bacillus icteroides* and *Bacillus X* and sent them to press. The field of yellow fever research and treatment had advanced no further than when Sternberg had left it 10 years earlier; the military governor was specifically urging the resumption of that work, and it was predicted to be a severe yellow fever season in Cuba. Delighted at the prospect, Sternberg began hammering out the details for a Yellow Fever Board with Reed.<sup>2</sup>

Exactly what they discussed behind closed doors will never be known because no notes of the meetings survived, which is regrettable in light of later events that would alter the close professional relationship they had shared since 1893. Carlos

Finlay's mosquito transmission theory was discussed. Although Sternberg suggested Reed look for an intermediate host—as in malaria—and “give special attention to the possibility of transmission by some insect,” he did not believe it was a mosquito.<sup>3</sup> More importantly, Sternberg was not suggesting the disease was transmitted by the bite of a mosquito or any other insect. He accepted the role of ticks and tsetse flies in transmitting Texas cattle fever and trypanosomiasis, respectively, but he was not convinced of the veracity of vector transmission in yellow fever. Sternberg considered the mosquito's relationship to yellow fever—if one existed—to be analogous to that of the fly in typhoid fever, and he still believed the intestinal tract was the most likely portal of entry for the infection. He also urged Reed to determine whether the disease could be transmitted from person to person through blood inoculations. In his formal instructions, he told Reed to take advantage of any opportunities to study other infectious diseases and gave detailed instructions concerning those maladies. By doing so, Sternberg watched for the unexpected and gave the Yellow Fever Board—at least officially—the flavor of the Tropical Disease Board in the Philippines. Sternberg made it clear to Reed that “the most important question which will occupy your attention is that which relates to the etiology” of yellow fever.<sup>4</sup> In this regard, he did not “consider it necessary to give [Reed] any suggestions or detailed instructions.”<sup>5</sup> What specific instructions could be given? The board was essentially starting its work from scratch. Sternberg had tremendous faith in the men he selected for his yellow fever think tank. Reed, Carroll, and Aristides Agramonte had been studying yellow fever in Washington and Cuba for the past 18 months. Jesse Lazear, a sharp bacteriologist who had been offered a contract by Sternberg upon the glowing recommendation of William Welch, had been performing superbly at the Camp Columbia hospital since February. After reporting to Wood, Reed was authorized to establish his headquarters at the Havana or Camp Columbia Laboratory and obtain whatever supplies were required from the depot in Havana.<sup>6</sup>

In the afternoon heat of June 25, the Yellow Fever Board gathered for the first time on the veranda of the officer's quarters at Camp Columbia and reviewed its general instructions. Since the work done disproving Giuseppe Sanarelli's claim had been conducted in Washington with older culture specimens, Reed felt the board was obligated to demonstrate the absence of *B icteroides* in fresh blood cultures and tissues of yellow fever victims. The board's work followed this line of investigation and continued to do so into July, but apparently Finlay's mosquito hypothesis was first discussed in earnest during the last week of June. Dr. Henry R. Carter, Chief of Quarantine Officers for the Marine Hospital Service in Havana, generated this discussion. In 1898, Carter had discovered that a consistent interval of two to three weeks between the index and secondary cases of yellow fever in two small Mississippi hamlets and became convinced this resulted from an intermediate host “analogous to the transmission of malaria.”<sup>7</sup> In a note written to Lazear on June 26, Carter stated he believed “the argument from Dr. F's theory has much in its favor—to me it is more plausible although his observations as I have read them are not convincing, scarcely corroborative.”<sup>8</sup> After reading Carter's paper on the Mississippi

study, Lazear was sufficiently convinced to recommend the board pursue this line of investigation. Reed acquiesced, and mosquito eggs were obtained from Finlay. Whether Reed was as convinced as Lazear and Carter at this date is uncertain, but Carroll and Agramonte were still unimpressed. But this old idea continued to bounce around in Reed's mind careening off of the studies of Ronald Ross and Carter and the fact that cases of disease in the American sector of Havana had traveled haphazardly, jumping houses and crossing streets, as if it moved through the air. The theory no longer seemed as ridiculous as it once had, but another event focused Reed's full attention upon it.<sup>9</sup>

In mid-July, Reed investigated eight deaths, initially reported as malarial fever, at the Pinar del Rio barracks. As he studied the outbreak, he suspected they were cases of yellow fever, and he made two astute observations. First, although no disinfection of linens or patient discharges had been done, none of the attending nurses, patients on the wards, or laundry personnel had become ill. Second, one of the deaths had been a prisoner in the stockade, making it impossible for him to have acquired the disease in town. Ironically, the diagnostic failure of the Pinar del Rio medical officers assisted in convincing Reed that Finlay's hypothesis had to be pursued to its natural conclusion.<sup>10</sup>

The decision to do so was not made lightly. No laboratory animal had been found to contract yellow fever, and, therefore, only through human experimentation could mosquito transmission be confirmed or denied. "Personally," Reed confided to Sternberg, "I feel that only...experimentation on human beings serve to clear the field for further effective work—with one or two points cleared up, we could then work to so much better advantage."<sup>11</sup> But the moral responsibility with such a venture weighed heavily on them as they discussed the various details inherent to this experimental approach. By August 1, the day Reed departed for Washington to assist Victor Vaughn in completing the final report of the Typhoid Board, it was agreed that lives sacrificed in the course of board's work would be justified by those saved following the establishment of the theory. All members of the board, with the exception of Agramonte who was immune, agreed to be bitten and accept the same risks as those they asked to volunteer. Sternberg, who supported their decision, had few qualms about human experimentation and was eager to conduct blood inoculations to test the transmissibility of yellow fever from one individual to another. As to using mosquitoes instead of hypodermic needles, Jefferson Kean commented years later, Sternberg was "entirely skeptical"<sup>12</sup> of the idea and quoted him as telling Reed, "You can try it if you want to, but there is nothing in it."<sup>13</sup> Even so, Sternberg either ordered or strongly advised his most able lieutenant not to experiment on himself.<sup>14</sup>

Sternberg was not afforded the luxury of enjoying—even vicariously—the resumption of yellow fever research in Cuba. His focus and that of his military and medical colleagues in the Philippines was abruptly shifted to a new crisis in early June. In China, a xenophobic, grassroots revolt, led by a society known as the Boxers United in Righteousness, had erupted in the northern provinces. The Boxers blamed foreign interference in trade, politics, religion, and technology for all of

China's problems, and their goal was to rid their country of all foreigners. Their increasingly violent activities put the British, Belgian, French, German, Dutch, Russian, and American legations in Peking under siege by early June. Following an ill-fated relief expedition from Tientsin, European Naval squadrons established a secure base of operations against the Boxers at Taku. It was estimated that 60,000 troops—10,000 of which should be American—were needed to enter Peking. The War Department ordered General Arthur MacArthur to send troops to protect Americans in China and dispatched a composite force, commanded by Major General Adna R. Chaffee, from the United States to China.<sup>15</sup>

Sternberg prepared for an inspection tour of major western hospitals and medical supply depots as these events transpired. To ensure the relief expedition had the required medical support before departing Washington, he ordered Major and Surgeon William Stephenson to Manila to confirm what medical arrangements had been made with Greenleaf, and then report to Chaffee in Taku for duty as chief surgeon for the expedition. Sternberg gave Stephenson \$50,000 for hospital and medical expenditures and told him at least a 250-bed hospital should be provided. Greenleaf winced at this loss of manpower and materiel. He had lost three surgeons—20 hospital corpsmen, four ambulances, and a 50-bed regimental hospital—to the 9th Infantry, a fact apparently not known in the Surgeon General's Office (SGO). He also lost four additional medical officers, 26 hospital corpsmen, a 300-bed hospital, and supplies for 5,000 for three months when the 14th Infantry sailed. The pain was more than he could endure. He wired the surgeon general in mid-July that he could not “spare medical officers or Hospital Corps for field hospital. Need one hundred medical officers, three hundred Hospital Corps Philippine Islands.”<sup>16</sup> Twelve days later, MacArthur concurred with Greenleaf's assessment in a cable to Adjutant General Henry Corbin noting that “117 stations without medical officers something over 10,000 men with inadequate medical attendance a large number of which without attention at all.”<sup>17</sup>

Sternberg returned to this flurry of communiqués on July 23. Greenleaf's outrageous request could be dealt with from the SGO, but MacArthur's concurrence required an immediate official response to the Corbin. The Army medical manpower issue in the Philippines had always been one of numbers and compensation. Supply had never met demand. Now, the crisis in China highlighted congressional dalliance in addressing the surgeon general's supply concerns and the increasing demand for medical personnel required by McKinley's pacification policy. Frustrated—and understandably somewhat defensive—Sternberg undoubtedly perceived the Medical Department was once again on the verge of being flogged for circumstances beyond its control. In two letters to Corbin, he explained his personnel problems concisely and put responsibility for decisive action where it belonged. The total number of hospital corps privates in service as of June 30, Sternberg explained, was 3,548, with 2,020 in the Philippines, 37 in China, and 95 en route with troops to Nagasaki, and 119 in training that required two months. “It is...impracticable...to comply with General MacArthur's request for 300 additional privates.... I respectfully invite attention...to the fact...he has the



authority to transfer enlisted men on duty under his command, from the line...to the Hospital Corps...The total number in the Hospital Corps from latest returns, including Hospital Stewards and Acting Hospital Stewards, is 4,189. There has been no definite limit fixed with reference to the number of Acting Hospital Stewards and privates, either by orders or by Act of Congress. I have therefore continued to authorize enlistments to meet the demands of the service, notwithstanding the fact...the appropriation made by Act of Congress for the current fiscal year will be insufficient to pay the number now in service.”<sup>18</sup> Sternberg had given authority to recruiting officers and attending surgeons at larger posts to enlist men for the hospital corps without reference to the SGO. As to medical officers, the surgeon general noted that on April 30 there were 239 in the Philippines. “Since the first of April 100 additional contract surgeons and eleven commissioned medical officers have been ordered to Manila and I have endeavored to send out on every transport sailing from San Francisco from five to ten to replace those returning because of expiration of contract or sickness. By the Act of Congress...the number of contract surgeons is limited to four hundred eighty. There are at present...ten more than the number authorized by law. I respectfully request instructions as to whether this unexpected call for one hundred additional medical officers in Manila shall be filled by the employment of that number of contract surgeons, notwithstanding the provisions of the Act.”<sup>19</sup> Sternberg also stated that immediate actions had been taken to provide the additional acting assistant surgeons requested, but in this regard invited Corbin’s attention to the fact that “Congress in its last session took no action upon my urgent recommendation for an increase of the Medical Corps of the Army, or upon the two bills which I forwarded for the benefit of acting assistant surgeons.... The result of this is...there is no inducement for the best of the contract surgeons to remain in the Philippines after their contracts expire, and a considerable number of them insist upon returning home [after one year].”<sup>20</sup> Sternberg also noted, in addition to the medical officers already supporting operations in China, five regular medical corps and 30 contract surgeons would be needed to assist them and at least 10 more to staff a base hospital in China or Japan. “It is therefore evident,” he concluded, “that to meet the requirements in Manila and China it will be necessary to employ under contract more than one hundred physicians in excess of the number provided for in the Act of Congress above referred to.”<sup>21</sup>

Sternberg’s comments and his demand for administration support were not lost on Corbin or Secretary of War Elihu Root. The following day, Root directed Corbin to send as many medical officers as could be spared to MacArthur and authorized “the employment of a sufficient number of contract surgeons to make up such deficiency in the number required to meet the present emergency.”<sup>22</sup> Untied from congressional purse strings, Sternberg immediately advertised for the required number of physicians. In his reply to Root’s request for a summary of the distribution of Medical Department physicians and corpsmen the following week, Sternberg was gratified to report he had already received 1,000 applications. By the July 31, 407 medical officers—regular, volunteer, and contract—and 2,318 hospital corpsmen

were serving in the Philippines. He clarified for the senior leadership that not all physicians and corpsmen who supported MacArthur were in the Philippines. He noted that 10 medical officers and 142 hospital corpsmen assigned to Letterman General Hospital were completely engaged in caring for soldiers returned from the islands and should be considered as Eighth Corps assets, rather than in the pool of deployable medical personnel available in the United States.<sup>23</sup>

As for the China Relief Expedition, Sternberg informed Root that 37 Medical Corps officers were in or en route to China. One hundred fifty members of the hospital corps were on their way to Taku from Manila and San Francisco, another 75 would sail on the steamer *Warren* in mid-August, and 39 were on the hospital ship *Relief*, now in Nagasaki Harbor. Three hundred seventy-five hospital beds with supplies for 5,000 men were available in China, and the *Relief* would soon provide another 250 beds. The surgeon general had also ensured that every command leaving San Francisco had a full complement of field medical equipment, including medical and surgical chests and folding field furniture, and a 50-bed field hospital had been attached to the 15th Infantry Regiment. Should these assets prove inadequate, he directed the medical supply officer in San Francisco to prepare a complete 1,000-bed field hospital for deployment to China upon request and another 500 beds and equipment—currently at Vancouver Barracks—shipped to Nagasaki to be used at the chief surgeon's discretion.<sup>24</sup>

On July 13, a combined British, French, Japanese, and American task force had retaken Tientsin. On August 14, allied forces breached the gates of Peking. The Imperial City was secured the following day. Chaffee was extremely gratified with the performance of his command. More importantly for Sternberg and the Medical Department, Chaffee commented in his report to Corbin, "The medical department has provided as prompt relief to our wounded and as timely care of the sick as was possible to render.... I am informed...the hospital ship *Relief* arrived in Taku Bay not long ago and took on board a number of the wounded and sick from Tientsin."<sup>25</sup>

Back in Washington, Sternberg enjoyed the success of his department in China. Chaffee was content, and no criticisms worthy of the name from self-actuated civilians or the press inundated his desk. It was also gratifying to have the support of a strong Secretary of War in resolving personnel issues. This allowed the surgeon general to focus on his concerns about how medical supply and personnel resources were being used in the Philippines and attempt to manage them more efficiently from Washington. To this end, he had half of the supplies requested for July through December sent as soon as practicable and the remaining half purchased in the usual manner by calling for proposals from suppliers. He scrutinized requisitions for hospital stores to ensure that all items were on the Medical Department's standardized supply table, and not items that the commissary department provided.<sup>26</sup>

The surgeon general also became increasingly frustrated studying Greenleaf's request for, and returns of, medical officers during the year and compared them with officers deployed. Earlier in the year, Greenleaf had stated 360 physicians

were adequate, but in July, when he requested another 100 officers, there were 364 medical officers on duty in the islands. As Sternberg compared these returns against May hospital reports for Manila hospitals, he found a disturbing distribution of patients to medical officers and officers being inappropriately employed elsewhere.<sup>27</sup> "In my opinion," Sternberg wrote to Greenleaf in mid-August, "in view of the urgent need of medical officers elsewhere...it would have been entirely practicable to detach a considerable number of medical officers from the various hospitals in and about Manila. I would say, further, that I do not approve of the detail of a medical officer as assistant to the Supply Officer at Manila. In view of the great scarcity of commissioned medical officers...not more than two commissioned officers should be stationed at any General Hospital in the Philippines or elsewhere." Sternberg followed up these lectures to Greenleaf with a lengthy explanation of the same to the Secretary of War in which he concluded, "It appears to me...this number [of medical officers in Manila] is excessive in view of the deficiency reported elsewhere."<sup>28</sup>

From Manila, Greenleaf did his best to comply with his chief's requests and educate him on the local situation. In response to the surgeon general's request for a report on the general medical condition of the troops, Greenleaf noted he was having difficulty obtaining timely reports from the southern stations. He estimated the total sick at 8.5 percent, but intestinal illnesses were increasing since the rainy season had begun. This is how he described his hospital situation: "There are no general hospitals in this Division, all being really field hospitals, but with local designations selected for convenience of administration: the sick are treated, first, in regimental hospitals, second, in 'military' hospitals, and third, in 'Manila hospitals.' The regimental hospital is in theory simply an emergency hospital, capable of expansion...as a rule they average a capacity of about ten beds, but there are instances where, owing to local sickness, it is increased to fifty beds. The 'military' hospitals are organizations segregated from regimental commands, and placed under the control of the Department Chief Surgeons; they are located at points convenient for either water or rail transportation, and are rather more elaborately equipped than regimental hospitals, from which they are intended to receive the over-flow; they vary in bed capacity from sixty to three hundred beds. The 'Manila hospitals' are all completely equipped, and vary from two hundred and fifty to one thousand bed capacity."<sup>29</sup> Greenleaf, however, continued to believe his chief was attempting to micromanage affairs he did not completely understand, and, therefore, replied rather indignantly to Sternberg's admonishment concerning doctor usage in Manila. "Referring to your criticism, in letter of 11th, on my assignment of medical officers to Manila hospitals," he wrote on September 23, "I must with all respect say that I do not think it is well grounded.... The field hospitals here must be equipped, in their personnel, on a basis of bed capacity and not bed occupancy, since this latter changes constantly.... It is my opinion that no ward doctor can do justice, under modern conditions of medical and surgical practice, to more than seventy-five patients, and here, where nearly all the cases are serious and the effect of the climate is debilitating, he should not be required to have more than

fifty patients under his charge; already a number of Manila Hospital doctors have broken down from overwork, and been sent home.”<sup>30</sup>

For all of Sternberg’s medical and administrative knowledge, abilities, and experience, he had never managed a medical department in the field responsible for 60,000 soldiers. He understood the theory, but the difficulties encountered week to week and month to month by a medical department supporting counter-insurgency operations in the tropics were nearly impossible for him grasp. Time delays in correspondence aside, the surgeon general had no experiential context in which to place the information that Greenleaf supplied in abundance. One can speculate why Sternberg did not go to the Philippines in 1900—as he would do a year later—to sort out these issues face-to-face with his chief surgeon. Regrettably, no records have been found to clarify this question. Sternberg, however, continued to deploy medical officers because Greenleaf said he needed them desperately. Twelve commissioned and 12 contract physicians were on their way to Manila by mid-September to join those diverted to, and returning from, China. The surgeon general continued to struggle with MacArthur and Greenleaf over medical personnel and supplies as Aguinaldo escalated the insurgency in the fall of 1900. But as Greenleaf composed his reply to Sternberg’s criticism, a cable arrived in the SGO from Major Jefferson R. Kean in Quemados, Cuba: “Lazear yellow fever since 19th severe case much albumen, temperature high.”<sup>31</sup> Sternberg ordered Kean to send daily reports on Lazear’s condition. On September 25, he wired Kean: “If Lazear is dangerously ill secure his notes relating to yellow fever experiments.”<sup>32</sup>

During Reed’s absence Lazear allowed some of the mosquitoes he had been rearing for the past month to bite confirmed yellow fever patients, and then began applying them at two- to three-day intervals to volunteers who had not left the post. He also applied them to himself, but by the last week in August no cases had developed. As faith in the theory was waning, Carroll patiently coaxed a recalcitrant mosquito to feed on his own arm and four days later became horribly ill. Lazear and Agramonte were stunned; however, Carroll’s illness could not be proven to originate from the mosquito that bit him in the laboratory. On the same day his colleague was admitted to the hospital, Lazear found another willing volunteer, Private William H. Dean, 7th Cavalry, who had not been off post in nearly two months. When he became ill on September 5, the ominous reality of the situation struck them like a thunderclap. Further experimentation was halted and Reed was notified, but apparently not the surgeon general. Unfortunately, Lazear was bitten, possibly through his own negligence and a mistaken belief that he was immune, by a stray mosquito at Las Animas Hospital, and died in the evening of September 26.<sup>33</sup>

A depressed Reed returned to Cuba on October 4 to a totally demoralized Yellow Fever Board. Details of the past weeks were discussed with Carroll and Agramonte, and Dean was interviewed at length concerning his movements after being released from the hospital. Only Dean’s case was confirmatory, and it convinced Reed that the mosquito did transmit yellow fever. Reed scrutinized the pages of Lazear’s laboratory notebooks for hours searching for data that would

explain the sudden success of these preliminary experiments. As he tabulated the experimental results, the picture came into focus: the difference was in the time interval between infection of the mosquito and human inoculation. Clearly, it was critical for the mosquito to feed on a severely ill patient early, but more importantly, the mosquito was not infective for at least 12 days afterward. This is what Carter had observed and why Finlay had failed. The mosquito—*Stegomyia fasciata* (*Aedes aegypti*)—was the intermediate host, the vector of yellow fever. Reed's characteristic slow, deliberate nature now gave way to a rush of activity. Sternberg was notified of his findings, and the report was prepared for publication. The results were inconclusive, but further experimentation had the potential to verify this preliminary analysis. Furthermore, ownership of the hypothesis had to be declared soon. For all of his prior derogatory comments concerning Finlay's theory, Sternberg had never seen Reed's scientific intuition or judgment fail. No chances could be taken even if he was wrong. Sternberg had Reed's paper added to the agenda of the annual American Public Health Association (APHA) meeting in Indianapolis on October 22, and then he convinced the editor of the *Philadelphia Medical Journal* to add the paper to the October issue.<sup>34</sup>

Sternberg would have enjoyed the APHA meeting, but Philippine issues kept him in Washington. Greenleaf complained that 2,000 hospital corps privates were insufficient, and another 250 natives and ex-Spanish Army soldiers should be hired to work as litter bearers, kitchen police, and scavengers because these duties "cannot be performed by Americans."<sup>35</sup> The contracted workers were paid from the medical and hospital appropriation or from the public civil fund. Sternberg passed the funding request on to the Secretary of War. But, in regard to the hospital corps, he noted that his calculations indicated that 2,230 privates were already on duty in the Philippines, 48 were en route from the states, a large majority of the 195 were in China, and another 100 were scheduled to sail from New York in November. Once all of these medical privates arrived, they would comprise more than 4 percent of the command, and, after the expected return of volunteers late in the year, would exceed 5 percent, which is the amount Greenleaf had earlier estimated was appropriate. "In view of this," commented Sternberg, "and the fact...the number now in service is very much in excess of the number for which Congress has made appropriation, recruiting has been stopped for the present."<sup>36</sup> Moreover, Sternberg was still rankled over the organization of the Manila medical supply depot, a point never clarified by Greenleaf. Major Merritte W. Ireland was the overall officer-in-charge with First Lieutenants Powell C. Fautleroy and Benjamin J. Edger in charge of medical supply for the Departments of Northern and Southern Luzon, respectively. The surgeon general told Corbin the necessity for this detail escaped him, especially since medical officers were critically needed elsewhere. "It is not advisable to detail junior medical officers...for such duty, as they are liable to lose interest in their professional work and they are deprived of the opportunity for gaining professional experience. I therefore request...an investigation be made as to the necessity for maintaining branch supply depots...in...Manila."<sup>37</sup>

For all of his good intentions, Sternberg was again meddling in operations that were beyond his understanding, and, while the investigation proceeded quickly, it was poorly timed. Aguinaldo's guerillas were making one last push to influence the November U.S. presidential elections. Attacks on isolated posts, detachments, and supply trains had increased in late summer and did not fade away until the end of November. MacArthur had little patience for the surgeon general's request because he was contending with these attacks and planning a counteroffensive to begin as the monsoon season dissipated, also in November. In a short reply to Corbin, MacArthur lambasted the centrally organized quartermaster, commissary, and medical supply depots as intolerable business propositions for his scattered forces and on the verge of total collapse until he had decentralized them—to the benefit of all. He concluded by commenting, "The Medical Department has derived incalculable advantages from the change, and the administration is now conducted with precision and to my entire satisfaction. This state of things will be interrupted if not entirely broken down if the views of the Surgeon General are to prevail."<sup>38</sup>

Reed arrived in Indianapolis for the APHA meeting well before Sternberg received word that he had lost the battle with the commander in the Philippines. Reed's carefully crafted remarks easily consumed the 20 minutes allotted for him and another 20 were generously granted. But the polite applause he received could not mask the indifference with which the audience received what was truly a stunning revelation. The response from Indianapolis and New York papers was equally bland, and the *Washington Post* declared the mosquito theory "the silliest beyond compare."<sup>39</sup> A disappointed Reed returned to Washington, visited briefly with Sternberg and the recovering Carroll, and packed for the return voyage to Cuba.<sup>40</sup>

Comments and concerns among contemporaries and historians have cast doubt on Sternberg's support of—and intentions toward—Reed's work.<sup>41</sup> Sternberg obviously believed Reed's intuition had been correct and must be pursued. Otherwise he would not have pushed to have Reed added to the APHA agenda nor spent the time to convince the editor of the *Philadelphia Medical Journal* that the paper had merit. The paper did go to press quickly, but the corrections—clarifying informed consent issues—that greatly concerned Reed were made. Reed also suggested the last conclusion should merely state the mosquito served as the intermediate host for yellow fever. However, Sternberg disagreed and sent it forward as originally written: "The mosquito serves as the intermediate host for the parasite of yellow fever, and it is highly probable that the disease is only propagated through the bite of this insect."<sup>42</sup> In November, he had reprints sent to a number of scientists around the world who would find it of interest. He also approved Kean's suggestions to use mosquito bars in all barracks and hospitals as well as in the field when practicable and to begin mosquito control measures on post. These did not seem like the actions of a doubting man. Moreover, he sent Reed the following note in November, "I am glad to know you are in a fair way to carry on additional inoculation experiments. As I said to you when you were in Washington, I consider this the most important matter for the present. The profession generally will not be disposed to accept the experiments already published as definitely settling the

question as to the role of the mosquito.... When this is once settled beyond question, it will not be so essential that you should demonstrate the presence of the parasite either in the blood of patients or in the bodies of mosquitoes, although of course this will be extremely desirable and is naturally the next step to be taken.”<sup>43</sup>

Even so, Sternberg was justifiably upset with the conduct of the experimentation. The methods of the board appeared haphazard and uncontrolled, caused the death of one man and nearly killed another, and in the end gave inconclusive results. Moreover, he was disappointed in four scientists whom he knew possessed all the requisite skills and knowledge to preclude such a travesty. The events of August and September argue against any suggestion that, as of August 1, Reed or the board had any faith in the validity of Finlay and Carter’s theories. Truby was probably correct in his assertion that no member of the board “...had any expectation of meeting with the sudden success which resulted from Lazear’s preliminary experiments. Otherwise, Reed would have either delayed the mosquito work or had his trip to the United States postponed.”<sup>44</sup> Sternberg’s continued support of Reed and the Yellow Fever Board suggests he felt the same way. However, in early November, he sent this short dispatch concerning the August experiments to the *British Medical Journal*: “Unfortunately the mode in which the experiments were conducted detracts much from their value. They are really by no means conclusive. The experimenters themselves are of the same opinion. At most they are suggestive. It is to be regretted that, considering the great danger to which the subjects of these experiments were exposed, greater care was not exercised that the conditions of the experiments were absolutely free from objection.... Dr. Lazear’s life has not been thrown away if these experiments lead...to their repetition under more rigid conditions....”<sup>45</sup> This was written, presumably, to demonstrate publicly to an international scientific audience that the Medical Department was being totally objective in its work, but determined to continue further investigations. A proud and sensitive man, Reed’s vanity as a scientist rivaled Sternberg’s. Although he had undoubtedly heard similar words behind closed doors and could not object to their validity, he may have interpreted them as a public rebuke.

Before leaving Cuba in October, Reed obtained Wood’s approval—and financial and diplomatic support—to pursue further investigations. An experimental station named Camp Lazear consisting of two frame buildings and seven floored hospital tents, was erected in a mere two weeks. Reed’s experimental plan consisted of four simple, yet elegant, phases:

1. verification of disease transmission from the bite of infected mosquitoes,
2. verification of disease transmission from exposure to clothing contaminated with discharges from yellow fever patients,
3. a demonstration to show a home cannot be considered infected without the mosquito’s presence, and
4. determination of disease transmission from yellow fever patients to nonimmunes via blood injections.

Volunteers for these experiments came from the American and Spanish nonimmune communities. Reed carefully prepared a contract, the world's first consent form printed in English and Spanish, describing the grave dangers involved. Conflict of interest precluded him from asking for volunteers among the medical staff and hospital corpsmen at Columbia Barracks. However, to his surprise and gratification, a number of these men rose to the challenge on their own.<sup>46</sup>

Phase I testing began on November 20. Private John R. Kissinger developed all the symptoms of yellow fever on December 8. As his fever soared, so did Reed's confidence. "Rejoice with me, sweetheart," Reed wrote to his wife, Emilie, "...aside from the antitoxin of diphtheria and Koch's discovery of the tubercle bacillus, it will be regarded as the most important piece of work, scientifically, during the 19th century.... It was Finlay's theory, and he deserves great credit for having suggested it, but he did nothing to prove it; it was rejected by all, including General Sternberg."<sup>47</sup> Two days later, he wrote to her again, still piqued that some of his colleagues would not recognize what was becoming—more and more—a discovery belonging solely to Reed: "The case is as plain as a nose on a man's face, but Dr. Guiteras has pronounced...our theory as being 'very wild and improbable'... Six months ago, when we landed on this Island, absolutely nothing was known concerning the propagation and spread of yellow fever...but, today...its mode of propagation [was] established...."<sup>48</sup> In the same letter, he also wrote, "I will write Dr. Sternberg in a few days about the case—of course, he will, at once, write an article & say that for 20 years he has considered the mosquito as the most probable cause of yellow fever — That would be just in order for him to do so."<sup>49</sup>

Ego notwithstanding, time and truth were on Reed's side. By December 15, three of the Spanish volunteers had developed confirmed cases. Furthermore, two weeks earlier, Dr. Cooke and Privates Levi Folk and Warren Jernigan had initiated phase II of the experiments in the infected clothing building. There, they had unpacked a number of boxes filled with clothing and bed linens soiled with the discharges of yellow fever patients, donned the clothing, prepared their beds, and hung the remaining malodorous rags about their quarters before retiring each night. They continued this repulsive ceremony for 20 days, but suffered only nausea as a result.<sup>50</sup>

Reed contacted Sternberg with results of their success in the first two phases. He was convinced they had proven the theory—although phases III and IV had not been started—and suggested they prepare a supplementary note to be presented to the Pan-American Medical Congress to be held in February. Then he inquired of Sternberg, "...whether you consider it necessary that we should try blood injections.... Any other suggestions that you may make, will be much appreciated."<sup>51</sup> Two days later, he wrote to his chief of the fourth case and his intent to begin phase IV.

Sternberg's initial response, "I congratulate you," received the following day, was curt, unemotional, and probably did more to deflate Reed's ego and engender bitter feelings than all the doubting colleagues and hostile press reports combined.<sup>52</sup> Reed expected and needed more applause from his boss, but he could not have



been surprised. When it came to science, Sternberg remained objective until all the evidence was in; only to Mrs. Sternberg were his emotions revealed. Reed had worked with him long enough to understand that. The surgeon general wrote to him again on December 19: "I was very much pleased to receive your telegrams and your letter of December 14th and congratulate you upon the success of your experiments. Now if you can identify the parasite the question of etiology will to a great extent be settled. With reference to inoculations with blood...I think it would be desirable to make some experiments. The question is still open as to whether the parasite must pass through the body of a mosquito in order to infect susceptible individuals. If it is in the blood of patients in such a stage of development that the disease can be transmitted by inoculating small quantities of blood, then I see no good reason why the contents of the intestine should not also contain the germ as disorganized blood is always present in fatal cases. Having proved... the disease may be transmitted by mosquitoes there is little reason to doubt...this is the usual way in which it is transmitted; but we should not hastily conclude... it is the only way."<sup>53</sup> However, he agreed completely that Reed should present the results to the Pan-American Medical Congress.<sup>54</sup>

Phase III of the experiments began just before Christmas with the release of 15 mosquitoes into one section of the infected mosquito building. Of these, only one—infected for 24 days—was capable of transmitting disease and three others—infected for 12 days—were considered possible vectors. John Moran, courageously accepting the challenge once more, was bitten repeatedly on the face and hands in three exposures of 30 minutes each while two nonimmune volunteers occupied the mosquito-free section. On Christmas day, Moran developed a confirmed case of yellow fever from which he subsequently recovered; the volunteers remained disease free. Reed again wrote Emilie of their success and commented rather smugly: "It will be as hard for Gen. Sternberg to give up the infected clothing theory as anyone else, for he has in his various writings espoused it as one of the facts that were well established! But we have already knocked this theory to simple Smithereens!"<sup>55</sup>

Blood inoculations constituting phase IV followed in early January. Four individuals received injections of blood taken from patients in the first or second day of illness and three developed yellow fever. Directed by Reed's genius, supported by Sternberg and Wood, and assisted by a host of intrepid American and Spanish volunteers, the Yellow Fever Board had unequivocally demonstrated that the mosquito transmits yellow fever. Remarkably, this had been accomplished with no fatalities. Reed presented the work to the Pan-American Medical Congress in Havana on February 4. The convention hall was packed with physicians from North and South America, Cuba, Spain, and Mexico eager to hear of the experiments and not only applaud Reed, but also Carroll, Agramonte, and Finlay. Some vocal detractors were present, but as he told Emilie, "It was...a signal triumph of our work."<sup>56</sup>

The first few weeks of 1901 were full of promise and optimism. MacArthur's fall campaign had focused on separating Filipino insurgents from their clandestine supply bases. Although anti-imperialist critics declared his methods nothing more

than a repetition of Spanish reconcentrado in Cuba, the quality of life in these towns improved. Resistance collapsed in Central Luzon by early February—which MacArthur heralded with gusto—and although Aguinaldo would not be captured until the end of March, the insurgency began to topple like dominoes throughout the archipelago. McKinley, who was buoyant over MacArthur's success, told Taft that he and his commissioners would soon take over from the military government.<sup>57</sup>

With peace around the corner, Congress debated the proper size for the army and its medical support now engaged in civil–military operations on a global scale. Congress settled on a regular army of between 59,131 and 100,000 officers and men in early February—a legislative victory for Root—that increased regular infantry regiments from 25 to 30 and regular cavalry regiments from 10 to 15, but did not settle on a fixed strength of 77,287 enlisted soldiers until May. Sternberg's lobbying efforts were not so well rewarded by the 56th Congress. They fixed the strength of regular medical officers at 321, an increase of only 129 positions; gave the president authority to appoint 200 surgeons and assistant surgeons of U.S. volunteers to serve in the Philippines for two years; and provided for an additional 100 hospital steward positions—for a total of 300—to replace those lost as volunteer regiments returned to the states. Considering that 146 posts were in the United States, Cuba, and Puerto Rico; 438 posts were in the Philippines; seven arsenals were in the United States and six general hospitals in the United States, Hawaii, and Japan; and facilities were still functioning in China, as well as administrative positions in the SGO, Library, and Army Medical Museum; these additions were a pittance. In this same military appropriations bill, however, Congress did approve the organization of a permanent Army Nurse Corps and a Dental Corps of 30 contract dentists.<sup>58</sup>

Sternberg recognized that whatever the fixed strength of the army would be, it would definitely be larger than its pre-1898 level and its mission tremendously more complex. Naturally, a proportional permanent expansion of the Medical Department would follow with a concomitant increase in the complexity of medical operations. Although he could not discern the future, Sternberg could clearly comprehend the past. War, national expansion, advances in medical science, and changing clinical practices had forever altered the composition and role of the Medical Department. Hospital ships, field laboratories, hospital corpsmen, nurses, and now dentists were fast becoming permanent fixtures in the department's inventory. Indeed, the hospital corpsman had become second only to the medical officer, a most indispensable asset on Cuba's battlefields, in the Philippine jungles, on the hospital and hospital ship wards, and in the laboratories. The success of future operations depended on their services, and the surgeon general focused considerable attention on the requirements of this corps in early 1901.<sup>59</sup>

In preparation for congressional questions concerning the size of the hospital corps, Sternberg queried his departmental surgeons on the number of commissioned officers and enlisted personnel required to staff hospitals of 100 to 1,000 beds based on the theory that all work at the facility was done by the hospital corps. The table generated from the data received gave a steady medical officer to enlisted ratio of one-to-seven and reflected the labor-intensive operations of larger

general hospitals. The numbers supported the conclusion that a hospital corps comprising 4 percent of the total projected army strength was sufficient. However, Sternberg cautioned that if the corps was to meet the sanitary needs of the Porto Rican Provisional Regiment and the 13,000 native troops in the Philippines, then its total strength could not be less than 3,800 men or 5 percent of the total fixed strength estimated.<sup>60</sup>

To meet current requirements, Sternberg had resumed hospital corps recruitment in January. Difficulties in recruiting and training desirable men, which had always been a problem, had intensified during the Philippine conflict. Large numbers of corpsmen had been brought into service often without basic knowledge of reading and arithmetic. Medical instruction was truncated in an effort to get corpsmen into theater with the hope they would obtain the rest of their education while on the job, a hope that frequently went unrequited. Sternberg began to address these issues with his usual methodical approach. Surgeons at Forts Columbus, Sheridan, Snelling, Leavenworth, Sam Houston, Logan, and Vancouver Barracks were directed to reestablish instruction detachments, which had been disrupted by the war. Pleased with the success of departmental surgeons in shouldering recruiting, instruction, and disciplinary actions of corpsmen in the United States, he implemented this program armywide in conjunction with a systematic course of instruction—five hours per week with a detailed report to accompany monthly returns—at every post. These three changes put greater responsibilities on departmental and post surgeons than they were used to and familiar with. Moreover, it required more experienced manpower than the army had, and it was on this point that Sternberg encountered resistance. Greenleaf, virtually the godfather of the hospital corps, was not optimistic about the creation of a systematic course of instruction at every post, commenting, “it must be remembered...more than eighty percent of the medical officers serving in this Division are to a greater or less extent untrained...their stations frequently changed, and very few of the acting assistant surgeons are sufficiently familiar with their military duties to be capable of instructing members of the Hospital Corps, except in methods of first aid...in a majority of instances the members of the Hospital Corps are more familiar with their military duties than is the doctor.”<sup>61</sup> From the Department of California, Deputy Surgeon General Henry Forwood was in the main supportive, but noted “At a general hospital, where the work is arduous and the number of corps men barely sufficient, it cannot be put into complete operation without detriment to the service....”<sup>62</sup> Majors George Torney, at the Army and Navy General Hospital, and Valery Havard, in the Department of Cuba, thought the idea workable, but Major William B. Bannister, recently posted to West Point after returning from China, declared such an enterprise was impossible at the academy due to the distance between the post’s two hospitals.<sup>63</sup> Nevertheless, the surgeon general held to his standards; but, over the next year, the instructional report fell from a “monthly” to an “occasional” requirement, and Sternberg’s comment in his annual report that “the instructional work of the various posts has generally been well done” suggests the reality was rather less than he had desired.<sup>64</sup>

In Cuba, the practical application of Reed's triumph also began in early 1901. Initially unfamiliar with the mosquito life cycle, William Gorgas and Reed felt that destroying sufficient numbers of adult mosquitoes to preclude outbreaks of disease would be impossible. After further thought and many discussions, Reed, Gorgas, and Sanitary Department members "decided that we should adopt all measures that seemed likely to be useful..."<sup>65</sup> These measures included screened yellow fever isolation wards, fumigation of homes and buildings with pyrethrum powder and kerosene, and destruction of breeding sites. In just a few weeks, Gorgas noticed a decline in yellow fever cases around Havana. Much to everyone's surprise, he hesitated to accept the board's conclusions completely and was not ready to dispense with the expensive, yet comforting, disinfection procedure. Wood and others in Havana were perplexed. Although he never pinched pennies in the fight against yellow fever, Wood did not like to see them frittered away either, and he asked Sternberg to adjudicate the matter. According to Valery Havard, Sternberg replied immediately and "with full conviction that, after the experiments of the Reed Commission, doubt was no longer possible..." Circular No. 5 was published in late April—sans disinfection—but Gorgas would continue the practice until August.<sup>66</sup>

It was assumed by medical experts that a mosquito that had bitten a mild case of yellow fever would transmit the same mild case. Therefore, vaccination with mosquitoes infected from mild cases was considered a possible method to establish lifelong immunity. Gorgas told Sternberg at the end of February that he had established "a small experimental station under the care of Dr. Guiteras, where I am carrying on experiments on the line of Reed's work, to see if some general system of inoculation would not be feasible and justified."<sup>67</sup> In doing so, Gorgas assumed command authority and scientific responsibility that he did not have. Interestingly enough, Sternberg and Wood allowed the experiments to proceed, an indication that methods for controlling new science and research in the Medical Department were yet to be established. Cool weather and apparently ineffective laboratory technique precluded captive mosquitoes from becoming infected. With a single exception, the first 29 attempts failed to produce disease, but this would change dramatically in August.<sup>68</sup>

In March, General and Mrs. Sternberg moved from 16th Street, NW, to 1440 M Street, NW, just a few days after sitting through President William McKinley's second inauguration. McKinley came to his second term on a great wave of popular approval. He was eager to see this large electorate, speak to them about important issues facing the nation, and have them see and hear their president in person. Therefore, he determined his first public action would be a grand tour of the nation that would end in Buffalo on June 13 for the President's Day celebration at the Pan-American Exhibition. Before leaving on this six-week excursion, he reviewed the preparations for the U.S.-directed civil government in the Philippines. A large amount of revision, fine tuning, and adjustment of organizations and agencies would be required as the military gave way to civilian control. Presidential decisions concerning the archipelago had to be based on current and accurate data and gathered by men McKinley could trust. With this in mind, he

directed the War Department to organize and conduct an inspection tour of the islands. While Inspector General Joseph C. Breckinridge dispatched Colonel Joseph P. Sanger on a comprehensive tour of U.S. assets, which included the Medical Department, in Asia in late March, Corbin planned a follow-on inspection by the bureau chiefs in the summer.<sup>69</sup>

The SGO hummed with activity that spring. Sternberg planned his Philippine agenda, prepared Forwood to conduct official business during his absence, and planned for the reopening of the Army Medical School. He addressed the American Social Science Association on the recent advancements in understanding yellow fever, and he wrote an article on mosquito transmission of that disease. Mrs. Dita H. Kinney settled in as the first superintendent of the Nurse Corps. Much to the surgeon general's delight and satisfaction, Reed had returned from Cuba. In mid-May, Mrs. McKinley was seriously ill secondary to an abscessed thumb. She returned immediately to Washington, and although she weathered the crisis her devoted husband requested Sternberg continue his regular visits and provide medical advice. Upon the completion of one of these visits, the two men discussed Sternberg's upcoming trip to the Philippines, and McKinley asked if Mrs. Sternberg was to accompany him. The surgeon general said she would not accompany him because she was planning to spend that time with her mother in Indianapolis. Having nearly lost his beloved Ida so recently, this reply disturbed the president tremendously. He urged Mrs. Sternberg to come and see him—which she did—and by the time she left the White House had determined to sail for the Philippines in June.<sup>70</sup>

With Forwood, Charles Alden, Kinney, and Reed supervising the SGO, Sternberg boarded the California Limited, bound for Los Angeles via Chicago, on June 18 in complete confidence that Medical Department business would proceed as he expected. By the time he returned, the medical school would be ready to accept the class of 1902, and Reed and Carroll might have some new knowledge of the yellow fever germ based on their blood work and examination of infected mosquitoes. Sternberg had commented after his exhaustive researches years before of “the possibility...the specific infectious agent...may belong to an entirely different class of micro-organisms from the bacteria, or that it may be ultramicroscopic, not capable of demonstration in the tissues by the staining methods usually employed...”<sup>71</sup> With Sternberg's hunch and a suggestion from long-time friend and mentor, William H. Welch, to consider pursuing the techniques that led Friedrich Loeffler and Paul Frosch to demonstrate the ultramicroscopic character of the agent of hoof and mouth disease in Germany, Reed had Carroll plan a return to Cuba in August to conduct another series of experiments.<sup>72</sup>

Regrettably, Reed perceived Sternberg was claiming more and more credit for the results of the Yellow Fever Board, a suspicion that had begun to germinate in his December 9 letter to Emilie.<sup>73</sup> Sternberg's article, “The Transmission of Yellow Fever by Mosquitoes,” which was published in the July 1901 issue of *Popular Science Monthly*, did nothing to allay Reed's growing paranoia. After a short recapitulation of modern yellow fever investigations, the paper described the work done by the Yellow Fever Board explicitly and gave appropriate credit. Sternberg

prefaced his presentation of the board's work by stating, "Having for some years given much thought to this subject, I became some time since impressed with the view that probably yellow fever, as in the malarial fevers, there is an 'intermediate host.' I therefore suggested to Dr. Reed...that he should give special attention to the possibility of transmission by some insect, although the experiments of Finlay seemed to show...this insect was not a mosquito of the genus *Culex*, such as he had used in his inoculation experiments. I also urged that efforts should be made to ascertain definitely whether the disease can be communicated from man to man by blood inoculations."<sup>74</sup> These comments infuriated Reed, and he quickly made his displeasure known to Gorgas in Havana: "You might tell Dr. Finlay... with my best compliments...he had better look to his laurels as the proposer of the Mosquito Theory, since Dr. Sternberg...puts forward his name very conspicuously for the credit for our work in Cuba. Dr. Finlay's turn will come. You must get it and read it. It says, as you will see, that 'having given the subject thought for many years sometime since (!) became impressed with the idea that yellow fever, like malarial fevers, was due to an intermediate host! I therefore suggested to Dr. Reed... to give special attention to the possibility of transmission by some insect!' The ungodly \_\_. What can our chief be thinking of to deliberately and grossly misrepresent the facts! Can he believe, for one moment, that he can hoodwink sensible men! Remember, my dear Gorgas...I have yet to hear one word of praise from Sternberg! This is the reward for our work in Cuba! He...only mentioned Finlay's theory to condemn it! and now, after the work has been done, he not only is willing to undertake to rob the living, but even the dead of their just reward!...I wish that you would show this to Havard.... You can both judge the motive of our Chief in doing so despicable a thing...."<sup>75</sup>

Again, Reed partisans have cited this essay and letter as evidence that Sternberg unjustly took credit for the board's work to reflect glory upon himself.<sup>76</sup> However, when the *Popular Science Monthly* article, Reed's letter to Gorgas, Sternberg's instructions to the board, and some of his previous writings are examined together, Reed's self-righteous anger and indignation do not have a completely honest ring. Sternberg stated his ideas concerning vector transmission of infectious diseases to the New York Academy of Medicine in 1895: "There is a way which pathogenic bacteria may be carried a limited distance through the air, and by which infectious material may be conveyed from house to house...privy-vault to...beefsteak upon the...table or into the milk-jug, which should not be lost sight of in considering channels of infection. This is upon the feet of insects, and especially of house-flies, which...frequent...decomposing animal material and swarm upon the surface of fecal matter deposited upon the surface of the ground or in shallow pits. There are many facts which support the view that such material affords a suitable nidus for the development of the yellow-fever germ, and I am strongly inclined to believe that the...house-fly is a factor of considerable importance in the propagation of yellow fever, typhoid fever, and cholera. Dr. Finlay...some years ago conceived the idea that yellow fever is transmitted from the sick to susceptible individuals by mosquitoes; but his experiments do not give any support to his theory.... It has also

been suggested...the mosquito may give rise to malarial infection, by introducing the malarial germ through the puncture it makes for the purpose of obtaining the blood of its victim. But I know of no exact observations or experimental evidence in support of this hypothesis. There are, however, some reasons for believing...the mosquito may play a part in the etiology of malaria in the way suggested by Manson.... The transmission of infectious diseases by insects appears to be well established [for] the Texas fever of cattle and...the fatal African epizootic known as the "fly-disease" [African trypanosomiasis]. In the first mentioned disease...the tick is the intermediate host.... After feeding on the blood of an infected animal the tsetse-fly can communicate the disease to a healthy animal by its bite."<sup>77</sup> In February 1898, he wrote this to Stanford Chaille: "There is every reason to believe that in yellow fever...the infectious agent is...in the excreta of the sick.... One method in which the infectious agent may be transported from the sick room...to a favorable nidus for its external development is by means of flies; I am disposed to believe... they constitute a very important factor in the propagation of disease."<sup>78</sup>

Clearly, Sternberg had been considering the role of intermediate hosts in disease transmission. He was impressed that the transmission of malaria might occur as Manson had described, and that yellow fever might be transmitted in the manner of typhoid fever. These opinions had not changed by 1900. Reed undoubtedly was familiar with Sternberg's opinions and, therefore, his indignation must reside in Sternberg's claim to have suggested looking for an intermediate insect host in Cuba. In his official instructions to the board, Sternberg stated he had no specific suggestions or directives upon which it should act. If the suggestion was made—something that will never be known—it must have been presented to Reed alone in one of their early meetings in May 1900. However, Sternberg never intimated publicly—before or after the yellow fever board's investigations—that he had seriously considered the mosquito or its bite to be a possible—or even likely—method of transmission.

The animus Reed perceived in Sternberg's actions during the yellow fever investigations and his sense of being under-appreciated by his mentor and chief did not spring from his mind *de novo* in Cuba. They developed through years of successful, yet laborious, scientific and administrative work for a man who was thoroughly objective in his approach to science and the army, and extremely unemotional in expressing his gratitude for a job well done. Sternberg did let Reed know he was appreciated, but not enough to support Reed's ego. Of course, Sternberg bears a great deal of responsibility for the creation of Reed's self-esteem. He handpicked and molded the fledgling bacteriologist in his own image—ego and all. If Sternberg was ever aware of Reed's true feelings, he never let it become public; if Mrs. Sternberg knew, she took the secret to her grave. Reed never made them public either.

The army transport *General Hancock* sailed by the northern route for a more rapid transit. Entering Manila Bay, the ship passed the imposing island of Corregidor rising some 600 feet above the sea, the old naval station at Cavite, the remnants of the Spanish Fleet, rusting monuments to Dewey's victory, and then dropped

anchor some distance off shore. A launch soon arrived carrying Chaffee and his staff to officially welcome Corbin and his staff, Quartermaster General Marshall I. Ludington, Commissary General John F. Weston, Chief of the Signal Corps General Adolphus W. Greely, and the Sternbergs. As the inspection party was preparing to go ashore to a Manila hotel, another launch, from the hospital ship *Relief*, also came alongside. The commander of the hospital ship, Major and Surgeon Harry O. Perley, climbed aboard the transport, warmly welcomed General and Mrs. Sternberg, and quietly urged them to stay aboard the *Relief*, rather than trust the doubtful accommodations in town.<sup>79</sup>

Aboard the *Relief*, Sternberg met with Lieutenant Colonel Benjamin F. Pope, who had replaced Greenleaf as chief surgeon in May, Perley, and other medical officers to discuss his inspection requirements and plan a travel agenda. The surgeon general found his officers upbeat and enthusiastic. The waning insurgency had significantly reduced the intensity of medical operations and the attendant stress and anxiety that accompanied them. Consumption of medical materiel had slowed, hospital beds were unfilled, and, as commands were consolidated, posts abandoned, and troops sent home, medical personnel began to enjoy a relative, momentary increase in their numbers. Sternberg's inspection began with a tour of the *Relief*, and over the next few days he focused on the larger hospitals on Corregidor, at Dagupan, and in Manila. All agreed the services of the faithful hospital ship were no longer needed. Moreover, it was tremendously expensive to operate, and Sternberg decided earlier to give it over to the Quartermaster Department for use as an inter-island transport. The hospitals, which were fixed facilities on hardstand, functioned satisfactorily from a medical standpoint, but needed repair, as well as some of their sterilizers, water distilling plants, and ice machines. Captain Merritte Ireland, who was in charge of the medical supply depot in Manila, presented warehouses to Sternberg that had stocks to last a year.<sup>80</sup>

In the last week of July, the Sternbergs joined Corbin and other officers in a tour of the southern islands that included stops at Iloilo, Cebu, Zamboanga, and Jolo. The difficulties of distance, terrain, and climate experienced by his surgeons on a daily basis, and described earlier by Henry Lippincott, Alfred Woodhull, and Charles Greenleaf became clear as he navigated steep and narrow trails from one station hospital to another. These hospitals—many just crude nipa shacks—were small and needed repair, but inside Sternberg was gratified to find that medical care, whether delivered by a physician or corpsman, met a standard of which the Medical Department could be proud. The overall health of the army was satisfactory, an indication medical and line officers were adhering to Medical Department directives on field sanitation and hygiene.<sup>81</sup>

Upon returning to Manila, the surgeon general cabled Forwood that \$20,000 worth of appropriations were needed for hospital construction and repair, and he was not to make any medical supply purchases in the fall. "The supply depots are loaded up with supplies of all kinds, and we are not likely to have any requisitions for a long time to come,"<sup>82</sup> Sternberg told Forwood, and "The supply depots at home are also full...in expectation that large requisitions would be received from



the Philippines. In view of the large amounts on hand...I expect to cut down our estimate for the Medical and Hospital appropriation to one million dollars."<sup>83</sup> He also initiated the consolidation of many hospitals and medical storage depots, and designated a handful of medical officers for redeployment to the states.<sup>84</sup>

Before leaving the Philippines, the surgeon general had one more mission to accomplish, this one at Root's direction. Suggestions for establishing a center for the rest and relaxation of officers and soldiers suffering from the ill effects of the tropical climate on a mountaintop near Baguio had filtered their way to Root's desk. He requested Sternberg personally investigate the area and comment on the practicality of such an undertaking. In mid-August, Sternberg took a train to northern Luzon once again. At Dagupan, Sternberg mounted a horse and followed a guide the last 30 miles—through jungle and up rugged trails—into the Central Mountains of Benguet Province. At 5,000 feet, the small party rode onto a grassy plateau dotted with pine and oak trees. Sternberg thought it was a beautiful location for a health resort, but building a wagon road, let alone a railroad, into the area would be expensive. Even so, he recommended the spot to Root, and in the coming years a health resort and convalescent home was established there.<sup>85</sup>

Seven weeks after anchoring in Manila Bay, the Sternbergs settled into their rooms aboard the army transport *Thomas* for their voyage home. Their stay in the Philippines had been an extremely pleasant adventure and, although eager to get home, they looked forward to the scheduled stops in Japan. As the steamer made its way north along the western coast of Luzon, Sternberg's mind undoubtedly turned to the yellow fever experiments being done by Reed and Carroll on the other side of the world.<sup>86</sup>

Carroll had arrived in Havana to begin his work at Las Animas Hospital just as Gorgas' inoculation experiments culminated in disaster in August. Sixteen individuals were bitten by infected mosquitoes. Of these, eight developed disease, several with severe symptoms, and three died, one of which was Miss Clara Maas, an American volunteer nurse at Las Animas Hospital. These events demonstrated the unpredictable lethality of mosquitoes infected with yellow fever and, thereby, the futility of inoculation as a preventive measure. This obvious risk notwithstanding, volunteers stepped forward to assist Carroll with his work. Two volunteers developed yellow fever after inoculation with infected mosquitoes. In the third day of illness, Carroll withdrew blood from one of these volunteers, divided it into three aliquots, and then began the planned experiments. One portion of blood was injected into another volunteer, a second was passed through a Berkefeld filter and then injected into a second volunteer, and the third portion was heated to 55°C for 10 minutes and then injected into three other volunteers. The first and second volunteers developed yellow fever and recovered, but the other three remained healthy. Carroll's demonstration of the ultramicroscopic and heat-sensitive nature of the yellow fever agent concluded the work of the Yellow Fever Board with a flourish. Reed and his colleagues had taken medical science one more step forward.<sup>87</sup>



## Chapter Fifteen

# A Proper Progressive in Washington

The U.S. Transport *Thomas* made a port call at Nagasaki, Japan, for coal in early September and then docked at the port of Kobe. The Sternbergs enjoyed the sight of Tokyo from a rickshaw, made short visits to Yokohama and the Shogun Temple at Nikko, and experienced an earthquake; but the largest shock awaited them upon returning to their steamer at Kobe. On September 6, President William McKinley had been shot twice by an anarchist at the Pan-American Exhibition in Buffalo. The president struggled for his life in a Buffalo hospital. The Sternbergs were devastated and further depressed by reports that McKinley's condition was deteriorating. As Sternberg and his wife strolled numbly along the deck that evening contemplating the tragic event, he told her that if the reports were accurate, there was little hope for the survival of their dear friend. At San Francisco, they received confirmation of the president's death and, upon arriving in Washington, a message from Mrs. McKinley to please visit her in Canton.<sup>1</sup>

The double report of Leon Czolgosz's handgun in the Temple of Music at the Pan-American Exhibition heralded the advent of the Progressive era in America. Youthful energy and exuberance, moral responsibility and confidence largely untarnished by cynicism, and unbounded optimism in America's potential defined the era. Theodore Roosevelt, who ascended to the presidency upon William McKinley's death, was the youngest—and arguably the most energetic and exuberant—occupant of the White House, and he became the national embodiment of this new era. The Progressive reform movement had its roots in the growing discomfiture of the urban middle class a decade before. This predominantly native-born, largely college-educated, and Protestant group of individuals came of age in the last 20 years of the 19th century. These individuals inherited a society and a national landscape that had been transformed by the rapid and massive urbanization, mechanization, and industrialization of the post-Civil War years. William Allen White remembered the Progressive ranks filled with “hundreds of thousands of young men in their twenties, thirties, and early forties,” but there were a few older standard bearers

who kept pace with their enthusiasm and tempered their indignation with maturity and experience.<sup>2</sup> Sternberg was destined for this role in the nation's capital in the near future, but for the moment army duties still called.

In December 1901, Lieutenant Colonel Pope, 8th Corps Surgeon in the Philippines, reported to the surgeon general that he had 561 military stations to provide care for and 163 of them did not have a medical officer assigned, an increase of 71 stations since his last report in May. Furthermore, Pope noted, "Attendance is rendered at such places from adjoining stations, that are distant from five to eighteen miles, and frequently a single medical officer attends three or four such places, traveling at the risk of his life from hostile insurgents, over mountain trails, swimming rivers, or taking perilous voyages at sea in cranky native dugouts."<sup>3</sup> Although the insurrection was coming to an end, mission intensity and the dangers inherent to field operations continued to be very real. Increased garrison size stateside requiring more medical support and annulment of contracts kept the Medical Department hustling to maintain numbers.

Sternberg responded to the never-ending physician shortage crisis in a report to Adjutant General Henry Corbin in mid-December. He demonstrated how the numbers of regular and volunteer surgeons had increased over the past 11 months in comparison to a steady decline in contract physicians. Furthermore, he noted that 60 assistant surgeon vacancies remained unfilled and the term of service for the volunteers would expire in a year, which were positions that would have to be filled by contract surgeons. Sternberg's solution was to remove the cap on contract physicians and have them commissioned as assistant surgeons of volunteers with the pay of a cavalry first lieutenant; extend the volunteer terms of service an additional year; and, although he did not "feel at liberty to recommend an addition to the number of assistant surgeons... until existing vacancies had been filled," he recommended an additional authorization for two colonels, six lieutenant colonels, and 25 majors.<sup>4</sup> The surgeon general summed up his rationale for this request by stating, "This would give us thirty-three additional vacancies and would furnish an incentive to volunteer medical officers and contract surgeons now in service to seek admission to the regular army."<sup>5</sup> Sternberg's gambit was to create a vacuum in the lower regular medical corps ranks that would be filled by volunteer and contract surgeons, and he hoped the higher status and pay for contract physicians would increase applications. Congress did not buy the argument in February 1902. The insurgent war in the Philippines was finally in its death throes as rebel generals accepted the amnesty from the Philippine Commission or were finally rooted out of their enclaves by force. In late April the insurrection came to an end.<sup>6</sup>

Sternberg's last battle in uniform with Congress had its origins in a bill to regulate the retirement of Civil War veterans currently on active duty, which proposed these officers be placed on the retired list with the rank and retired pay one grade higher than that actually held at the time of retirement. Chairman of the Senate Committee on Military Affairs, Joseph R. Hawley, introduced the bill S1679 in December 1901. Sternberg obviously took comfort in this action. But, a month later, two other bills on the subject were introduced by Representative Charles W.

F. Dick (OH) and Senator Henry M. Teller (CO). Their legislation proposed that any Civil War veteran on active duty below the grade of brigadier general in the staff or major general in the line shall be retired with the rank and pay of the next higher grade. The discrimination between staff and line was an affront Sternberg would not let pass. He fired off a letter to the Secretary of War in which he gave his indignation full reign: "At the time of my retirement in June next I will have been more than forty-one years in service and more than nine years Surgeon General of the Army. That I have rendered efficient and faithful service during this period I believe to be a matter of record in the War Department. That my responsibilities as Surgeon General of the Army during and since the Spanish-American War have been at least equal to those of line officers commanding military departments, is, I think, beyond question.... During the Civil War, and subsequently in two Indian wars, I was repeatedly exposed upon the field of battle to all of the dangers which a line officer is expected to encounter and...I have passed through several epidemics of yellow fever and an epidemic of cholera. Such epidemics constitute the battlefield of the medical officer, a battle long drawn out, and in which he is exposed to all the dangers and bears the principal responsibility."<sup>7</sup> Moreover, Sternberg noted the navy had already set the precedent when, after four years as navy surgeon general, Admiral William Van Reypen retired as rear admiral.<sup>8</sup> Sternberg's claims met with a tremendous amount of support. Both the Secretary of War and Corbin lobbied Congress, as well as a special committee composed of Doctors H. L. E. Johnson, William Welch, and William Rodman from the American Medical Association. In early March, legislation was introduced to authorize the president "to select one from such medical officers of the Army as have served forty-one years or more, nine years of which shall have been as Surgeon General, and, by and with the advice of the Senate, appoint him a major-general of the United States Army, for the purpose of placing him on the retired list."<sup>9</sup> The bill was reintroduced in April. Later in the month, Hawley wrote to Sternberg: "It is hardly necessary for me to say that I am heartily in favor of the proposed legislation, and shall take pleasure in furthering its enactment at the proper time. Your long and brilliant military and professional career entitles you to this consideration and I doubt if there will be any opposition from any source."<sup>10</sup>

The bill sailed easily through both houses of Congress by mid-May, but Hawley's optimism was dashed two weeks later. Some House members felt the committee on military affairs had been unfair in pushing Sternberg's bill along while ignoring similar bills for other officers, namely Colonels Smith and Charles Greenleaf. Sternberg's June 8 retirement date was the prime driver for passage of the legislation, and, apparently, debate over these other bills threatened to go beyond that date. On June 2, Sternberg's supporters moved to suspend the rules of the House to pass the bill, but failed to get the required two-thirds majority vote on the grounds it would set an unwanted precedent for similar legislation. Although Mrs. Sternberg commented the "affair was a bitter disappointment" for her husband, and one that he would continue to pursue for another four years, it did not overshadow the pleasant duties that remained in his last weeks as surgeon general.<sup>11</sup>

In April, Sternberg addressed the first Army Medical School graduating class since the war with Spain. Although the war had suspended the school's activities, it had not threatened the life of the young institution. To the contrary, the war and subsequent Philippine insurgency had not only demonstrated the importance of the special training required for the competent, efficient delivery of field medical care, but also provided examples—typhoid fever, malaria, yellow fever, smallpox, and plague—upon which future lessons could be drawn. Sternberg highlighted his remarks with these lessons, but the foundation of his address rested on preparation, responsibility, and duty. “If the duties of a medical officer were simply to care for the sick and wounded soldiers,” he stated, “the necessity for an army medical school could scarcely be maintained, for successful candidates for admission to the Medical Corps are graduates in medicine whose professional qualifications have been passed upon by an army medical examining board. But even more important than the successful treatment of disease and injuries is the prevention of disease among our soldiers. The efficiency of an army is not measured by the number of names on the muster rolls but by the number and physical endurance of those who are fit for active service.”<sup>12</sup> The duty of the medical officer is to safeguard the health of the command, whether in garrison or the field, with timely and appropriate recommendations to the commander. Medical officers had to “impress upon officers of the line...that a majority of the diseases which contribute to the non-efficiency of soldiers, including all those which prevail as epidemics, are preventable.”<sup>13</sup> To execute this responsibility, army physicians had to have “exact knowledge with reference to the etiology and prevention of those diseases which have been found...to present the greatest dangers as regards the health of troops and the efficiency of armies. The most important function of the army medical school is to make the student-officers practically familiar with all that is known upon this subject and prepare them to give expert advice upon all matters relating to the prevention of disease among our soldiers under the various conditions of service.”<sup>14</sup>

Sternberg received a tremendous outpouring of heartfelt admiration and gratitude from friends, colleagues, and fellow soldiers across the nation as his retirement approached. In late May, he and Mrs. Sternberg attended a complimentary dinner—organized by Colonel Forwood, and Majors Walter Reed and William Borden—at the New Willard Hotel in Washington. On June 13, another dinner in his honor was held at Delmonico's restaurant in New York City. This tribute, organized by civilian medical colleagues, was a veritable “who's who” of the eastern medical profession with a sprinkling of army associates.<sup>15</sup>

Sternberg took off the uniform he had worn for 41 years and handed the Medical Department over to long-time friend and colleague, Henry Forwood, on June 8. Soon after, the Sternbergs moved from M Street to California Avenue. On the spacious grounds, the general found a relaxing recreational sanctuary among fruit trees, roses, and flowering shrubs. Mrs. Sternberg wrote her husband “was not left long in the pursuit of absolute leisure” due to demands for his professional expertise.<sup>16</sup> But, she was quite aware his tremendous physical and mental energies could never be exhausted in the confines of a backyard, and that the majority of

the activities he engaged in for leisure the average man would define as hard work. Sternberg's medical and administrative expertise, dedication to improving public health, community service, and humanitarian aid had been in great demand by municipal leaders long before he retired. He was president of the Washington Sanitary Improvement Company, the Citizen's Relief Association, and the prestigious Cosmos Club; chairman of the board of directors and member of the nurses training school committee at Garfield Memorial Hospital; and he was also an active member of the Biological, Philosophical, and Medical Societies of Washington, DC. Sternberg had retired from the army, but not from productive life.<sup>17</sup>

One of the major issues tackled by the Roosevelt administration and Congress was the construction of an inter-oceanic canal in Central America. With American possessions and military and business interests extending into Asia after the war, something had to be done to circumvent the laborious passage around Cape Horn to the Far East. Observing that Ferdinand de Lesseps and the French had failed—mainly due to deaths from yellow fever and malaria—to complete a canal through Panama in the late 1880s, Americans conceived of a similar venture through Nicaragua and Costa Rica.<sup>18</sup> In early 1902, Major William Gorgas told Sternberg that the anti-mosquito methods used in Havana were not only possible on the isthmus but imperative if Americans were to avoid the fate of the French. Engineering concerns, the interests of the French Panama Canal Company, and congressional politics, however, redirected discussions on the proposed canal to Panama.<sup>19</sup>

Sternberg watched these events with interest from California Avenue. He agreed with Gorgas and recommended before retirement that Havana's sanitary officer direct sanitary operations on the isthmus. Concerned that health issues would be forgotten as plans to make the dirt fly progressed, Sternberg composed an article, "Sanitary Problems Connected with the Construction of the Isthmian Canal," for the *North American Review*. "The object of the...paper is to indicate how these difficulties may be avoided...and to impress upon those who will have charge of the work the fact that...it would not only be costly, but criminal, to repeat the experiences of the past.... An unnecessary sacrifice of the lives of those who are employed...excavating the canal would be unjustifiable; but it is not to be expected that an undertaking of this kind will be postponed or delayed on account of the possibility that large numbers of human lives may be sacrificed in carrying out plans...approved by the Congress..."<sup>20</sup> He went on to review the various sanitary and disease issues facing the directors of the project, noting that protecting the health of the labor force on the isthmus was similar to that of soldiers in the field. He advocated appropriate preventive measures, such as a safe water supply and mosquito nets, and the deployment of a trained and dedicated force of hospital corpsmen to accomplish the sanitary mission. "At the head of the sanitary service," Sternberg continued, "we should have a man fully informed as to the sanitary problems...to be encountered...the best methods of meeting them, and also of demonstrated executive ability. Under him should be sanitary engineers, expert sanitary inspectors, and a corps of intelligent men employed especially for the sanitary service. He should be given the necessary money and autocratic power for the execution of

sanitary measures...have general direction of the medical service...establishment of hospitals, the purchase of supplies, etc.”<sup>21</sup> He concluded with a word of warning, “The cost of such a sanitary service would not be inconsiderable, but it would not be great when considered in connection with the magnitude and importance of the work.... A single epidemic of yellow fever...among the employees...would, without doubt, be more expensive than the cost of an efficient sanitary service.”<sup>22</sup> His article was timely, and presumably it assisted in keeping health issues to the fore as plans for the canal continued. Gorgas did direct medical operations on the isthmus. His efforts and those under him contributed largely to the successful finish of the Panama Canal.

By 1902, bacteriology had begun to broaden the scope and revolutionize the practice of public health. Teaching this new scientific foundation and the methodologies for its practical application to public health specialists was crucial to the success of this developing profession, but standard course work remained elusive as public health degree programs sprouted in the early 1900s at the University of Michigan, University of Pennsylvania, Harvard University, and the Massachusetts Institute of Technology. The definition of a public health professional was also nebulous. By the time the Johns Hopkins University opened its school of hygiene and public health in 1918, candidates for admission included sanitary engineers, chemists, epidemiologists, nurses, and social workers. For the moment, however, public health leadership remained the bailiwick of physicians.<sup>23</sup>

Several leading physicians in Washington surveyed medical educational assets—Georgetown University and Columbian (soon to be George Washington) University Medical Schools, and a large number of hospitals and clinics—available in Washington in 1902. They concluded that a postgraduate institution giving special attention to preventive medicine, tropical diseases, and laboratory work in bacteriology and sanitary chemistry would be extremely valuable to general practitioners, specialists, and health officers in the government service. The departments of medicine at Georgetown and Columbian Universities provided classroom, laboratory, clinic, and faculty support. Sternberg’s experience in postgraduate education and administration and his availability made him an obvious choice for president of the faculty. He provided the introductory address on preventive medicine, which opened the Washington Post-Graduate Medical School on January 12, 1903. Thirteen months later, the president and university council of Columbian University presented a petition to the board of trustees for the establishment of a graduate department of public health. The purpose of the department was to instruct physicians in preventive medicine subjects and the fundamental and administrative laws concerning the prevention of disease, epidemics, and injuries. The one-year course that awarded a master’s degree in public health covered hygiene, sanitary chemistry, bacteriology, medical zoology, biochemistry, sanitary administration, sanitary inspection service, dangerous occupations, sanitary engineering, comparative medicine, insect agents in the transmission of infectious diseases, history of preventive medicine, and law (international, constitutional, and statutory) affecting sanitary regulations. Students could also pursue a 2-year course for a



doctorate in public health. Sternberg accepted the dean's chair and continued to teach hygiene and preventive medicine.<sup>24</sup>

A main goal of the Progressive movement was to educate the masses, not just the professionals in their ranks, to the repulsive and often health-threatening realities of American life. While journalists such as Lincoln Steffens, Ida Tarbell, and Ray Stannard Baker, "raked up muck" on industrialists and politicians in *McClure's Magazine*, others preached the value of home economics in the *Ladies Home Journal* and *Good Housekeeping*. Sternberg's first self-imposed task from California Avenue was the production of one final book, *Infection and Immunity with Special Reference to Infectious Diseases*, a small compendium of well-explained facts on infection, immunity, and practical instructions for preventing infectious diseases. In its pages, he became a bit of a muckraker himself in discussing typhoid fever and tuberculosis.<sup>25</sup>

The death rate from typhoid fever in Washington was considerably higher than any other major U.S. or European city, with the exception of Belfast and St. Petersburg, a fact Sternberg attributed to a contaminated water supply. Tuberculosis death rates were declining nationwide. Hermann Biggs' education, sputum testing, and case registration programs were showing impressive results in New York City. Washington, too, had experienced a mild reduction in tuberculosis death rates over the past 12 years, but it remained a serious health threat particularly among the black population, whose death rates were nearly four times higher than whites. Sternberg made it clear—even to the casual Washington reader—that the problem resided in the lungs of the poor laboring class of citizens that lived in damp, unventilated, overcrowded, and unsanitary dwellings.<sup>26</sup>

Once these iniquities and moral failures had been exposed, Sternberg and the Progressives believed public indignation would intensify to a threshold where intervention was demanded. Reform measures would come from an informed and responsible government and from a sense of moral, civic, and humanitarian duty, as well as enlightened self-interest, of the population at large. Among these measures, housing reform remained one of Sternberg's chief interests. This movement had made slow, but steady progress over the past seven years. The Washington Sanitary Improvement Company (WSIC) grew and boasted \$428,000 in assets, all dividends paid, and more than \$33,000 in surplus funds. A total of 142 neat, trim homes graced Washington streets. At the Paris Exposition held in 1900, the WSIC took home the only gold medals awarded to an American company. Two years later, Associated Charities had established the committee on housing conditions to stimulate greater public awareness and interest among influential citizens and Congress members. While the committee's primary objective was to force passage of a bill—originally written and submitted by Sternberg—for the repair or removal of dilapidated housing in Washington, it also advocated the development of an adequate building code, appropriations for the conversion of hidden alleys to minor streets, and a more robust housing inspection program. The committee's agitation finally reached the White House. The plight of alley dwellers shocked President Theodore Roosevelt, who apparently had been unaware of

this disgraceful smudge on the beautiful city program he encouraged. In the fall of 1902, he commissioned Charles Weller, General Secretary of the Associated Charities, to conduct a thorough survey of the alleys.<sup>27</sup>

Sternberg and his directors had never been truly satisfied with the initial arrangement of the WSIC. To generate enough capital to begin operations, they had been forced to accept a 5 percent investment dividend knowing that rents would be just beyond the reach of lower wage-earners, the class of worker the company was most interested in helping. To accommodate this compromise, the aim of the business was altered. It would provide housing “for the better class of wage-earners,” for the moment, hoping the houses vacated would become available to unskilled laborers at reasonable prices.<sup>28</sup> The company had been a smashing success from a business perspective, and other landlords used its blueprints. Sternberg was under no illusion that regenerating the slums would be a swift and inexpensive proposition, but these successes, interest from the Oval Office, and the hope of congressional legislation were tremendously encouraging. Therefore, Sternberg proposed the creation of a second housing company with investment dividends limited to 4 percent.<sup>29</sup>

Essentially, a mirror image of its parent company, the Washington Sanitary Housing Company (WSHC), was incorporated on April 23, 1904, with Sternberg as president. Sternberg advertised this second venture as safe and sound business philanthropy. By purchasing less expensive land and eliminating bay windows and cellars, he could build homes with the same amenities as the WSIC, guarantee 4 percent dividends, and accrue surplus funds of 2 percent by the end of the year. The 1 percent dividend given up through philanthropy would reduce rentals, thereby directly benefiting the lower wage-earning tenant. Sufficient stock subscriptions were obtained for land to be purchased in May. Sternberg selected land on Van Street, between M, N, Third, and Four and a half Streets, Southwest, where Civil War era frame shacks adorned both sides of the street, to provide an object lesson for the city and to goad hesitant businessmen. By October, 17 three- and four-room apartments, renting for \$7 and \$8, respectively, and all filled by respectable black citizens, looked out on equal or higher priced hovels across the street. Reformers won a small victory when landlords of the remaining shanties opted to tear them down rather than upgrade them with sewer and water connections.<sup>30</sup>

Sternberg’s enthusiasm and his passion for erecting reasonably priced rental properties derived from multifaceted humanitarian goals. His apartments offered not only sanitary comfort, but also respectability not found in the crime and vice-ridden alleys.<sup>31</sup> With Sternberg’s rebate system and timely attention by apartment managers, tenants proved to be highly responsible for maintaining—and even upgrading—their flats. Furthermore, these small abodes offered an escape from the high disease mortality that claimed a large proportion of alley infants, children, and adults. While typhoid fever, diphtheria, croup, and pneumonia took their toll seasonally, tuberculosis was a perpetual scourge. In regard to tuberculosis rates, Sternberg disdainfully commented in 1904, “Washington has the disgraceful pre-eminence of leading all

cities in the United States, with the exception of Denver and Los Angeles, to which cities the unfortunate victims of this disease resort in large numbers from all parts of the country.<sup>32</sup>

Retrospectively, 1904 was a watershed for an expanding anti-tuberculosis campaign in America. In the preceding decade, tuberculosis had begun to lose its mystique as public health and social reformers united in an effort to demote it into the ranks of more common infectious diseases. Tenements and alley slums had been exposed as natural habitats of the disease, as had herds of dairy and beef cattle that supplied infected milk and meat to the cities. Housing reform and settlement movements were making progress. Local associations for the prevention of tuberculosis were organized, first by Lawrence Flick in Philadelphia, and then by Biggs in New York City and Sternberg in Washington.<sup>33</sup>

Cultural conceptions of, and the medical approach to, tuberculosis—commonly known as consumption due to the chronic weight loss it induced—had undergone a significant transformation since Koch had isolated the tubercle bacillus. Mid-19th century middle class notions of the pale, emaciated man or woman lingering on pillows, intermittently glowing with the flush of fever, and patiently awaiting death were no longer the epitome of romantic beauty or quiet genius. Through the 1890s, society regarded the consumptive as a contagious, nonproductive invalid at best, one to be warehoused in special hospitals like the insane. More commonly, the tuberculosis victim was identified as one of the thousands of unskilled laborers, immigrants, or urban African-Americans residing in city slums. American physicians did not readily accept an infectious etiology for tuberculosis, however. They were steeped in the belief that heredity and a special predisposition—a consumptive diathesis—directly related to physical traits and habits of the victim, and the environment were the major factors in developing the disease. Over time, epidemiologic evidence demonstrated that only a small proportion of sputum-positive individuals were symptomatic and fewer still developed active disease. Critics used these data, as well as Sternberg's earlier demonstration—that not all bacteria that normally inhabit the human body were virulent or pathogenic—to substantiate the belief that exposure to the tubercle bacillus did not guarantee infection. Although Sternberg had revised his conceptions of the disease by the late 1880s, the majority of American physicians remained unconvinced that tubercular lesions were produced by a specific bacillus. Moreover, tuberculosis did not fit the model of infectious disease, that is, illness followed by death or recovery, as it was then understood. The chronic nature of the disease with its latency, remissions, and recrudescences led to diagnostic confusion and a wide variety of treatment options. However, there was another option to this therapeutic dilemma, which addressed the patient's habits and environment: the sanatorium.<sup>34</sup>

A large number of sanatoriums specifically for consumptives had been established in continental Europe and Britain since mid-century, and physicians at these institutions reported surprisingly good results from regimens of strict hygiene, exercise, and diet. Americans had little enthusiasm for this modality

until a consumptive physician serendipitously applied the restorative European methods to himself. Three years later, Edward L. Trudeau, who was convinced that strengthening the body's resistance to the disease was the most practical and productive rehabilitative therapy, initiated the American sanatorium movement at Saranac Lake, New York. In the small cabins he established, Trudeau followed the German model of consumptive management providing his patients with wholesome foods, hygienic discipline, and a regimen of graduated exercise and rest in fresh, sunlit air. Protein-rich diets and exercise restored physical strength and confidence, while hygienic discipline developed the patient's sense of personal responsibility for the transmission of his malady. Furthermore, Trudeau offered the hope of rehabilitation, the restoration of a productive life, and the possibility of being cured. Encouraging results were obtained and, in time came the empirical observation from Vincent Bowditch's Sharon Sanatorium near Boston that care could be delivered as effectively at sea level as in higher elevations. Sanatoriums sprouted up throughout the east coast and midwest.<sup>35</sup>

All of these efforts, however, lacked the unity, coordination, and sense of direction necessary to dispel the inertia and indifference of the government, philanthropists, and the public. However, two independent organizations, the American Congress on Tuberculosis and the American Congress on Tuberculosis for the Prevention of Consumption, materialized in 1903. Both organizations were planning international congresses and exhibitions that conflicted with activities of the Maryland Commission on Tuberculosis, headed by William Osler and William Welch, and the International Congress being held in Paris in 1904. The confusion inherent in the names of these congresses as well as the competition and potential embarrassment they posed to other sanctioned anti-tuberculosis activities did not go unchallenged. In a public letter, published in the *JAMA*, Dr. S. Adolphus Knopf, of the New York City Health Department, pointed out these difficulties and that the leadership of these organizations did not contain "among them the men we are wont to look up to as leaders in movements of this kind."<sup>36</sup> He suggested all those interested in a representative national association should meet at the Tuberculosis Exposition in Baltimore on January 28, 1904, a suggestion well received and acted upon.<sup>37</sup>

A distinguished collection of physicians from the east coast and Canada, chaired by Welch, attended the meeting and appointed a committee to evaluate anti-tuberculosis associations and their activities and consider forming a national committee for representation at the International Congress in Paris. Welch selected Osler to preside over a 15-man committee that included Welch, Knopf, Biggs, Trudeau, Flick, Theobald Smith, Edward Janeway, Mazyck Ravenel, and Abraham Jacobi. Sternberg apparently did not attend, most likely because of graduate school obligations. However, he was at the March 28 meeting at the Phipps Institute in Philadelphia, where the National Tuberculosis Association (NTA) was born. A constitutional committee was formed with Flick assigned to draft the constitution and Sternberg to draft the by-laws. These two documents,

which were presented and approved at the home of Dr. Biggs in New York City in late April, established NTA's objectives:

1. to study all forms of tuberculosis;
2. to distribute current knowledge on the causes, prevention, and therapies of the disease; and
3. to provide incentive for the prevention and scientific treatment of tuberculosis (a board of directors was appointed, and the association's first official meeting would be conducted in conjunction with the American Medical Association conference in June<sup>38</sup>).

Osler called the 150+ members to order in an Atlantic City schoolhouse on June 6. Attendees unanimously elected Trudeau as president, Osler and Biggs as vice presidents, Sternberg as treasurer, and Henry Jacobs as secretary. An executive committee also was selected. It was agreed that NTA's main thrust was to educate the public, rural physicians, patients, and government. Expanding local associations, establishing dispensaries with visiting nurses to follow cases, and petitioning legislatures to construct more sanatoriums and close lay-medical cooperation were also advocated. To press forward, however, required more tangible means than the reputations of the men assembled. Memberships and contributions, notably from Jacob Schiff and John D. Rockefeller—although modest—slowly increased. In the winter of 1905, Dr. Livingston Farrand, a physician teaching psychology and anthropology at Columbia University, accepted the position of executive secretary.<sup>39</sup>

Sternberg returned from Atlantic City with renewed zeal and enthusiasm to advance educational, clinical, and legislative initiatives in the capital. In October, he participated in a tuberculosis symposium sponsored by the Medical Society of the District and allied with Dr. William Woodward, the District Health Officer, to secure mandatory case registration and anti-spitting legislation. The local anti-tuberculosis committee of the Associated Charities, over which Sternberg presided, had already opened a centrally located dispensary on H Street, northwest, where volunteer physicians saw consumptive patients unable to afford private care. Visiting nurses provided patients with educational materials and followup care, and the Associated Charities supplemented diets with eggs and milk. Outpatient treatment by itself, however, did little to reduce society's risk of acquiring the disease. Tuberculosis patients required special hospitals or sanatoriums, or at least wards isolated from other hospital patients, but none of the District hospitals offered such care. George Kober and others pressured Congress to appropriate funds for a municipal tuberculosis hospital and made them aware of growing public concern over the issue. While Congress declined to act for another 2 years, when it put \$100,000 in the 1907 budget for the hospital, Sternberg asked the private sector to reach into its pockets again to support tuberculosis reform in the District.<sup>40</sup>

In an article in the *Washington Medical Annals* in 1905, Sternberg reviewed the clinical experience of American and European sanatoriums that claimed 20 to 25 percent cure and 30 to 50 percent improvement rates. He concluded from these

statistics that “pulmonary tuberculosis in its earlier stages is very amenable to treatment, and...recovery may occur, under favorable conditions, in a considerable proportion of cases.... Improvement, more or less permanent, is reported in from 15 to 50 or 60 per cent of the cases treated...”<sup>41</sup> Although climate and altitude were not important factors in recovery, an outdoor life with a continual supply of fresh air aided in recovery. Patients were advised to live—literally—outdoors in a tent year-round, and, as Sternberg pointed out, this was easier to accomplish in a sanatorium where patients could be properly clothed, fed, and supervised by trained physicians and nurses. Therein lay the problem: many consumptives could not afford to travel and reside at distant sanatoriums. For those who could, the strain of new surroundings and absence of family and friends often led to homesickness, depression, and termination of therapy. Other than the want of a facility, Sternberg saw no reason why consumptives could not be treated near their homes with the same results as those obtained elsewhere. For the better part of 1905, he strenuously and successfully campaigned for funds, searched for property, and developed the layout of Starmont Sanatorium. Situated on six acres of high ground just outside of Washington Grove in Montgomery County, Maryland, it received no public funding. Generous support came from members of the Washington Medical Society, and Henry Phipps donated a sum of money for deserving patients, but essentially the institution had to be self-supporting. The first patients arrived in the late fall and paid \$10 per week for room and board.<sup>42</sup>

By the spring of 1907, the tuberculosis and housing reform movements were receiving welcome support from the White House. The NTA planned for an International Congress on Tuberculosis to be held in Washington in the early fall of 1908. In accepting the presidency of the Congress, Roosevelt commented that the importance of the crusade could not be overestimated “when it is realized... tuberculosis costs our country two hundred thousand lives a year...besides constituting a most serious handicap to material progress, prosperity, and happiness, and being an enormous expense to society, most often in those walks of life where the burden is least bearable.”<sup>43</sup> The president had used the same tenor and similar words concerning the alley slums in his address to the 59th Congress in December 1904. In condemning the moral and mortal perils of the alleys, the president admonished Congress that national prosperity purchased with the lives of the laboring class was national folly. He suggested the need for a commission on housing and health conditions in Washington to correct the situation. In the following year, he appointed James B. Reynolds, an old friend and former head of the University Settlement in New York, to survey all federal and district governmental departments related to the welfare of Washington and “give particular attention to the housing problem.”<sup>44</sup> Harangued by the president again in his 1905 message, congressional legislators, each with a copy of Weller’s final report in hand, finally passed the long-awaited act to have unfit alley dwellings repaired or removed in May 1906. Fifty thousand dollars was appropriated for condemnation activities in converting alleys to minor thoroughfares. As shacks and shanties disappeared, WSIC homes continued to be raised. At the end of the year, the company owned 200 houses. Moreover, Kober

reported the death rate among individuals who lived in WSIC apartments was seven per 1,000 over the past year, a little less than half of the death rate for white Washingtonians. For the moment, Washington Progressives rejoiced.<sup>45</sup>

Reynolds' report hit Roosevelt's desk at the end of April 1907 with a reverberating thud. Reynolds had inspected nearly 400 tenements, small houses, and shanties throughout Washington, examined many alleys, and talked with their occupants. His findings echoed those of Kober and Sternberg. Although brick houses demonstrated many structural defects, virtually all of the frame shacks needed to be razed immediately. All of them were filthy inside and out, had inadequate or poorly situated water sources, and had open privies. The alleys remained chaotic foci of crime and moral degradation. He applauded the work done by the Board for the Condemnation of Insanitary Buildings in removing 134 structures and repairing 24 others; however, this good work was halted in March when the Supreme Court declared it unconstitutional to assume the total cost of converting alleys into small streets should be assessed upon the adjoining property owners. Some proportion of the funding had to come from the public treasury, which meant further congressional action and inevitable delays. Reynolds identified horribly flawed construction laws and ordinances that provided loopholes for nimble landlords to slip through and a larger force was needed for efficient and timely inspections. Furthermore, he encouraged more homes on the WSHC model. Reynolds concluded his report by recommending the appointment of a President's Homes Commission to determine the most efficient and effective methods used by public enterprise and private philanthropy across the country, invite participation in public hearings, and recommend reforms that could be enacted by executive order or the District government. Roosevelt acted upon this advice immediately. Reynolds, Sternberg, Kober, William Baldwin, and philanthropist S. W. Woodward received formal requests to participate. Sternberg held the organizational meeting at his home on the evening of May 29 and was unanimously elected chairman. Their initial work, distributed among four committees—(1) improvement of existing houses and elimination of unsanitary and alley houses committee, chaired by Baldwin; (2) social betterment committee, chaired by Kober; (3) building of model homes committee, chaired by Sternberg; and (4) finance committee, chaired by S. W. Woodward—culminated in a preliminary report that outlined their plan of action to Roosevelt at the end of June.<sup>46</sup>

Over the next 17 months, the commission crafted a detailed, comprehensive plan of action for the president. No aspect of the slum problem went untouched and virtually every public, private, and philanthropic agency or organization had some obligation in their remediation. Baldwin's committee noted that in the past two years, 545 houses had been demolished, leaving 1,614 individuals in need of new lodgings and obviating the need for less expensive quarters. Of course, the best way to get rid of alley dwellings was to get rid of the alleys. Among other recommendations for more stringent building codes, the committee successfully fought to amend the damages and benefits assessment code so that up to 25 percent of the total damages in converting alleys to minor streets would come from the District's general fund.<sup>47</sup>

The social betterment committee examined every nook and cranny of alley life. The commission's longest report scrutinized nutrition; diseases; alcohol, drug, and tobacco usage; moral behavior and usury; wages earned and how spent; and cost of living. Although education, restriction on the sales of tobacco and alcohol, construction of playgrounds, and a convalescent hospital for those acutely ill were all important for the welfare of alley dweller, Kober and his committee saw the true plight of these people in the abuses of employers and others in the community who preyed on them. The committee boldly called for the enactment of factory and labor laws for sanitary workshops, employer accident liability, comprehensive industrial insurance for employees, building codes for workplaces, wage increases, and the addition of a Bureau of Labor to the president's cabinet.<sup>48</sup>

Sternberg's final report was a clear, concise tour de force of housing problems and the model home industry at home and abroad. It was also a subtle attack on the indifference, greed, and sloth of government, business, and the public at large, and one more plea for their cooperation. As in European cities, Washington required a large number of unskilled laborers who needed sanitary dwellings near their place of employment and should not have to pay more than one-fifth of their monthly wages—\$35 to \$45—for it were—he believed—established conditions. He reviewed the efforts of Britain, Germany, and France to relieve their housing dilemmas, the homes that had been built in Philadelphia and Baltimore, and the progress of his own housing companies. Cost- and profit-motivated private enterprises were wholly inadequate to the task. In the past five years, of 2,589 brick dwellings built to rent, only seven were within the financial reach of unskilled workers. A mere 300 frame structures had been erected, and while they rented from \$8 to \$12 per month, most of them were outside the city. Corporate giants, such as Carnegie, Rockefeller, and Morgan whose largesse could relieve the situation, had not offered to invest in the endeavor. Business philanthropy—building homes for the benefit of those who live in them and the surrounding community—was the best long-term solution. Experience, however, was beginning to show that when dividends were reduced to accommodate low rents, business self-interests trumped civic duty and philanthropic ideals. To Sternberg's great disappointment, the WSHC had stopped building operations for lack of funds, even though it had faithfully paid its dividends. Although he admitted the impracticalities of government-housing subsidies to municipalities nationwide, Sternberg interpreted the relationship between Congress and the municipality of Washington in a different light. Congressional legislative authority over District territory inferred responsibility, and he advocated either appropriations or loans to housing companies at a reduced rate of 3 percent, to establish decent homes for the lower class wage-earner.<sup>49</sup>

The economic recession, which began in October 1907, did not encourage Congress to follow Sternberg's financial advice. This and the difficulties with the WSHC, notwithstanding, his enthusiasm and optimism for social reform progress remained undiminished throughout 1908. The governor's conference, which had been held in May to discuss the development and conservation of natural resources, was a strong



public declaration by the president that conservation was not only a priority, but also a national duty. Although Roosevelt is remembered as the great protector of land, trees, and water, his governor's conference, and the National Conservation Commission he created soon thereafter, had a broader scope. Conservation and national efficiency encompassed the social, physical, mental, and moral welfare of human resources. The point was not lost on Professor Irving Fisher, an economist from Yale University, and fellow economist J. Pease Norton. They had resurrected the drive for a national board of health through the auspices of the American Association for the Advancement of Science. The association established the Committee of One Hundred on National Health, a collection of public health, social welfare, business, labor, political, and agricultural gurus with whom Sternberg worked routinely, to provide information on the preservation of human health to the new national commission. Philosophically, Fisher's committee believed national, state, and local governments should protect people from disease for it was "bad policy and bad economy to leave this work mainly to the weak and spasmodic efforts of charity, or the philanthropy of physicians."<sup>50</sup>

Sternberg and his colleagues could not have been in more agreement as they prepared for the Sixth International Congress on Tuberculosis to be held in Washington in late September. To stimulate public interest, a traveling exhibit was developed consisting of models, photographs, and lantern slides depicting sanitary and unsanitary environments, sanatoriums, and hospitals. Sternberg worked vigorously as the chair of the committee on local affairs and as one of the vice presidents, which included—among others—Jane Addams, Lillian Wald, Florence Kelley, Samuel Gompers, and Jacob Riis, of the section on hygienic, social, industrial, and economic aspects of tuberculosis. These efforts, strong state and federal government participation, and the support of the international anti-tuberculosis community paved the way for the impressive congress that began with the opening of a massive exhibit in the recently completed National Museum Building on September 21.<sup>51</sup>

In the late morning of September 28, 4,500 delegates were ushered into the museum's assembly hall to the spirited tunes of the Marine Band. The Secretary of the Treasury, George B. Cortelyou, who was standing in for the President, called the meeting to order, welcomed the distinguished gathering to the capital, and announced the honorary vice presidents of the congress, Edward Trudeau of Saranac Lake, Robert Koch of Berlin, Louis Landouzy of Paris, and Theodore Williams of London. William H. Welch spoke to the imperative of prevention in the war on tuberculosis and noted it was "not a doctor's fight merely, but all the forces of society—economic, social, moral, legislative, administrative, philanthropic—must be enlisted in this contest," and it had become "increasingly apparent that successful prevention will be attended by improved conditions of living, of work, and of play; in a word, by a general social betterment of the people."<sup>52</sup> With this warmly applauded Progressive credo ringing in their ears, attendees began their week-long seminar of presentations—70 percent of which were provided by foreign delegates—on every aspect of tuberculosis from bacteriology, pathology, clinical

studies, and therapy to industrial and economic aspects, state and municipal control, and veterinary concerns.<sup>53</sup>

The official banquet, hosted by Elihu Root, now serving as Secretary of State, was held at the New Willard Hotel on October 2. The Kobers hosted a Cosmos Club dinner, and the Sternbergs honored Robert Koch with a special dinner. Koch and Sternberg had developed a close and mutually admiring friendship since their 1885 meeting in Berlin. After modestly accepting a toast, Koch put his hand on Sternberg's shoulder, complimented his many achievements, and said, "Here is my brother in the work and one whom I admire among the men of the world."<sup>54</sup>

During the final academic session of the congress, President Roosevelt made an unannounced visit to the Assembly Hall. He made his way to the lectern to deliver a few short remarks, amid spontaneous cheers from the audience, as the Marine band struck up "The Star Spangled Banner." With his usual enthusiasm and humor, the president praised the advancements of science and medicine over the past 20 years, particularly in regard to yellow fever and malaria, and the humanitarian contributions such progress had made. Over the next two days, Executive Secretary Farrand and his committee on resolutions presented nine resolutions, which were unanimously adopted, that urged state and local governments to establish case registration laws, hospitals, sanatoriums, and dispensaries and day camps for advanced, curable, and ambulant cases, respectively. Prevention of human-to-human and bovine-to-human transmission was to be vigorously pursued as was education in hygiene and sanitation for both the layman and professional. These resolutions summarized the purpose of the congress and provided a compass for future work, but the committee's achievements transcended the content of their resolutions. The fledgling NTA, with no official status and little funding, had produced an inspiring conference. An international audience had seen firsthand the quality of American medical science and how it was organized and practically applied, and they were deeply impressed. Moreover, the pre-congress educational and publicity campaign, as much as the academic sessions, had transformed the anti-tuberculosis movement into an American crusade. In the next year, federal, state, county, and municipal governments would grant \$8 million worth of appropriations to support the fight against tuberculosis.<sup>55</sup>

Sternberg led the charge in the District of Columbia. The issues he encountered and solutions he developed reflected those of other cities and followed NTA objectives. The committee on the prevention of tuberculosis for the District had grown to the point where, in November 1908, he had it reorganized and chartered as the Association for the Prevention of Tuberculosis for the District of Columbia. The tuberculosis hospital had opened in July; Starmont was doing well; Eudowood Sanatorium in Towson, Maryland, was operational; the Tuberculosis Dispensary was seeing nearly 2,000 patients annually; and visiting nurses were seeing a little more than 9,000 patients in homes and at the dispensary. The enemy was being contained, but for eradication and final victory an assault on its citadels—particularly the younger ones—was imperative. To do so, Sternberg recognized that a broad educational campaign directed at incipient cases unable to go to hospitals

or sanatoriums and those uninfected was required. Through the continued and generous support of the Red Cross Society, Visiting Nurses Association, charities, and churches, many innovative programs were initiated by the new association. A tuberculosis day class and later a day camp on the grounds of the tuberculosis hospital taught the principles of sanatorium treatment to those who could only afford home treatment. They received individualized care and relief in the form of making up wages lost by attending, payment of rent, special food, bedding, or clothing, and—in some cases—sleeping porches built on their homes. Large amounts of literature were distributed through three major insurance companies with a resultant increase in dispensary visits, and more public meetings on tuberculosis were held.<sup>56</sup>

The public school system was especially targeted as a viable route for education and prevention. The District School Board was persuaded to allow a nurse to provide 20-minute classes on tuberculosis hygiene and prevention in May and June 1909. Begun as an experiment only in the black schools, the lectures were so well received that they were implemented in all schools the following year, with the addition of a primer on the disease printed by Sternberg's association. Before the next school year ended, Sternberg's organization was lobbying for open-air schoolrooms for tuberculous children. Although Congress declined to fund the project, Sternberg found A. T. Stuart, Superintendent of Public Schools, the local principal of Blake School, and her fourth grade teacher more supportive of the innovation. In mid-November 1910, a warmly bundled teacher and students proceeded with lessons in the District's first open-air classroom. Two years later, the second such room was opened at Stevens School for black children.<sup>57</sup>

On the cover of the Third Annual Report of the Association for the Prevention of Tuberculosis in 1911, Sternberg published the results of the burgeoning campaign against tuberculosis. From 1881 to 1910, death rates for the disease in the District had dropped in the white community by 60 percent, but only by 44 percent in the black population.<sup>58</sup> Moreover, death rates among blacks were still nearly three and a half times greater than in the white population. Although the anti-tuberculosis measures had been enacted for the benefit of all Washingtonians, most of the patients in the dispensary, at the tuberculosis hospital, and at Starmont were black, and the majority of relief had been directed into black hands. A portion of the black community had responded with gratitude and a demonstration of personal responsibility for improving alley life. But, as Howard University professor William Henry Jones wrote in 1929, "Wherever the white man's interests do not penetrate the alley inhabitants remain on a very low level of culture. A certain class of people prefers the alley life, because it enables them to escape responsibility to the wider phases of society."<sup>59</sup> To Sternberg's frustration and chagrin, the alleys, and the diseases they bred, remained an integral part of District life. The Homes Commission had not generated sufficient white interest on Capitol Hill or in the community at large to penetrate the alleys. While social Progressives salved their consciences with past victories wrung from Congress—such as school attendance and child labor laws, a juvenile court, an Industrial Home for Black Children, a

new home for the Aged and Infirm, and a number of playgrounds—Sternberg wrestled with a housing company crisis. Stock subscriptions for the WSHC had dried up. Faced with dissolving the company or raising dividends to 5 percent, he reluctantly chose the latter, and the charter was amended in February 1911. But motivation for District social reform declined during the Taft Administration. The WSIC built another 115 homes and the WSHC built 23. By the end of 1914, the companies owned 716 apartments, renting from \$7 to \$16 per month, and had invested more than \$1.25 million.<sup>60</sup>

Sternberg's tremendous energies began to wane in 1912. As a member of the executive committee on organization and the committee on arrangements in preparation for the 15th International Congress on Hygiene and Demography held in the fall in Washington, he contributed significantly to the conference's success, but the following month resigned as treasurer of the National Association for the Study and Prevention of Tuberculosis. He also resigned himself to the fact that writing a medical history of the Spanish–American War was now beyond his strength and endurance. Instead, he gathered papers and addresses on the topic and had them published in a small volume for limited distribution to friends in December.<sup>61</sup> His association with the Army Medical School remained strong. In 1913, he presented the first Sternberg Medal for proficiency in bacteriology and serum therapy to Lieutenant George R. Callender telling him, "It is a matter of gratification to me to know that...in the Army Medical School [bacteriology] is given special attention.... At the same time, I desire to impress upon you...that no expert knowledge in any one branch of medical science will justify a neglect of...practical knowledge of medicine and surgery, and...preparation for active field-service which it is essential that every medical officer possess."<sup>62</sup> His passionate, strenuous lobbying—in person and in the press—for local reform remained undiminished. Sternberg continued to advocate larger appropriations for the District's public health infrastructure and tuberculosis hospital, the passage of legislation for testing and pasteurization of milk, and low cost housing for the poor. In the fall of 1915, he was actively engaged in reducing liquor sales, gambling, and prostitution in and around the neighborhoods he had built. After registering a protest in the name of the housing company with the Excise Board over approving a wholesale liquor license, he went toe-to-toe with the Excise Board's attorney who questioned Sternberg's authority to complain on behalf of the company. The liquor license was refused, but Sternberg had struck his last blow for Progressive reform.<sup>63</sup>

On October 19, he suffered a stroke. Major and Surgeon Deane C. Howard, called to attend his former chief, confirmed the diagnosis. Howard made his patient as comfortable as possible and offered hope, but as the days passed Sternberg failed to rally.<sup>64</sup> "My darling husband is making a brave fight for his life," Mrs. Sternberg wrote to George Kober, "but his poor disabled heart makes it difficult for him to be made comfortable... he seems very weak to me."<sup>65</sup> Sternberg's chronically inflamed heart tissue finally gave out. In the early hours of November 3, 1915, the general quietly took his last breath.<sup>66</sup>

Sternberg's death came at a transitional juncture for the Progressive Reform Movement. Public health education was being shaped into its modern form by Wickliffe Rose and the General Education Board of the Rockefeller Foundation. Through a

partnership with the American Red Cross and the Christmas Seal Campaign, the National Tuberculosis Association became financially stable, was reorganized, and expanded its services. In contrast, the housing reform movement had crested in Washington. The WSIC and the WSHC realized a couple more bursts of activity, but rock bottom dividends found little enthusiasm among investors.<sup>67</sup>

It is tempting to pigeonhole the reform activities of District Progressives into successes or failures. From the lofty perch of the 21st century, it is easy to grasp that the success of urban sanitation, public health education, and the anti-tuberculosis reforms resulted from broad-based national support because these issues affected the daily health and welfare of all Americans. It is just as easy to understand that the alley slums remained essentially unchanged because poor blacks inhabited them, who were largely hidden from routine scrutiny, and, therefore, made little impact on the public consciousness. But to focus solely on end results is to miss the ethos of the Progressives in general and George Sternberg in particular.

Sternberg, the son of well-educated Lutheran evangelicals of limited means, was imbued with the philosophy that knowledge, resourcefulness, moral courage, selfless dedication, and an abiding faith in God were the means by which responsibilities to family, community, and mankind were discharged. With higher academic, religious, and social achievement, these responsibilities increased in magnitude and scope. Sternberg provided astute, dynamic leadership in both the military and civilian medical communities from the mid-1870s. His Progressive bent became clearly manifest in the 1880s. He advocated, and fought for, the establishment of effective quarantine laws through a national board of health and government-sponsored bacteriological research. By 1893, Sternberg had the rank, position, and experience to wield prodigious authority and power in military and civilian medical circles. Bacteriology, now sufficiently matured, became the basis for change not only in the delivery of medical and surgical care in hospitals, but also the foundation upon which effective public health was constructed. Sternberg used the military organizational structure to apply this new technology effectively—the summer of 1898 notwithstanding—during his tenure as surgeon general. Sternberg's philosophy of life, his very nature, and his stature in medicine drew him into the sphere of public health and social reform in the District of Columbia. In the densely packed alley slums, he probably saw parallels to overcrowded, filthy, and disease-ridden mobilization camps. While he attacked public health issues on a broad front as he had done in the army, military command authority was replaced by evangelical zeal and political acumen. His energetic, confident, and patient leadership reverberated in the halls of Congress, university classrooms, hospital wards, and meetings of a wide range of professional and charitable organizations. His colorblind philanthropy and humanity—unwavering in its optimism—restored health and brought order, comfort, and respect to thousands in the District.

Sternberg was laid to rest in Arlington National Cemetery, near Arlington Mansion and not far from where he camped before battle in July 1861. His many friends and colleagues remembered him as a man who always had work to accomplish and eagerly looked forward to the next project; he was a modest man of absolute sincerity,

scientific honesty, and genuine kindness of heart that he applied to all mankind without overlooking the individual. Retired Commanding General of the Army Nelson A. Miles eulogized Sternberg as “one of the most earnest, devoted, untiring public officers...I have ever known.... The world was better for his having lived in it.”<sup>68</sup>

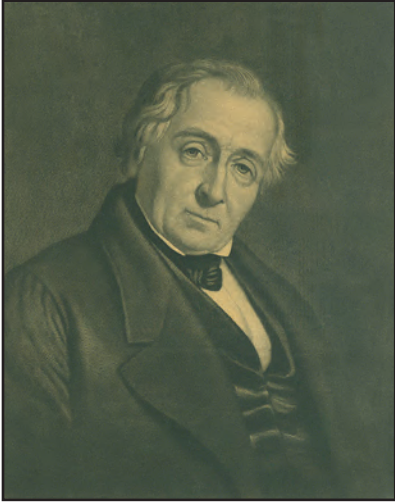
*Section One:*

# **Early Years**

(1838–1870)







The Reverend Ernst Lewis Hazelius, D.D. (1777–1853). Principal of Hartwick Seminary (1815–1830) and its first full-time professor, Hazelius was a friend and mentor to George Miller and Levi Sternberg. Courtesy of Paul F. Cooper, Jr. Archives, Hartwick College, Oneonta, NY.



Hartwick Seminary. This is the earliest image of the seminary. Courtesy of Paul F. Cooper, Jr. Archives, Hartwick College, Oneonta, NY.



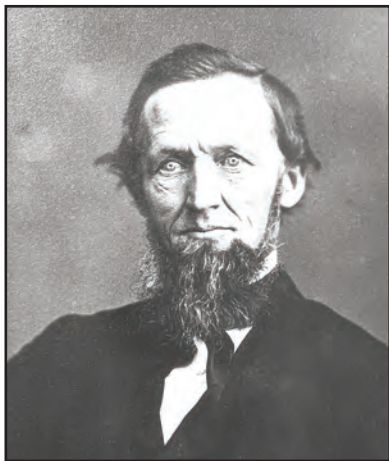
Delia Snyder Miller (1797–1876). Mother to nine girls, four boys, and a perennial handful of seminary students, which at one time included grandsons George and Theodore, she created and directed the nurturing environment that was the Miller home. Courtesy of Mrs. Phyllis Pitcher Giancola.



The Reverend George Benjamin Miller (1795–1869). Miller joined Benjamin Hazelius at Hartwick Seminary in 1827 and remained there for the next 42 years as Principal (1830–1839) and Professor of Theology. A man of tremendous energy and stamina both mentally and physically, he mentored Levi Sternberg when he was a student at the seminary and by nature and nurture shaped the character of his grandsons, George and Theodore. Courtesy of Mrs. Phyllis Pitcher Giancola.



Hartwick Seminary, circa 1845, as it looked when George B. Miller was Principal. Courtesy of Paul F. Cooper, Jr. Archives, Hartwick College, Oneonta, NY.



The Reverend Levi Sternberg (1814–1896). Levi met Margaret when he began boarding in the Miller home as a seminary student in 1828. Courtesy of Mrs. Phyllis Pitcher Giancola.



Margaret Levering Miller Sternberg (1818–1888). Courtesy of Mrs. Phyllis Pitcher Giancola.



Hartwick Seminary, circa 1858, as it looked when George Sternberg graduated in 1853. After teaching school locally and for one winter in New Jersey, Sternberg returned to teach at Hartwick in 1856. Courtesy of Paul F. Cooper, Jr. Archives, Hartwick College, Oneonta, NY.



George M. Sternberg, circa 1855: the elementary school teacher. Mature and serious for his age, Sternberg's competence in the classroom impressed his supervisors in New Jersey. He returned to Hartwick Seminary to teach for his father, but appears never to have seriously entertained the idea of becoming a Lutheran minister. Copyright 1920. American Medical Association. All Rights Reserved.



George M. Sternberg, circa 1859. He had completed the first phase of his apprenticeship with Dr. Lathrop and the medical courses at the Medical Department at Buffalo University. Still the serious and determined young man, Sternberg graduated from the College of Physicians and Surgeons of New York and entered the uncertain world of medical practice in March 1860. Copyright 1920. American Medical Association. All Rights Reserved.



The Medical Department at Buffalo University, Buffalo, New York, 1849. The department was very proud of its large faculty and the clinical experience offered to its students. Collection of the Buffalo and Erie County Historical Society, used with permission.



Frank H. Hamilton, M.D., was an innovative surgeon, author, and educator. Courtesy of the National Library of Medicine.



James P. White, M.D. At times a controversial figure, White presented a woman in active labor and delivered the baby in class; this occurred at a time when many physicians graduated from medical school without ever having delivered a child. White was taken to court over the incident, but continued his—for the times—unorthodox educational methods. Courtesy of the National Library of Medicine.



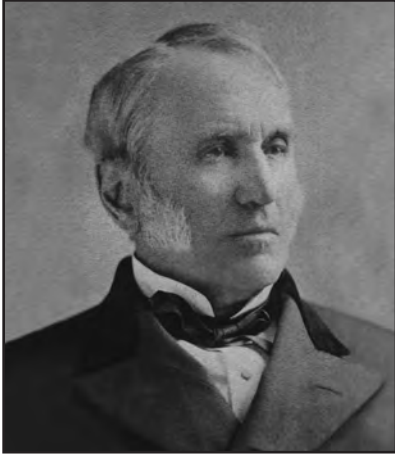
John C. Dalton, M.D. Courtesy of the National Library of Medicine.



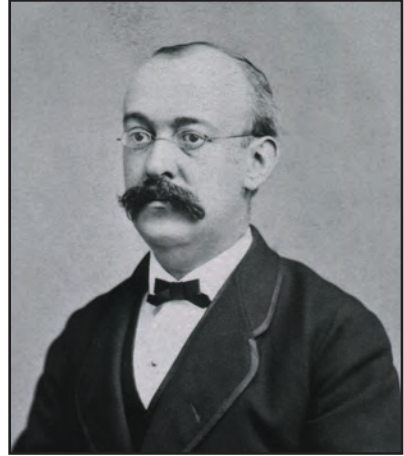
Austin Flint, Jr., M.D. Courtesy of the National Library of Medicine.



College of Physicians and Surgeons of New York. Courtesy of the National Library of Medicine.



Willard Parker, M.D. Courtesy of the National Library of Medicine.



Henry Sands, M.D. Courtesy of the National Library of Medicine.



William Detmold, M.D. Courtesy of the New York Academy of Medicine Library.



Chandler Gilman, M.D. Courtesy of the National Library of Medicine.



Looking south along the Manassas-Sudley Road as it appeared during the Civil War. Sternberg followed his regiment southward, in the fields to the left of the road, into the maelstrom of Confederate fire late in the morning of July 21, 1861. Courtesy of the Photography Collections, University of Maryland, Baltimore County.



Alonzo Clark, M.D. Courtesy of the National Library of Medicine.



Sudley Church. Late in the afternoon of July 21, Sternberg found about a dozen colleagues tending to more than 300 wounded soldiers in and around this church. Elements of J.E.B. Stuart's First Virginia Cavalry took them prisoner by early evening. Courtesy of the Library of Congress.



George M. Sternberg, circa 1861–1866. Courtesy of the National Library of Medicine.



The U.S. Sanitary Commission had a number of steamers converted to hospital ships that took the sick and wounded from Harrison's Landing to hospitals at Fort Monroe, Annapolis, Alexandria, and Washington, DC. Sternberg left the Virginia Peninsula aboard one of these transports with severe typhoid fever. Courtesy of the National Library of Medicine.



Lovell General Hospital, Portsmouth Grove, RI. Once recovered from typhoid fever Sternberg begged for a hospital assignment. He served as Executive Officer and Surgeon-in-Charge of the surgical wards. In the early fall of 1862, he contended with his first epidemic of hospital gangrene at Lovell, an experience that left an indelible mark on his mind. Courtesy of the National Library of Medicine.



U.S. General Hospital, Cleveland, Ohio. Lieutenant Colonel Charles Tripler, Northern Department Surgeon, sent Sternberg to find a location for this hospital and then gave him command of the facility in 1864. Sternberg remained here until the end of the war. Copyright 1920. American Medical Association. All Rights Reserved.



Fort Harker, Kansas, circa 1866–1867. Courtesy of the Kansas State Historical Society.



Ellsworth, Kansas. Sternberg may have considered resigning from the army to become a physician and dairy farmer here. However, the cholera epidemic of 1867 left him a widower and Ellsworth a ghost town. Courtesy of the Kansas State Historical Society.



George M. Sternberg, 1869. Sporting whiskers made popular by Major General Ambrose Burnside and betrothed to Martha Louise Pattison of Indianapolis, the 31-year-old brevet major's world view had improved by the summer of 1869. Copyright 1920. American Medical Association. All Rights Reserved.



Fort Riley, Kansas. The Sternbergs occupied the home in the left foreground. Courtesy of the United States Cavalry Museum, Fort Riley, Kansas.



Hospital, Fort Riley, Kansas, where Sternberg spent his morning hours attending to sick call and hospital business. Courtesy of the National Library of Medicine.



*Section Two:*

# **Middle Years**

(1870–1893)





Swinburne Island, Hospital. This facility had been completed recently when the yellow fever epidemic struck Governors Island in 1870. Sternberg spent long hours on the wards and received an education in yellow fever that he would never forget. Courtesy of the National Library of Medicine.



Hospital, Fort Barrancas, Florida. Courtesy of the National Library of Medicine.

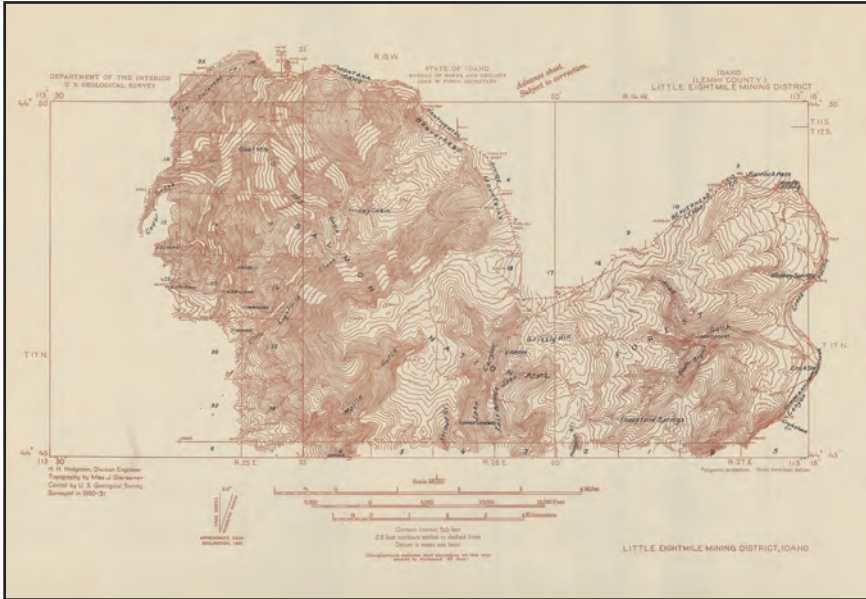


(Above) The back of the hospital, Fort Barrancas, Florida. To the left of the child near the fence was where the rotten potatoes were thrown that supposedly started the yellow fever outbreak of September 1873. Courtesy of the National Library of Medicine.

(Left) George M. Sternberg, 1876. Copyright 1920. American Medical Association. All Rights Reserved.



Map of the Clearwater battlefield site. Courtesy of the Idaho State Historical Society Archives and Research Center.



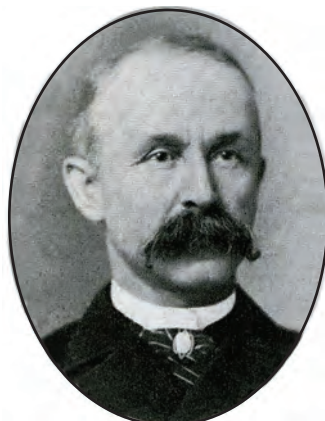
Map of the Clearwater battlefield. Courtesy of the Idaho State Historical Society Archives and Research Center.



Fort Lapwai, Idaho. The duplex with the 'X' on it in the foreground may have been the Sternberg's home in the summer of 1877. "Fort Lapwai; x marks the Fitzgerald home, 1876" from *An Army Doctor's Wife on the Frontier: Letters From Alaska and the Far West, 1874-1878*, by Emily Fitzgerald, edited by Abe Laufe. Copyright 1962. Reprinted with permission of the University of Pittsburgh Press.



Havana Yellow Fever Commission, 1879. The commission validated Sternberg as a yellow fever subject matter expert and established him as a national scientist. Copyright 1920. American Medical Association. All Rights Reserved.



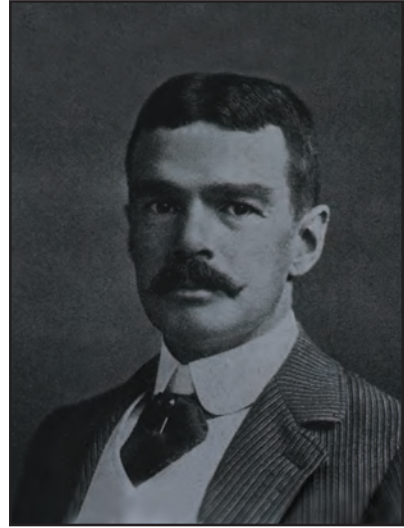
George M. Sternberg, 1880. Sternberg as he looked when on special assignment at the Johns Hopkins Laboratory for the National Board of Health. Copyright 1920. American Medical Association. All Rights Reserved.



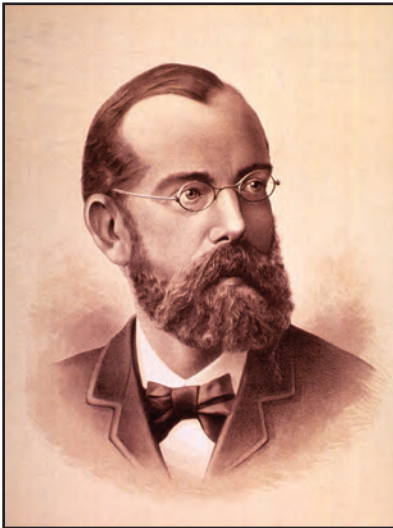
The original Pathological Building (the “Old Pathological”) at Johns Hopkins Medical School. This was the new laboratory that was being completed in 1885 during Welch’s sabbatical to Europe. Sternberg and his students moved their laboratory apparatus into the building and began work before it was completed. Courtesy of the Alan Mason Chesney Medical Archives of the Johns Hopkins Medical Institutions.



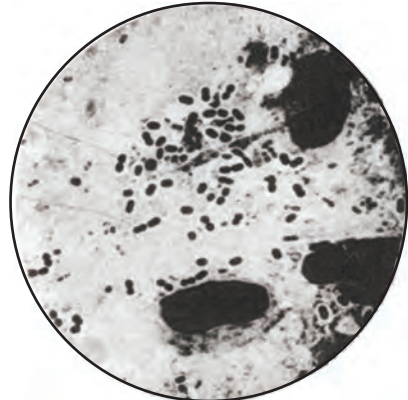
William Henry Welch, M.D. (1850-1934). Welch and Sternberg met soon after the former's arrival at Johns Hopkins, beginning a close professional relationship that would last until Sternberg's death in 1915. Courtesy of the National Library of Medicine.



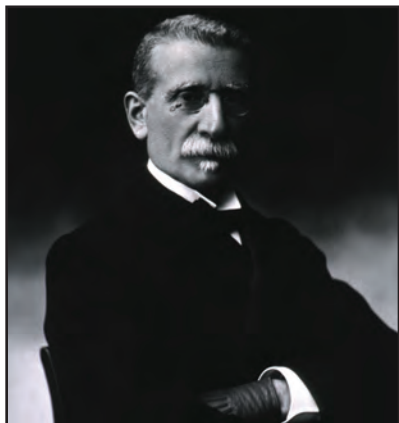
Alexander C. Abbott, M.D. This Baltimore physician learned everything he knew about bacteriology at Sternberg's elbow on the Johns Hopkins campus. He would later become Professor of Bacteriology and Public Health at the University of Pennsylvania. Courtesy of the National Library of Medicine.



Robert Koch, M.D. (1843-1910). Sternberg followed Koch's work closely and reproduced his findings with tuberculosis for the American medical community. By the mid-1880s they would not only be collaborating colleagues, but also good friends. Courtesy of the National Library of Medicine.



Micrococcus of rabbit septicemia, known today as *Streptococcus pneumoniae*. Sternberg made this photomicrograph in his laboratory, probably from cultures of his own saliva. Alexander Abbott, M.D., and Sternberg finally isolated this pathogen from a Baltimore patient with pneumonia, but were never able to connect it with lobar pneumonia. From George Sternberg. *Manual of Bacteriology* (New York: William Wood, 1892).



Ettore Marchiafava, M.D. (1847–1935), and Angelo Celli, M.D. (1857–1914), well-known Italian malariologists, demonstrated a living malaria parasite under the microscope to Sternberg in 1885 and removed his skepticism about Laveran's discovery. Courtesy of the National Library of Medicine.



Hoagland Laboratory. Cornelius Hoagland was determined to have Sternberg as director of the laboratory and recruited him aggressively. Sternberg accepted the job in 1889, but continued to reside in Baltimore because no army positions were open to him. After a short tour in California from 1891 to 1892, Sternberg was stationed in New York City until his selection as Surgeon General in May 1893. Courtesy of the Brooklyn Museum Archives, Slide Lantern Collection. [S10.11]. Views: Brooklyn, Long Island, Staten Island. Brooklyn scenes; buildings. Hoagland Laboratory, Dutch architecture.

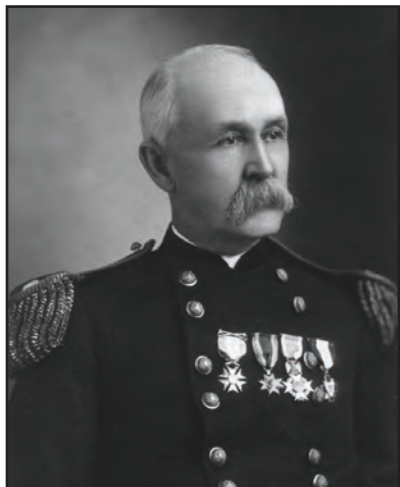


*Section Three:*

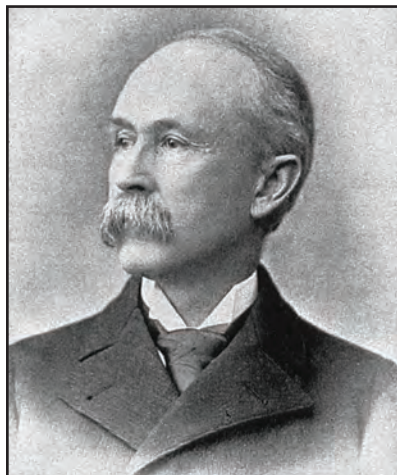
# **Later Years**

(1893–1915)





George M. Sternberg, U.S. Army Surgeon General, circa 1893–1895. Courtesy of the National Library of Medicine.



George M. Sternberg in mufti, circa 1893. Irving A. Watson. *Physicians and Surgeons of America* (Concord, NH: Republican Press Association, 1896).



The first Army Medical School graduating class, 1894. Standing left to right: 1st Lieutenants T. S. Bratton, A. S. Porter, D. C. Howard, and W. H. Wilson; Seated: 1st Lieutenant W. W. Quinton. Twenty-one years later, Major Deane Howard would attend Sternberg in his last illness. Courtesy of the National Library of Medicine.



The Army Medical Museum and Library. Opened in 1889, it was the first proper home for the museum and surgeon general's library. Sternberg converted space in this building to establish the Army Medical School in June 1893. Affectionately known as the "Old Red Brick," it stood on the corner of 7th Street and Independence Avenue where the Hirshhorn Museum now stands. Courtesy of the National Library of Medicine.



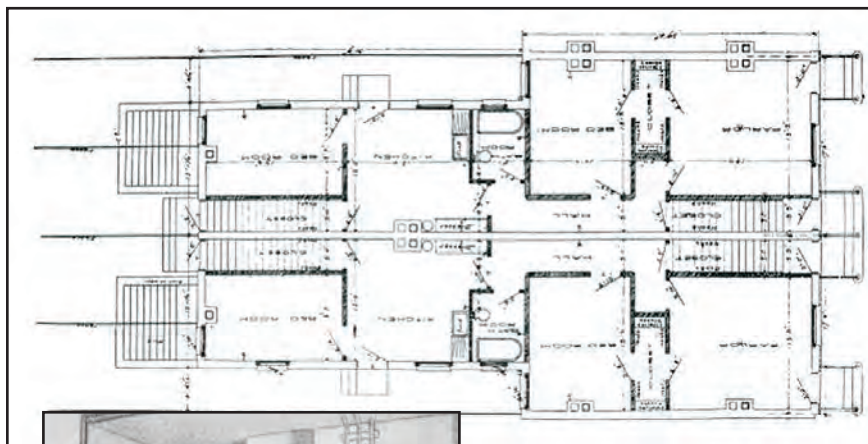
Interior of the Army Medical Museum and Library. Courtesy of the National Library of Medicine.



Interior of the Army Medical Museum and Library. Courtesy of the National Library of Medicine.



George M. Kober, M.D. (1850–1931). Sternberg and Kober met at Fort Lapwai in 1877. They became a powerful team for advancing medical education, fighting tuberculosis, and striving for social justice during the Progressive Era. Courtesy of the National Library of Medicine.



(Above) Floor plan of a Washington Sanitary Housing Company apartment. Each home consisted of two independent apartments, one above the other with separate entrances, small backyard, cellar, and exit to rear alley. Courtesy of Paul K. Williams, WashingtonHistory.com.

(Below) A kitchen in a Washington Sanitary Housing Company apartment. Courtesy of Paul K. Williams, WashingtonHistory.com.



Bates Street, NW, illustrating conversion of an alley to a minor street and Washington Sanitary Housing Company apartments. Courtesy of Paul K. Williams, WashingtonHistory.com.



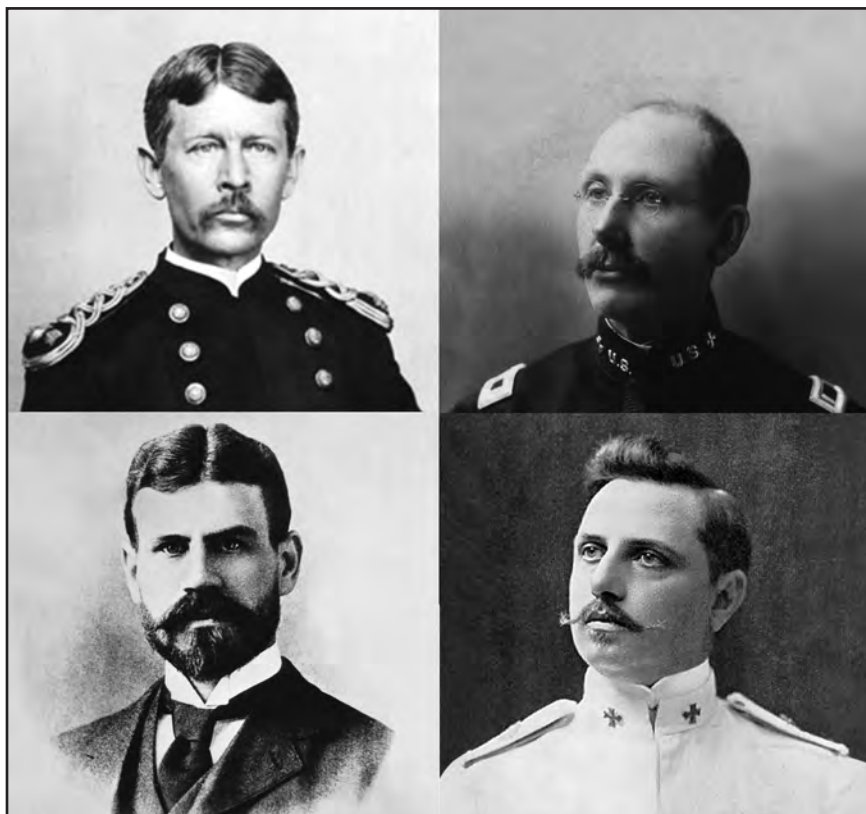
Honorary Presidents and Secretaries of the Military Medicine Section at the 12th International Congress of Medicine, Moscow, 1897. Sternberg is seated 4th from left. Copyright 1920. American Medical Association. All Rights Reserved.



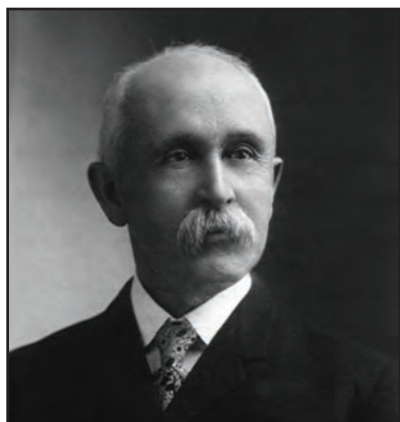
Sternberg (left, hands on blouse) confers with Colonel Henry Forwood and an unidentified officer at Camp Wycoff, Montauk Point, Long Island, NY, in 1898. Courtesy of the National Library of Medicine.



Giuseppe Sanarelli, M.D. A well-respected Italian bacteriologist, he studied yellow fever in Montevideo. His claim to have discovered the yellow fever germ in 1897 got Sternberg's immediate and full attention. Courtesy of the National Library of Medicine.



The U.S. Army Yellow Fever Board, 1900 Washington Sanitary Housing Company 1901. Clockwise from upper left: Walter Reed, James Carroll, Aristides Agramonte, and Jesse Lazear. All photos courtesy of the National Library of Medicine.



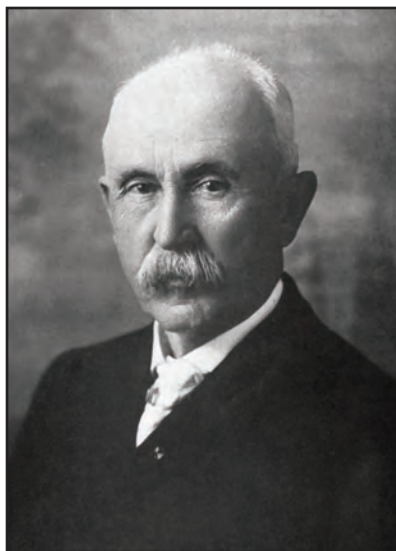
George M. Sternberg, 1905. Courtesy of the National Library of Medicine.



Martha L. Sternberg, 1905. Courtesy of the National Society of the Daughters of the American Revolution Archives.



George M. Sternberg, 1908. Sternberg donned his uniform one last time for a photograph at the request of friends attending his 70th birthday celebration. From Adolphus S. Knopf. *A History of the National Tuberculosis Association* (New York: National Tuberculosis Association, 1922).



George M. Sternberg, 1912. Still an influential voice in medicine and the public welfare in Washington, DC, his physical strength had begun to wane. Copyright 1920. American Medical Association. All Rights Reserved.



Starmont Sanatorium, Washington Grove, Maryland. Courtesy of the Montgomery County Historic Preservation Office, M-NPPC, Silver Spring, MD. Resource #20-14, Michael Dwyer photographer, October 24, 1974.



## Epilogue

On July 19, 1916, Senator J. H. Gallinger refreshed the memories of his colleagues in the Senate chamber on Sternberg's remarkable career and accomplishments. His intention was to sponsor a bill that would obtain a more adequate pension for Mrs. Sternberg. Congress had become more parsimonious in granting pensions to the widows of general officers, and \$50 per month was the limit set by the committee on pensions in both the House and Senate. Gallinger acknowledged this fact, but declared Mrs. Sternberg's case was unique because of her husband's accomplishments. He presented supporting letters from Surgeon General William Gorgas, General Leonard Wood, George Kober, and Elihu Root. Root's eloquent words summarized the feelings of these men and many others who had known and worked with Sternberg: "Senator Gallinger's bill does not rest alone upon long and faithful service...but chiefly and distinctively upon the great part which General Sternberg played in the service rendered by the Medical Corps of the Army in the nine years during which he was Surgeon General. The practical extirpation of yellow fever in Cuba and on the Isthmus of Panama and the development of methods of preventive medicine, which have secured the phenomenal freedom from typhoid in recent years, are achievements in which the Medical Corps of the Army bore a great part and won the highest distinction. Congress has paid great honor to the medical officers who in the field and in the camp became distinguished for their part in this extraordinary work. Let no one think, however, that the man who was at the head of the corps can be left out of account of this creditable record. Such things do not happen by accident. No body of men accomplishes what our medical officers accomplished except in response to leadership, incitement, encouragement, opportunity, motive, power, coming from the head of the corps. The Medical Corps accomplished what it did largely because the man at the top was a pioneer in bacteriology, an advance worker in protective medicine, and had the enthusiasm and devotion through which science wins victories.

That spirit communicated itself to the corps, directed its energies, made the field of opportunity for scientific effort, kept good men in it, brought good men into it, and furnished the indispensable element of leadership without which the good work could not have been done. General Sternberg was the general commanding in that campaign. Congress has been honoring his subordinates gratefully and properly. It is all wrong that there should be no appreciation for the commander.”<sup>1</sup> Gallinger called it “the simple truth” and moved to have her pension raised to \$100 per month.<sup>2</sup> After some discussion, the amendment was agreed to and the action went into conference committee.

Two weeks later, Mr. Edward Keating, of Colorado, called up the conference report on pension bills, which included that of Mrs. Sternberg, in the House of Representatives. A great deal of discussion occurred over Sternberg’s role in the conquest of yellow fever. This may have been the subject upon which passage of the bill hinged. Kober had submitted the testimony of Aristides Agramonte, the last surviving member of the Yellow Fever Board, in which the Cuban doctor affirmed that Sternberg’s “. . . instructions to Major Reed were so precise yet so complete that they embraced even human experimentation, a thing until then considered will nigh impossible, and, without the moral support which his reputation as a scientist of the highest order and his official position rendered us, I am sure we would have never undertaken the method of investigation with which you are familiar.”<sup>3</sup> Even with this evidence, Representative Clarence B. Miller, of Minnesota, fearful the bill would fail, had prepared a speech in support of the bill and asked for 10 minutes on the floor. Keating—perhaps aware of what was to come—graciously relinquished the remainder of his time to his northern colleague.<sup>4</sup>

The representative from Minnesota delivered the most comprehensive, concise, and accurate biography of George Sternberg that has ever been written. Miller’s words captured the soldier, the scientist, the philanthropist, and the man. If any opposition remained by the time he reached his final remarks, it faded away as he closed:

“Had General Sternberg devoted even a portion of his lifetime to acquiring remuneration for his services, he might have died a rich man. . . . He has contributed more for the well being of humanity than almost any other man I can name in the whole realm of medical science during the last half century. It seems to me that a great – I do not mean to say generous, but I think I have a right to say a fairly considerate government will recognize the lifetime of service, the heroic devotion and the splendid achievements of this man and honor his memory, a memory that ought to be blessed and hallowed by every man in the South. He has done more for you than any other living man. I believe you agree with me that his widow, who is now in advanced years, ought to be able to live in reasonable comfort during the remaining period of her life, and the distinguished services of this noble man thereby in some degree recognized by an appreciative Government.”<sup>5</sup>

The bill passed.

In early November 1919, friends and students from the Army Medical School gathered at Arlington National Cemetery to dedicate the large monument to General Sternberg. Army Surgeon General Merritte W. Ireland, Brigadier General Walter

D. McCaw, MC, and Colonels Edward L. Munson and Frederick F. Russell, MC, provided tributes to their old chief and mentor. But long-time family friend and colleague George Kober touched Mrs. Sternberg the most when he said Sternberg left “a memory of patriotism and good citizenship, a memory of brotherly love and good deeds.”<sup>6</sup>

Martha Sternberg, the General’s beloved “Mattie,” resided in Washington, DC, until her death in February 1936.<sup>7</sup>



# Acronyms and Abbreviations

ACP	Ammunition Control Point
AFIP	Armed Forces Institute of Pathology
AGO	Adjutant General's Office
AMA	American Medical Association
AMEDD	Army Medical Department
Am Jour Med Sci	<i>American Journal of the Medical Sciences</i>
AMS	Army Medical School
AMSUS	Association of Military Surgeons of the United States
APHA	American Public Health Association
ARIG	<i>Annual Report of the Inspector General</i>
ARSG	<i>Annual Report of the Surgeon General</i>
ARSW	<i>Annual Report of the Secretary of War</i>
ARWD	<i>Annual Report of the War Department</i>
BDE	<i>Brooklyn Daily Eagle</i>
B&L	<i>Battles and Leaders of the Civil War</i>
BM&SJ	<i>Boston Medical &amp; Surgical Journal</i>
CB	Commission Branch
CMH	Center for Military History
DAR	Daughters of the American Revolution
DCR	Dodge Commission Report
FGO	Field General Order
FY	fiscal year
GMS	George Miller Sternberg
GO	General Order

GPO	Government Printing Office
GWU	George Washington University
HIV	human immunodeficiency virus
HQ	headquarters
HR	House of Representatives
HRC	Hench-Reed Collection
JAMA	<i>Journal of the American Medical Association</i>
LOC	Library of Congress
Med Rec	Medical Record
MHP	Medical History of Post
MR	Muster Rolls
M&SHCW	<i>Medical &amp; Surgical History of the Civil War</i>
M&SHWR	<i>Medical &amp; Surgical History of the War of the Rebellion</i>
NARA	National Archives and Records Administration
NBH	National Board of Health
n.d.	no date
NGU	nongonococcal urethritis
NLM	National Library of Medicine
NMH	National Museum of Health and Medicine
NMM	National Medical Museum
NOM&SJ	<i>New Orleans Medical &amp; Surgical Journal</i>
n.p.	no publisher
n.s.	new series
NTA	National Tuberculosis Association
NYEP	<i>New York Evening Post</i>
NYS	<i>New York Sun</i>
NYT	<i>New York Times</i>
OR	The War of the Rebellion: A Compilation of the Official Records of the Union and Confederate Armies
PH	Post History
PHRP	Public Health Reports and Papers
PPPMO	Personal Papers of Physicians and Medical Officers
PR	Post Returns
RG	Record Group
Rpt.	report
Sen. Doc.	Senate document
SFO	Special Field Order
SGO	Surgeon General's Office

SO	Special Order
Ther Gaz	<i>Therapeutic Gazette</i>
TN&HR	<i>The Trained Nurse and Hospital Review</i>
USSC	U.S. Sanitary Commission
USUHS	Uniformed Services University of the Health Sciences
UVA	University of Virginia
WES	<i>Washington Evening Star</i>
WRAIR	Walter Reed Army Institute of Research
WSHC	Washington Sanitary Housing Company
WSIC	Washington Sanitary Improvement Company





# Endnotes

## Chapter One

### Palatines, Pietists, and Medicine

1. Levi Sternberg, *Story of My Life* (privately published by Martin A. Lambert, Decatur, AL, 1997), 1, 36.
2. *Ibid.*, 1–2.
3. Bailey, *Hartwick College: A Bicentennial History*, 43, 44; Jensson, *American Lutheran Biographies*, 322; Kuenning, *The Rise and Fall of American Lutheran Pietism*, 47, 75–89; Wolf, *The Lutherans in America*, 355; M. Sternberg, *George Miller Sternberg*, 2.
4. Kreider, *History of the United Lutheran Synod of New York and New England*, 70–93; L. Sternberg, *Story of My Life*, 3–4; Sternberg genealogy, Albert A. Martin, Decatur, AL.
5. This condition became epidemic among clergymen in the 1830s and 1840s, and some lost the use of their voice completely. Levi may have suffered from chronic laryngitis with secondary nodule formation on his vocal cords that developed from prolonged use and abuse of his vocal cords. Cassedy, “An American Clerical Crisis: Minister’s Sore Throat, 1830–1860,” 23–38.
6. L. Sternberg, *Story of My Life*, 5–8.
7. GMS, *My Life*, MS C100 George Miller Sternberg Papers, 1861–1917, Box 1, Folder 7, n.d., NLM, 3; GMS, “Presidential Address,” Association of Military Surgeons of the United States, 11; M. Sternberg, *GMS*, 2; 1850 New York census, NARA.
8. A. Hiller to Martha L. Sternberg, 1917, Biographical Sketch of George Sternberg by Alfred Hiller, MS C100 George Miller Sternberg Papers, 1861–1917, Box 1, Folder 23, NLM.
9. Sternberg genealogy.
10. Bailey, *Hartwick College*, 44; Hiller, “Biography of Rev Miller,” 75–78.

11. GMS, *My Life*, 5.
12. GMS, *My Life*, 2; Hiller, "Biography of Rev Miller," 75–80.
13. Kreider, *History United Lutheran Synod*, 201; L. Sternberg, *Story of My Life*, 9, 14, 17, 31.
14. GMS, *My Life*, 4.
15. *Ibid.*
16. Livermore, *Condensed History of Cooperstown*, 161–162; M. Sternberg, GMS, 2.
17. GMS, *My Life*, 4.
18. *Ibid.*, 5.
19. *Annual Catalog of the Officers and Students of Hartwick Theological and Classical Seminary, Academic Year Ending Aug. 25, 1852*, 4–7.
20. Bailey, *Hartwick College*, 48; Bruce, *Launching of American Science, 1846–1876*, 121, 122; Daniels, *American Science in the Age of Jackson*, 7, 20, 47, 48, 50–53. See also Stanley Guralnick, *Science and the Ante-Bellum American College* (Philadelphia: American Philosophical Society, 1975).
21. GMS, *My Life*, 5.
22. "A letter from Rev. G. B. Miller, D.D., Written to his Daughter Henrietta, now Mrs. A. Hiller, 55 years ago," *The Monthly*, Hartwick Seminary, Oct 1908, 4. Rogers, *Dinosaur Dynasty: Sternberg Fossil Hunters*, 10.
23. "A letter from Rev. G. B. Miller, D.D., Written to his Daughter Henrietta, now Mrs. A. Hiller, 55 years ago," *The Monthly*, Hartwick Seminary, Oct 1908, 4.
24. *Annual Catalog of the Officers and Students of Hartwick Theological and Classical Seminary, Academic Year Ending Aug. 23, 1854*, 6–7; GMS, *My Life*, 6.
25. GMS, *My Life*, 6–7; Sternberg genealogy.
26. GMS, *My Life*, 7.
27. GMS's comment on missing his mother is difficult to reconcile with his actions. At 13 he spent a year living in Cooperstown and there is no comment by him or Mrs. Sternberg suggesting that separation was a trial. GMS, *My Life*, 7; Kaester, *Pillars of the Republic: Common Schools and American Society, 1780–1860*, 20–22.
28. GMS, *My Life*, 8; *Annual Catalog of the Officers and Students of Hartwick Theological and Classical Seminary, Academic Year Ending Aug. 26, 1857*, 2.
29. GMS, *My Life*, 8.
30. *Ibid.*, 8–9.
31. GMS, *My Life*, 9. In the two autobiographical essays Sternberg wrote during his life—the short biography he provided the Medical Examining Board in May 1861 and *My Life* written after 1875—he was vague about the true sequence of events between 1856 and 1858. When these essays are combined with the records of Hartwick Seminary, it is evident he must have returned from New Jersey in the summer of 1856. "Prelim. Exam. Dr. Sternberg, May 13, 1861," Personal Papers of Physicians and Medical Officers (cited herein as PPPMO), MO, Box 551, RG94, NARA; Gibson, *Soldier in White*, 10; Minutes, Board of Trustees, 1857, Cooper Archives, Hartwick College, Oneonta, NY.

32. *Biographical Review of Otsego County*, 153–154; Gibson, *Soldier in White*, 11–12.
33. Material for medical education, practice, and personalities in this chapter was derived from the following sources: Starr, *The Social Transformation of American Medicine*, 81–83; Norwood, *Medical Education in the United States Before the Civil War*, 393–394; Bonner, *Becoming a Physician: Medical Education in Great Britain, France, Germany, and the United States, 1750–1945*, 229–230; Haller, *American Medicine in Transition, 1840–1910*, 197–199; Shryock, *Medicine and Society in America, 1660–1860*, 141, 144, 148, 149, and *The Development of Modern Medicine: An Interpretation of the Social and Scientific Factors Involved*, 183; Porter, *The Greatest Benefit to Mankind: A Medical History of Humanity*, 290, 354; Mettler, *History of Medicine*, 527–528; Rothstein, *American Physicians in the 19th Century: From Sects to Science*, 85, 88–89, 92; Bynum, *Science and the Practice of Medicine in the Nineteenth Century*, 26, 31–33, 41–42; Ludmerer, *Learning to Heal: The Development of American Medical Education*, 21–22; Warner, *The Therapeutic Perspective: Medical Practice, Knowledge, and Identity in America, 1820–1885*, 13, 14, 15; Rothschild, *History of Physiology*, 187–188; Lesch, *Science and Medicine in France*, 5, 14, 54, 58; Warner, *Against the Spirit of System: The French Impulse in Nineteenth Century American Medicine*, 3–4, 7–9; Kelly and Burrage, *Dictionary of American Medical Biography*; Atkinson, ed., *Physicians and Surgeons of the United States*; Garrison, *An Introduction to the History of Medicine*, 4th ed., 601, 278; Walsh, *History of Medicine in New York*, v2, 492–493; Duffy, *The Healers: A History of American Medicine*, 167, 172, 174–175.
34. GMS, *My Life*, 9.
35. The College of Physicians and Surgeons of New York required six-month terms during the early 1850s, but had returned to four-month terms by the time of GMS's matriculation.
36. Ludmerer, *Learning to Heal*, 13; Smith, *The Emergence of Organized Clinical Instruction in the Nineteenth Century American Cities of Boston, New York, and Philadelphia*, 236–237.
37. *Atlas of Otsego County*, 18; Map of Otsego County, 1868, New York State Historical Society, Cooperstown, New York.
38. Bylebyl, "William Beaumont, Robley Dunglison, and the 'Philadelphia Physiologists'" 3–21; Warner, "The Campaign for Medical Microscopy in Antebellum America," 371–372; Cassidy, "The Microscope in American Medical Science, 1840–1860," 76–97.
39. Bonner, *Becoming a Physician*, 152.
40. Haller, *American Medicine in Transition*, 206.
41. GMS, *My Life*, 9; GMS, "Presidential Address," 7.
42. *Eleventh Annual Announcement, Medical Department, University of Buffalo, 1856–57*, 16.
43. *Ibid.*, 9.
44. *Ibid.*, 9.
45. *Ibid.*, 9.
46. *Ibid.*, 9.

47. Editorial, *Buffalo Medical Journal*, Jul 1857, 13(2):127, Jan 1858, 13(8):512, Aug 1858, 14(3):180–182, Aug 1857, 13(3):190.
48. Editorial, *Buffalo Medical Journal*, Aug 1857, 13(3):190.
49. White's presentation of a woman in labor to his class outraged some Buffalo physicians, but his methods survived the criticism and lawsuit.
50. Editorial, "Medical Department – University of Buffalo," *Buffalo Medical Journal*, Aug 1857, 13(3):190 and Aug 1858, 14(3):180–182; *Annual Announcement, Medical Department of the University of Buffalo, 1858–1859* (Buffalo, NY: Chas. E. Felton, 1859), 8; Sentz, *Medical History of Buffalo*, 4–5, 7, 43; Smith, "Austin Flint and Auscultation in America," 129–149; Peltier, "A Brief History of Traction," 1603–1617; Fye, "Growth of American Physiology, 1850–1900," 48; Rothschild, *History of Physiology*, 189.
51. *11th Annual Announcement*, 10.
52. Editorial, *Buffalo Medical Journal*, 14(5), Oct 1858, 316 and 14(6), Nov 1858, 374–375.
53. Sternberg attended the College of Physicians and Surgeons during the 1859–1860 session; however, he wrote that he did this the winter following his Buffalo instruction, which he stated was in the winter of 1857–1858. Since he graduated in March 1860, presumably he made an error and attended Buffalo in the winter of 1858–1859. *GMS, My Life*, 9–10.
54. Shradly, ed., *The College of Physicians and Surgeons of New York and Its Founders, Officers, Benefactors, and Alumni*, v1, 106–107.
55. Walsh, *History of Medicine in New York*, v2, 427.
56. Walsh, *History of Medicine in New York*, v2, 427–429; *53rd Annual Catalogue, College of Physicians and Surgeons in the City of New York, 1859–60*, 12; Smith, *Emergence of Organized Clinical Instruction*, 169, 170, 173; Rosenberg, "The Practice of Medicine in New York a Century Ago," 140.
57. *53rd Annual Catalogue, College of Physicians and Surgeons in the City of New York*, 2; Sentz, *Medical History in Buffalo*, 7; Ruhrah, "Willard Parker," 205–214; Smith, "A Historical Overview of the Recognition of Appendicitis – Part I," 571–647; Baldwin, "The Detmold Method of Controlling Inoperable Hemorrhage," 34–36; Shradly, *College of Physicians and Surgeons*, 107, 111, 112–113; Smith, *Emergence of Organized Clinical Instruction*, 173; Norwood, *Medical Education in the United States*, 164.
58. According to the college catalog of 1860–1861, Sternberg's essay was titled "Necrosis," but 14 months later he told the Army Medical Examining Board the paper was on the subject of "Cynanche Trachealis." The essay has not survived, but presumably, the catalog entry was a misprint. "Prelim. Exam. Dr. Sternberg, May 13, 1861," PPPMO, Box 551, RG94, NARA; *54th Annual Catalogue, College of Physicians and Surgeons in the City of New York, 1860–1861*.
59. Rosenberg, *The Care of Strangers*, 72, 74, 78, 83, 93.
60. M. Sternberg, *GMS*, 245.

61. Cassedy, "The Microscope in American Medical Science," 76, 82 & n, 83, 97; Schaeffer, "Nineteenth Century American Microscopy," 464; Gage, "Microscopy in America (1830–1945)," 47–49, 57; Warner, "The Campaign for Medical Microscopy in Antebellum America," 369, 374–375, 377, 379.
62. See GMS Civil War reports in: *The Medical and Surgical History of the Civil War*, v2, (Wilmington, NC: Broadfoot Publishing, 1990), 8, 88.
63. *54th Annual Catalogue, College of Physicians and Surgeons, Session of 1860–1861*, 15–16. Rosenberg, "The Practice of Medicine in New York a Century Ago," 151, and *Care of Strangers*, 65.

## Chapter Two

### From First Bull Run to Hospital Command

1. M. Sternberg, GMS, 245.
2. Ibid.
3. Starr, *Transformation*, 64, 89.
4. M. Sternberg, GMS, 245.
5. Although GMS's forefathers had served in the Seven Years and Revolutionary Wars, and his paternal grandfather had owned slaves, he had grown up in a religious environment that was both pacifist and abolitionist. Yet, where the struggle for abolition was concerned the Evangelical Lutherans believed that the end justified the means. GMS, and later his brothers Theodore and Frederick, probably received support for their decisions to enter the service. GMS to Cameron, 14 Apr 1861, PPPMO, Box 551 (Sternberg), RG94, NARA; Gibson, *Soldier in White*, 13, 14.
6. Ludmerer, *Learning to Heal*, 15–16; Cameron to GMS, 22 Apr 1861 and GMS to Surgeon General, 4 May 1861, PPPMO, Box 551, RG94, NARA.
7. William A. Hammond, older than most of the other candidates and with prior army service, stood first in the class. Charles C. Gray, Charles E. Goddard, Blencoe E. Fryer, and Henry R. Silliman, who would work closely with GMS in the very near future, also performed well. Merit Rolls Regulars, Entry 77, RG112, NARA; Brown, *The Medical Department of the United States Army from 1775 to 1873*, 212, 216, 217; William Sloan to Surgeon General, 16 May 1861 and Contract of Service, 20 May 1861, PPPMO, Box 551, RG94, NARA.
8. GMS Narrative of Service to Surgeon General, Jul 29, 1863, PPPMO, Box 551, RG94, NARA; Marcus, ed., *Washington During Wartime*, Appendix B; Bryan, *A History of the National Capital*, v2, 3n, 479. Reese, *Sykes' Regular Infantry Division*, 32, 33.
9. Weigley, *History of the United States Army*, 189, 190, 200, 566.
10. Gillett, *The Army Medical Department, 1818–1865*, 128.

11. Gillett, *The Army Medical Department, 1818–1865*, 127–132; Otis, *Report on the Transport of Sick and Wounded by Pack Animals*, 4, 5.
12. Leech, *Reville in Washington*, 55.
13. Mitgang, ed., Noah Brooks, *Washington, D.C. in Lincoln's Time*, 13; Elden Billings, "Military Activities in Washington in 1861," 131; *Battles & Leaders of the Civil War*, v1, 171 (hereafter cited as *B&L*); Warner, *Generals in Blue*, 298; GMS Narrative of Service to Surgeon General GMS to SGO, Jul 29, 1863, PPPMO, Box 551, RG94, NARA.
14. *B&L*, v1, 174–175; Davis, *Battle at Bull Run*, 73–76; W. S. King, "Report of Events Connected with the First Bull Run Campaign," *Medical and Surgical History of the Civil War*, v2, 1–4, 6 (hereafter cited as *M&SHCW*); Gillett, *AMEDD, 1818–1865*, 163, 164; Duncan, *The Medical Department of the United States Army in the Civil War*, 21, 26; Cunningham, *Field Medical Services at the Battles of Manassas*, 20; Adams, *Doctors in Blue*, 26.
15. Sykes Regular Battalion consisted of two companies: 2d U.S. Infantry, 5 from the 3rd U.S. Infantry, and one from the 8th U.S. Infantry Reese, *Sykes' Regular Infantry*, 34. Adams, *Doctors in Blue*, 25; *B&L*, v1, 178; Hennessy, *First Battle of Manassas*, 2d ed., 12; *The War of the Rebellion: A Compilation of the Official Records of the Union and Confederate Armies* (hereafter cited as *OR*), Series 1, v2, 315, 390; Duncan, *Medical Department in the Civil War*, 38; Johnston, *Bull Run*, 114–115, 120, 130–136.
16. "Capture and Escape of Dr. Sternberg," *Freeman's Journal*, Cooperstown, NY, Aug 1861, George Miller Sternberg Papers, 1861–1917, Box 1, Folder 8, NLM; Davis, *Battle at Bull Run*, 159, 160, 162; Johnston, *Bull Run*, 144.
17. Davis, *Battle at Bull Run*, 167; Haynes, *A History of the Second Regiment, New Hampshire Volunteer Infantry in the War of the Rebellion*, 23–28; Woodbury, *The Second Rhode Island Regiment*, 31; Fairchild, *History of the 27th Regiment New York Volunteers*, 9–11. Sternberg thought the flank march to be about 10 miles. According to measurements from battlefield maps contemporary with the battle, the distance from where Hunter's Division turned off the Warrenton Turnpike to the Sudley Ford was about 6 miles. *B&L*, v1, 186; "Capture and Escape of Dr. Sternberg"; Parker, "The Regular Infantry in the First Bull Run Campaign," 525; Johnston, *Bull Run*, 184–185; Davis, Perrin, and Kirkley, *Official Military Atlas of the Civil War*, Plate 3.
18. *OR*, Series 1, v2, 319, 383–387, 488, 559; Parker, "The Regular Infantry in the First Bull Run Campaign," 527; "Capture and Escape of Dr. Sternberg."
19. "Capture and Escape of Dr. Sternberg."
20. "No. 35, Report of Maj. George Sykes," 390–391 and "No. 110, Report of Brig. Gen. Nathan G. Evans," 559, *OR*, Series 1, v2; Davis, *Battle at Bull Run*, 173–174. "Capture and Escape of Dr. Sternberg." For an analysis of how Union soldiers reacted to battle, see Hess, *Union Soldier in Battle* (Lawrence: University of Kansas Press, 1997).
21. W. S. King, "Report of Events Connected with the First Bull Run Campaign," *M&SHCW*, v2, 4, 5.

22. "No. 110, Report of Brig. Gen. Nathan G. Evans, *OR*," Series 1, v2, 559; Davis, *Battle at Bull Run*, 175, 177, 180–185, 187–188; Reese, *Sykes' Regular Infantry*, 37, 40; Parker, "Regular Infantry in the First Bull Run Campaign," 529. Cunningham, *Field Medical Services*, 15, 36; Duncan, *Medical Department in the Civil War*, 31.
23. "Capture and Escape of Dr. Sternberg."
24. GMS sent Colonel Jones to Sudley Church for definitive care. Jones died at Orange Hospital, Orange, Virginia, from complications of his injuries on 3 Sep 1861. Compiled Service Records of Confederate Soldiers, M-311, Roll 124, NARA; Davis, *Battle of Bull Run*, 181.
25. Davis, *Battle of Bull Run*, 191–195, 214, 236.
26. Reese, *Sykes' Regular Infantry*, 38–40; Parker, "Regular Infantry in the First Bull Run Campaign," 528–529; Hennessy, *First Battle of Manassas*, 78; "Capture and Escape of Dr. Sternberg"; "No. 35, Report of Maj. George Sykes," 390–399, and "No. 83, Report of Col. J. E. B. Stuart," *OR*, Series 1, v2, 484.
27. "Capture and Escape of Dr. Sternberg." GMS probably tethered his horse at the Lewis home. Undoubtedly, his unattended mount had been the vehicle of someone's headlong flight from the battlefield. He humorously remarked years later, "I tied him to a tree, and unless some one else took him away he is still there, for I have never seen him since." GMS, "Presidential Address," 13. Among surgeons ordered to Sudley Church were Charles C. Gray, Regular Army, William W. Keene, 5th Mass, and C. S. Degraw, 8th NY. *M&SHCW*, v2, 5, 7, 8, 18.
28. Taken prisoner with GMS were: Charles Gray, Regular Army; Foster Swift, G. S. Winston, and C. S. DeGraw, 8th NY; Homiston and William F. Swalm, 14th NY; Eugene E. R. Peugnet, 71st NY; James Harris, 2d RI; Jacob H. Stewart and Charles W. Boutillier, 1st Minn; Benjamin F. Buxton, 5th Maine, William Allen, 2d Maine, James M. Lewis, 2d Wis, and Edward F. Taylor, 2d NJ. Cunningham, *Field Medical Services*, 6, 20; Duncan, *Medical Department in the Civil War*, 31, 34–35; C. C. Gray, "Extract from a Report of Services at the First Battle of Bull Run," *M&SHCW*, v2, 7; "No. 83, Report of Col. J. E. B. Stuart," *OR*, Series 1, v2, 484.
29. "Capture and Escape of Dr. Sternberg"; PPPMO, Boxes 453 (Peugenet), 566 (Swalm), 646 (Winston), RG94, NARA; Alan Goff, ed., George H. Otis, *The Second Wisconsin Infantry*, 236, 295; Mundy, *Second to None: The Story of the Second Maine Volunteers*, 81–82; Bilby and Goble, *Remember You Are Jerseyemen!* 66; Blackford, *War Years with JEB Stuart*, 41–42.
30. Cunningham, *Field Medical Services*, 14, 15; "Capture and Escape of Dr. Sternberg."
31. G. M. Sternberg, "Extract from a Report on Duties Assigned to Him from the Outbreak of the Rebellion," *M&SHCW*, v2, 8.
32. "Capture and Escape of Dr. Sternberg."
33. *Ibid.*
34. Winston, PPPMO, Box 646, RG94, NARA; "Capture and Escape of Dr. Sternberg."
35. "Capture and Escape of Dr. Sternberg."
36. *Ibid.*

37. Ibid.
38. Ibid.
39. "Capture and Escape of Dr. Sternberg." Poultices of red oak were used for their astringent properties on wounds and abscesses, and decoctions of the bark, fortified with opium, were used orally to control chronic diarrhea. Neill and Smith, *An Analytical Compendium of the Various Branches of Medical Science*, 705–706.
40. "Capture and Escape of Dr. Sternberg."
41. GMS's course from Centreville to the Maryland side of the Potomac west of Washington can be recreated with a reasonable amount of certainty. He paralleled present day state route 28 to its junction with state route 7, a distance of about 15 miles. State route 7 (Leesburg Pike) was the road patrolled by the South Carolina Regiment. From the junction of routes 28 and 7, GMS proceeded about 7 miles east to the banks of the Potomac just north of Great Falls in the River Park area. This is 9.5 miles above the Little Falls Dam. From Little Falls Dam to Rock Creek, the southwestern edge of the city is about 5 miles. *The Union Army*, v1, 43; Davis, *Official Military Atlas*, Plate 7.
42. *The Union Army*, v1, 42; "Capture and Escape of Dr. Sternberg."
43. Warner, *Generals in Blue*, 291; Billings, "Military Activities," 131; Bryan, *History of the National Capital*, 478–479, 481, 484; Green, *Washington*, 262; Brooks, *Washington, D.C. in Lincoln's Time*, 13–14.
44. Steiner, *Disease in the Civil War*, Table 105, 106, 107, 109, 115–116.
45. GMS Narrative of Service to Surgeon General GMS to SGO, Jul 29, 1863, PPPMO, Box 551, RG94, NARA; C. E. Goddard, "Extracts from a Report of His Services in the Medical Staff," *M&SHCW*, v2, 74; Lowry, *Civil War Bawdy Houses of Washington, D.C.*, 10, map.
46. Sears, *George B. McClellan*, 167 and *To the Gates of Richmond*, 5, 12–14, 18–20; *B&L*, v2, 167–168.
47. Charles S. Tripler, "Report of the Operations of the Medical Department of the Army of the Potomac," *M&SHCW*, v2, 44–57.
48. Ibid.
49. Tripler, "Report of Operations," *M&SHCW*, v2, 49–50; Gillett, *AMEDD, 1818–1865*, 186.
50. George M. Sternberg, Carded Medical Records, RG94, NARA; Register of Letters Received, 1862, RG112, NARA; Reese, *Sykes' Regular Infantry*, 70.
51. Foote, *The Civil War*, v2, 410, 417; *B&L*, v2, 168–173; Reese, *Sykes' Regular Infantry*, 73.
52. Gillett, *AMEDD, 1818–1865*, 188–189; Tripler, "Report of Operations," *M&SHCW*, v2, 58.
53. "No. 137, Report of Brig. Gen. George Sykes," 348–349 and "No. 141, Report of Capt. Thomas W. Walker," 361–363, *OR*, Series 1, v11; Reese, *Sykes' Regular Infantry*, 76–84; Sears, *To the Gates of Richmond*, 223–225; *B&L*, v2, map 334, 335; G. M. Sternberg, "Second Extract from a Report on Duties Assigned to Him," *M&SHCW*, v2, 88.



54. G. M. Sternberg, "Second Extract from a Report on Duties Assigned to Him," *M&SHCW*, v2, 88.
55. Surgeons provided a primitive version of advanced trauma life support. Without intravenous fluid replacement and the means for airway management, this consisted of applying compression dressings and immobilization devices, and administering anodynes and stimulants as the case may warrant. Narratives and Reports of Service, *M&SHCW*, v2, 69 (Brown), 72 (Bentley), 73 (Woodhull and Greenleaf), 76 (Schell), 80 (waters), 81 (Spencer and Hand), 82 (Middleton).
56. Reese, *Sykes' Regular Infantry*, 89–90; Sears, *To the Gates of Richmond*, 236–242; Hess, *Union Soldier in Battle*, 17, 19, 21, 27; *B&L*, v2, 339–340; "No. 137, Report of Brig. Gen. George Sykes," *OR*, Series 1, v11, 348–349. Tripler stated there were 1,300 casualties at Savage Station, but his estimate is not substantiated by others who were there and contemporary historians. Tripler may have made this estimate prior to the arrival of wounded from the Gaines' Mill engagement. Tripler, "Report of the Operations of the Army of the Potomac" and Greenleaf, "Narrative of Medical Services," *M&SHCW*, v2, 57, 73; *B&L*, v2, 386; Foote, *Sumter to Perryville*, 501.
57. "No. 137, Report of Brig. Gen. George Sykes," *OR*, Series 1, v11, 350; Reese, *Sykes' Regular Infantry*, 96–97.
58. "No. 137, Report of Brig. Gen. George Sykes," *OR*, Series 1, v11, 352.
59. *Ibid.*
60. "No. 35, Report of Maj. George Sykes," *OR*, Series 1, v2, p 391.
61. "No. 140, Report of Lieut. Col. Robert C. Buchanan," *OR*, Series 1, v11, 360; Reese, *Sykes' Regular Infantry*, 99; GMS Narrative of Service to Surgeon General GMS to SGO, Jul 29, 1863, PPPMO, Box 551, RG94, NARA, 6; Narrative Reports of Service, *M&SHCW*, v2, 45–57 (Tripler), 81 (Spencer), 82 (Middleton), 88 (Sternberg), 93–94 (Letterman); Duncan, *Medical Department in the Civil War*, 102; GMS to Letterman, Jul 19, 1862, PPPMO, Box 551, RG94, NARA. Volunteer medical staff and 650 wounded were left to the enemy at Savage Station. "Narratives and Reports of Service," *M&SHCW*, v2, 72 (Bentley), 76 (Schell).
62. Letterman, *Medical Recollections*, 5–8; Stille, *History of the USSC*, 159–160.
63. The USSC fitted out the *Daniel Webster* and *Ocean Queen* and the Medical Department renovated the *Cosmopolitan*, *Western Metropolis*, *Connecticut*, and *State of Maine*. *M&SHCW*, v12, 982, 984; Stille, *History of the USSC*, 154–158; Letterman, *Medical Recollections*, 9–11. Adams commented that the transport vessels were filthy, poorly equipped, and inadequately staffed until the USSC assumed control of them. This is contradictory to Letterman's assessment of these floating hospitals. Adams, *Doctors in Blue*, 71–72.
64. Steiner, *Disease in the Civil War*, 125; Reports, *M&SHCW*, v2, 93–96 (Letterman).
65. GMS to Hammond, Jul 9, 1862, PPPMO, Box 551, RG94, NARA.
66. *Ibid.*
67. SGO to GMS, Jul 15, 1862, PPPMO, Box 551, RG94, NARA.

68. GMS to Letterman, Jul 19, 1862, GMS Narrative of Service to Surgeon General GMS to SGO, Jul 29, 1863, SGO to GMS, Aug 29, 1862, and GMS to SGO, Sep 18, 1862, PPPMO, Box 551, RG94, NARA; Sternberg, *GMS*, 28; Gibson, *Soldier in White*, 31.
69. Gibson, *Soldier in White*, 31; *M&SHCW*, v3, 15 and v6, 935, 939, 940, 956; GMS, "Disease Germs," 451–455.
70. Editorial, "The Hospital at Portsmouth, R.I.," 115, 116.
71. GMS, "Address to the Pan-American Medical Congress," 371.
72. GMS to SGO, Nov 19, 1862 and SO#355, Adj Gen Office, Nov 20, 1862, PPPMO, Box 551, RG94, NARA; Harrington, *Fighting Politician*, 86.
73. Johnson, *Red River Campaign*, 10–25, 28; Harrington, *Fighting Politician*, 85, 86; Halleck to Banks, HQ of the Army, Nov 9, 1862, Minority Report, Report of Red River Expedition to the 38th Cong (Millwood, NY: Kraus Reprint Company, 1977), 16; SO#17, HQ Banks Expedition, Nov 26, 1862, PPPMO, Box 551, RG94, NARA.
74. Duffy, *History of Medicine in Louisiana*, v2, 319; OR, Series 1, v26, 13, 14; Johnson, *Red River Campaign*, 32–33; Harrington, *Fighting Politician*, 121–122, 124. SO#28, HQ Banks Expedition, Dec 14, 1862, PPPMO, Box 551, RG94, NARA; Chaille, "The Yellow Fever, Sanitary Condition, and Vital Statistics of New Orleans," 570–571; *M&SHCW*, v6, 676; Woodward to GMS, Woodward Letter Book, Curatorial Records, Otis Archives. Alexander installed GMS as secretary of the Board of Health. Brown, *Report on Quarantine*, 54.
75. GMS accompanied Banks' to the desolate, windswept flats of Brazos Island and Brownsville, Texas, in October. By mid-December, he was back at his desk in New Orleans. OR, Series 1, v26, 20, 397, 399; SO#16, HQ, Dept of the Gulf, Jan 19, 1864; GMS to Barnes, Feb 6, 1864, PPPMO, Box 551, RG94, NARA.
76. SO#74, Feb 15, and SO#84, War Dept, Washington, DC, Feb 20, 1864, PPPMO, Box 551, RG94, NARA.
77. Cleveland General Hospital, consisting of 11 wards, was located on an open plain in the University Heights suburbs, one mile from Cleveland proper. GMS commanded the camp until mid-August when Colonel Charles C. Smith, 10th Ohio Vol. Cavalry, assumed control of Camp Cleveland. SO#37, HQ, Northern Dept, Mar 12, 1864, GMS to Barnes, Mar 12, 1864, Tripler to GMS, Apr 16, 1864, SO #76, May 2, SO, May 5, 1864, SO#92, May 21, 1864, and SO#159, Aug 12, HQ, Northern Dept, PPPMO, Box 551, RG94, NARA; Indexes to Field Records of Hospitals, 1821–1912, Records of the AGO, RG94, Box 5, NARA; Stark, "The United States General Hospital at Cleveland, Ohio," 125–128.
78. GMS to Wood, Aug 19, 1864 and GMS to Wood, Nov 15, 1864, PPPMO, Box 551, RG94, NARA. Lutheran Church conservatives had advocated a more defined confessional position based on a revision of the Augsburg Confessions and symbolical books of the church. Levi became outraged, particularly over the suggestion Lutherans accept the Roman doctrine of transubstantiation, and led the opposition at Hartwick in an article titled "The Lord's Supper." Dr. Miller agreed with Levi's arguments, but pleaded with him not to publish it for fear of repercussions to the seminary. The dissension that rocked the church found its way into the seminary, polarized the student body, and caused a schism between Levi

- and Miller. The growing conservative movement in the Lutheran church was extinguishing the evangelical fire, and Levi saw himself surrounded by adversaries. A moderate, George Miller was a burr under Levi's saddle as he fought the good fight for evangelicalism. By virtue of Miller's seniority at the school and his relationship as mentor and father-in-law, Rev. Sternberg had felt some obligation to be deferential, but as pressures mounted so did his insecurities, and he became ever more suspicious that opponents in the synods, on the board of trustees, and possibly Miller, were subverting his authority as principal. L. Sternberg, *Story of My Life*, 12, 14, 15 and "The Lord's Supper," 558–578; Jacobs, *A History of the Evangelical Lutheran Church in the United States*, 416, 418, 424–425; L. Sternberg to Lintner, Mar 10, 1864, Weiskotten to Lintner, Mar 21, 1864, and L. Sternberg to Lintner, Apr 24, 1864, Cooper Archives, Hartwick College, Oneonta, NY.
79. Miller to Pohlman, Nov 27, 1864, Cooper Archives, Hartwick College.
  80. Pohlman to Miller, Dec 16, 1864, and Miller to Lintner, Dec 19, 1864, Cooper Archives, Hartwick College; L. Sternberg, *Story of My Life*, 12; GMS to Tripler, Nov 15, 1864, Tripler to GMS, Dec 17, 1864, SO#104, Dec 20, 1864, Medical Director's Office, Gen Hospital, Louisville, KY, GMS to Tripler, Dec 21, 1864, and GMS to Tripler, Mar 18, 1865, PPPMO, Box 551, RG94, NARA.
  81. Gillett, *AMEDD 1865–1917*, 11; Tripler to GMS, Jul 4, 1865, PPPMO, Box 551, RG94, NARA.
  82. SO#425, Aug 8, 1865, GMS to Tripler, Aug 29, 1865, and GMS to Wood, Aug 31, 1865, PPPMO, Box 551, RG94, NARA.

### Chapter Three

## The Kansas Plains

1. *Biographical Review*, Otsego County, NY, 117; *Freeman's Journal*, Oct 27, 1865; Sternberg, *GMS*, 11.
2. The Military Division of the Missouri was composed of the Departments of the Missouri (Missouri, Kansas, Colorado, and New Mexico), the Platte (Iowa, Nebraska, Utah and parts of Dakota and Montana), Dakota (Minnesota and the remainder of Dakota and Montana), and the Arkansas (Indian Territory, now Oklahoma). Utley, *Frontier Regulars*, 2, 13–14, 45, 93, 94. Billings, *Report on Barracks and Hospitals*, 276; Weigley, *The American Way of War*, 157–158; Leckie, *Military Conquest of the Southern Plains*, 3, 28; Gillett, *AMEDD, 1865–1917*, 63; Sherman, *Memoirs*, v2, 412, 413.
3. Gillett, *AMEDD, 1865–1917*, 12; Ashburn, *History of the Medical Department of the United States Army*, 89; Brown, *Medical Department United States Army*, 244; GMS to Barnes, Jan 31, 1866, SO#89, Apr 14, 1866, and GMS to Barnes, Apr 30, 1866, PPPMO, Box 551, RG94, NARA. GMS was promoted to captain on 28 May 1866. At the end of the war, he had received "brevet" promotions, for gallantry in combat, to Captain and Major and therefore wore the rank of, and was addressed as, Major. Brevet promotions were honorary ranks given for gallantry and

meritorious service. Although brevet rank had little practical significance, officers could be assigned on the basis of their brevet rank; however, for pay and retirement purposes, their regular, or permanent, rank applied. The issue of brevet versus regular rank can become confusing, therefore, only regular army rank will be used. Heitman, *Historical Register*, 921; *Official Army Register 1893*, 10; Weigley, *United States Army*, 110–111; Utley, *Frontier Regulars*, 13, 37 n. 13; Utley, personal communication, Aug 12, 1997.

4. Louisa returned to Cooperstown on account of “frail health.” No other sources substantiate she was in poor health, and, as will be seen, her later actions contradict the idea that she lacked physical or emotional strength. M. Sternberg, *GMS*, 11; Billings, *Report Barracks and Hospitals*, 290; Post Returns, Fort Harker, M617, Roll 453, NARA; Zornow, *Kansas*, 137; Clapsaddle, “Conflict and Commerce on the Santa Fe Trail,” 2, 133–134. In 1863, the railway was designated the Union Pacific, Eastern Division and in 1869 the name was changed to Kansas Pacific. Garfield, “Defense of the Kansas Frontier, 1866–1867,” 326–344; Carriker and Carriker, eds. *An Army Wife on the Frontier*, 35; Medical History of Post, 1865–1872, (Fort Harker), vol 128, E547, RG94; Gibson, *Soldier in White*, 33–34; Rogers, *Dinosaur Dynasty*, 10, 11; Coffman, *The Old Army*, 254; Oliva, *Fort Harker*, 26–28.
5. Jennie Barnitz to Albert Barnitz, Jul 21, 1867, Albert Barnitz Papers, Beineke Library, Yale University.
6. The reasons for Lamb’s incarceration are unknown. Clary, “The Role of the Army Surgeon in the West,” 53–66; Lynch, “The Day of Small Things in the United States Army, 1865–1898,” 44; SO#43, May 8, 1866, PPPMO, Box 551, RG94, NARA; Post Returns, Ft. Harker; Wengert, “The Contract Surgeon,” 67–76; Rickey, *Forty Miles a Day on Beans and Hay*, 131, 132; Gillett, *AMEDD, 1865–1917*, 49, 73, 74, 77; Knight, *Life and Manners in the Frontier Army*, 172–173.
7. Post Returns, Ft. Harker M617, Roll 453, NARA; Medical History of Post, Ft. Harker, 2, 15–16; Oliva, *Fort Harker*, 43.
8. M. Sternberg, *GMS*, 19; Dobak, *Fort Riley and its Neighbors*, 41, 62; Dykstra, “Ellsworth, 1869–1875: The Rise and Fall of a Kansas Cowtown,” 162, 163 and *Cattle Towns*, 31; Rogers, *Dinosaur Dynasty*, 11–12; C. Sternberg, *Life of a Fossil Hunter*, 11; Land Records, Registrar’s Office, Ellsworth Kansas. Congress granted a 33.3 percent pay raise to all officers in the spring of 1867 retroactive to July 1, 1866, but for only two years. Coffman, *Old Army*, 84, 85, 265. Utley, ed., *Life in Custer’s Cavalry*, 59.
9. L. Sternberg, *Story of My Life*, 21, 24.
10. After resigning from the seminary, Levi had accepted an oil company superintendency in Pennsylvania. Although the annual salary of \$2,000 was more money than Levi had ever contemplated earning, he was not fit for the job and after four months he resigned. In the fall of 1865, he accepted the Iowa position and began his duties in January 1866. L. Sternberg, *Story of My Life*, 12, 13, 20, 24. As of October 1867, Levi was still living in Albion, Iowa. CB Files, M1064, Roll 376, NARA.
11. Mrs. Sternberg indicated *GMS* was not in favor of settling his mother in Kansas, but Rogers noted it was part of his plan to coax his parents to Kansas from the time he purchased the ranch. Gibson does not refer to the episode, and Charles Sternberg

- merely stated he and his brother Edward moved to the ranch in 1867. GMS had good reason not to want his educated and refined mother near Ellsworth. Soon after its founding in 1867, it gained a reputation as a rough, seedy cowtown harboring the worst elements of society; however, this does not appear to have deterred his plans and his parents eventually moved into the town. M. Sternberg, *GMS*, 18–19; Rogers, *Dinosaur Dynasty*, 1–12; Sternberg, *Life of a Fossil Hunter*, 5–6, 13–14; Dykstra, *Cattle Towns*, 113; Clapsaddle, “Conflict and Commerce,” 136.
12. Moore, *Cheyenne Nation*, 46; Utley, *Frontier Regulars*, 93, 97, 103–107, 113, 114; Leckie, *Military Conquest*, 9, 30–32; Zwink, “E. W. Wynkoop and the Bluff Creek Council, 1866,” 217; Garfield, “Defense of the Kansas Frontier,” 326, 328; Carriker, *Fort Supply*, 3.
  13. Billings, *Report Barracks and Hospitals*, 290; The railroad was not completed to Ellsworth until July 5. Zornow, *Kansas*, 152; Jennie Barnitz to Albert Barnitz, Jul 21, 1867, Albert Barnitz Papers, Beineke Library, Yale University.
  14. Jennie Barnitz’s Journal, Jul 20, 1867, Utley, *Life in Custer’s Cavalry*, 91.
  15. Utley, *Life in Custer’s Cavalry*, 59, 91.
  16. Utley, *Life in Custer’s Cavalry*, 59; Carriker and Carriker, *Army Wife on the Frontier*, 42.
  17. Utley, *Life in Custer’s Cavalry*, 59; Jennie Barnitz to Albert Barnitz, Jul 21, 1867, Albert Barnitz Papers, Beineke Library, Yale University.
  18. Early on July 4, an Indian scouting party did approach the Sternberg ranch, but dispersed at the site of a troop of cavalry. C. Sternberg, *Life of a Fossil Hunter*, 11; Utley, *Frontier Regulars*, 114–120; Leckie, *Military Conquest*, 47, 48, 56; Garfield, “Defense of the Kansas Frontier,” 329–332; Medical History of Post, Ft. Harker, 9; Woodward, *Report on the Epidemic Cholera...During the Year 1867*, 29.
  19. Powers and Younger, “Cholera on the Plains,” 368; Woodward, *Report Epidemic Cholera, 1867*, 29–30, 41, 43. In 1874, line officers were further motivated to implement sanitary recommendations by the post surgeon when the army required them to routinely submit reports on the sanitation of their units to their commanding officer. Gillett, *AMEDD, 1865–1917*, 4, 39; Utley, *Frontier Regulars*, 86; Medical History of Post, Ft. Harker, 13.
  20. Rosenberg, *Cholera Years*, 198–200; Woodward, *Report Epidemic Cholera, 1867*, 16–18, and *Report Epidemic Cholera, 1867*, 37, 43; Powers and Younger, “Cholera and the Army,” 49.
  21. Powers and Younger, “Cholera on the Plains,” 360–361.
  22. Woodward, *Report Epidemic Cholera, 1867*, 28, 29, 43.
  23. Woodward, *Report Epidemic Cholera, 1867*, 29, 35 (tables).
  24. Woodward, *Report Epidemic Cholera, 1867*, 29.
  25. Armes, *Ups and Downs*, 231–232.
  26. GMS to Post Commander, Jul 9, 1867, Letters Received, SGO, 1818–1870, Box 96, RG112, NARA.
  27. GMS to Post Commander, Jul 13, 1867, Letters Received, SGO, 1818–1870, Box 96, RG112, NARA.

28. GMS to Post Commander, Jul 17, 1867, Letters Received, SGO, 1818–1870, Box 96, RG112, NARA.
29. Woodward, *Report Epidemic Cholera, 1867*, 32.
30. PPMO, Boxes 354 (McClellan), 451 (Perry), and 545 (Squier), RG94, NARA; Powers and Younger, “Cholera on the Plains,” 367, 372–373; Woodward, *Report Epidemic Cholera, 1867*, 31.
31. Powers and Younger, “Cholera on the Plains,” 368; Clapsaddle, “Conflict and Commerce,” 137; Utley, *Life in Custer’s Cavalry*, 89; Custer, *Tenting on the Plains*, 381.
32. Post Returns, Ft. Harker, M617, Roll 453, NARA; Armes, *Ups and Downs*, 234–235; Custer, *Tenting on the Plains*, 382.
33. Woodward, *Report Epidemic Cholera, 1867*, 29, 30, 31, 36; Leiker, “Voices from a Disease Frontier, 244–245; Utley, *Life in Custer’s Cavalry*, 89.
34. Carriker and Carriker, *Army Wife on the Frontier*, 42.
35. Woodward, *Report Epidemic Cholera, 1867*, 29, 31, 33, 34, 37.
36. Woodward, *Report Epidemic Cholera, 1867*, 35.
37. Woodward, *Report Epidemic Cholera, 1867*, 33, 34, 35.
38. *Ibid.*, 35.
39. Woodward, *Report Epidemic Cholera, 1866*, xvi, 43, and appendices.
40. Wood, *Treatise on the Practice of Medicine*, 732–733; Howard-Jones, “Cholera Therapy,” 382; Rothstein, *American Physicians*, 51, 59, 183–185, 188. Duffy, “History of Asiatic Cholera,” 116; Rosenberg, *Cholera Years*, 222, 223; *Report Epidemic Cholera, 1867*, 30, 31, 35, 36; Powers and Younger, “Cholera and the Army,” 49–54; Woodward, *Report Epidemic Cholera, 1867*, 35.
41. Woodward, *Report Epidemic Cholera, 1867*, 37.
42. Woodward, *Report Epidemic Cholera, 1867*, 29, 37, 38.
43. Woodward, *Report Epidemic Cholera, 1867*, 37.
44. Woodward, *Report Epidemic Cholera, 1867*, 38.
45. *Ibid.*
46. SO #163, HQ Dept of the Missouri, Fort Leavenworth, Jul 30, 1867, Box 2, Folder 13, George M. Sternberg Papers, 1861-1917, MS C100, NLM; Post Returns, Fort Harker, KS, M617, Roll 453, NARA. Wood was scarce, and those who died at Harker that summer were buried in coffins hastily constructed from hardtack boxes. Custer, *Tenting on the Plains*, 381.
47. Kappler, *Indian Treaties*, 982–989; Utley, *Frontier Regulars*, 132–133, 137–138, 142, 147 and *Life in Custer’s Cavalry*, 147; Leckie, *Military Conquest*, 64, 67; Wooster, *Military and United States Indian Policy*, 130; Sheridan, *Personal Memoirs*, v2, 283–284, 286.
48. Post Returns, Ft Riley, KS, Jan 1868, M617, Roll 1012, NARA; Leckie, *Buffalo Soldiers*, 27–28; Leckie, ed., *Colonel’s Lady*, 13, 15. The act to increase the Military Peace Establishment of the United States on July 28, 1866, created six U.S. Colored

- Regiments: the 9th and 10th Cavalry, and the 38th, 39th, 40th, and 41st Infantry. Unit pride and morale were high in these regiments; alcoholism extremely low; and desertion rates the lowest in the army. Dubbed “buffalo soldiers” by the Indians, they wore the sobriquet proudly, but whether it was their black curly hair or their ferocity, uncommon stamina, and courage in battle that was reminiscent of the buffalo is uncertain. White officers were assigned to these regiments. Utley, *Frontier Regulars*, 11; Leckie, *Buffalo Soldiers*, 6, 8, 26, 26 n. 14; Foner, *Blacks and the Military*, 52, 53; Smith, *Fort Huachuca*, 1; Orders, HQ Dept of the Missouri, Mar 23, 1868, and SO#70, HQ Dept of the Missouri, Apr 8, 1868, Box 2, Folder 14, George M. Sternberg Papers, 1861-1917, MS C100, NLM; Muster Rolls, 10th Cavalry, Apr 1867 and Apr–Sep 1868, Boxes 1140, 1141, 1147, 1149, 1151, 1153, and 1155, RG94, NARA; Utley, *Life in Custer’s Cavalry*, 143, 148–149.
49. Henry, *AFIP*, 58; SGO to GMS, Jul 30, 1868, and Woodward to GMS, Aug 6, 1868, Woodward Letterbook, 1868-69, Curatorial Records, Otis Archives, NMM; Lamb, “The Army Medical Museum in American Anthropology,” 625–632; M. Sternberg, *GMS*, 14; Gibson, *Soldier in White*, 37.
  50. Sheridan, *Memoirs*, v2, 288, 289–291; Armes, *Ups and Downs*, 265; Muster Rolls, 10th Cavalry, Apr–Sep 1868, Boxes 1138, 1140, 1141, 1147, 1149, 1151, 1153, and 1155, RG94, NARA; Leckie, *Military Conquest*, 69–71, 74; Utley, *Frontier Regulars*, 138; Godfrey, “Some Reminiscences, Including an Account of General Sully’s Expedition Against the Southern Plains Indians,” 419.
  51. Leckie, *Military Conquest*, 74; Muster Rolls, 7th Cavalry; Burke, *Buffalo Bill*, 49; Armes, *Ups and Downs*, 273, 274.
  52. When unwrapped at the Army Medical Museum, Sternberg’s prize was found to be the remains of a Cheyenne child. For the complete report, see George A. Otis to GMS, 15 Oct 1868, Box 2, Folder 14, George M. Sternberg Papers, 1861–1917, MS C100, NLM.
  53. White, “General Sully’s Expedition to the North Canadian,” 75–98; Godfrey, “Some Reminiscences,” 421–425; Armes, *Ups and Downs*, 274; Sheridan, *Memoirs*, v2, 297, 308–309; Utley, *Frontier Regulars*, 149–150 and *Life in Custer’s Cavalry*, 228–229; Carriker, *Fort Supply*, 14; FGO#2, HQ, Fort Dodge, GMS to Adj Gen, Nov 7, 1868, SFO#40, Nov 22, 1868, and SFO#41, Nov 22, 1868, Box 2, Folder 14, George M. Sternberg Papers, 1861–1917, MS C100, NLM; M. Sternberg, *GMS*, 13; Medical History of Post, Fort Supply, IT, Sep 1868–Feb 1893, 166, 1-3, RG94, NARA; Keim, *Sheridan’s Troopers*, 102.
  54. Keim, *Sheridan’s Troopers*, 101; Utley, *Life in Custer’s Cavalry*, 204, 208, 229; Custer, *My Life on the Plains*, 210, 214; Sheridan, *Memoirs*, v2, 308, 311–312; PPPMO, Boxes No. 342 (Lippincott), No. 482 (Renick), No. 19 (Asch), RG94, NARA; Medical History of Post, Camp Supply, 1, 2. Quarters and storehouses consisted of “pits, four and a half feet deep, walled with cottonwood logs extending above the ground about three feet and covered with logs, straw, and earth.” Carriker, *Fort Supply*, 3, 17, 20, 21.
  55. Carriker, *Fort Supply*, 22, 23; Hoig, *Battle of the Washita*, 118, 127, 129–134, 142; Custer, *My Life on the Plains*, 232–234, 240–248, 250; Keim, *Sheridan’s Troopers*, 115–121, 124–125; Utley, *Frontier Regulars*, 150–152 and *Life in Custer’s Cavalry*, 225–227, 237.

56. Utley, *Life in Custer's Cavalry*, 237. The greater omentum is a fold of peritoneal membrane passing from the greater curvature of the stomach to the transverse portion of the large intestine and hangs like an apron in front of the intestines. Barnitz recovered and was medically retired from the army in June 1870. He died July 18, 1912, from a growth around the wound received at the Washita. Utley, *Life in Custer's Cavalry*, 247.
57. Albert to Jennie Barnitz, Dec 8, 1868, Albert Barnitz Papers, Beineke Library, Yale University.
58. Medical History of Post, Fort Supply 2, 3; Godfrey, "Some Reminiscences, Including the Washita Battle, Nov 27, 1868," 495; SGO to GMS, 4 Jan 1869, Otis Archives, NMM. There are very few direct references concerning the clinical care and specific instruments GMS used at this time. It is apparent the SGO was diligent in its efforts to keep frontier surgeons supplied with the most current medical instruments. SGO to GMS, Apr 4, 1868 and SGO to GMS, Jun 15, 1868, Letters & Endorsements Sent to Medical Officers, Sep 1862–Sep 1872, RG112, E7.
59. SFO#65, Dec 7, 1868, George A. Otis to GMS, May 15, 1869, SO#23, Mar 2, 1869, and SO#54, Apr 17, 1869, Box 2, Folders 14 and 15, George M. Sternberg Papers, 1861–1917, MS C100, NLM; GMS to SGO, Mar 31, 1869, PPPMO, Box 551, RG94, NARA; Gibson, *Soldier in White*, 39. Captain Leonard Young Loring, born Feb 1, 1844 in St. Louis, was commissioned on May 14, 1867. Initially assigned to Downer's Station, Kansas, he arrived at Fort Riley in July 1868. He again became post surgeon when GMS departed in May 1870. Loring retired in 1908. Omer, "An Army Hospital: From Dragoons to Rough Riders," 337–367; Post Returns, Fort Riley, M617, Roll 1012, NARA.
60. Turner found the fossil skeleton of *Elasmosaurus platyurus*, a 34.5-foot-long mosasaur, 14 miles north of the fort, and dug it out of the chalk in late Dec 1867. Almy, "Thof's Dragon," 184; Otis to GMS, Jul 30 and Nov 24, 1868, Woodward to GMS, Aug 6, 1868, Woodward Letterbook, 1868–1869, Otis Archives, NMM; Leidy, "Contributions to the Extinct Vertebrate Fauna of the Western Territories," 269–291.
61. The "considerable herd of cattle" noted by Levi became the Smoky Hill Dairy, a major butter producer for the area. Over the next five years, Levi became a successful farmer and then cattleman, being elected president of the Stock Growers Association of Kansas in 1873. While earning a statewide reputation as an agriculturist, he also was appointed pastor of the First Presbyterian Church of Ellsworth and was on one of the early boards of regents for Kansas State College. In another year, the elder Sternberg's estate would be valued at \$7,500, third largest in the county, and Theodore owned an additional \$2,000 worth of real estate in his own right. L. Sternberg, *Story of My Life*, 24, 25–26; Dykstra, "Ellsworth: 1869–1875," 163 and *Cattle Towns*, 309. Although still impressive, Fort Riley was entering the low ebb of its existence. When the Kansas Pacific Railroad reached Ellsworth in the summer of 1867, the army moved the quartermaster depot from Riley to Fort Harker. With it went jobs and civilian optimism that the fort would continue to support the local economy. In July 1869, General John M. Schofield, Commander, Department of the Missouri, converted Fort Riley into a school of instruction for light artillery, but the post's garrison continued to decline through 1870. Registers, Medical Officers of the Regular Army arriving at the SGO, 1848–1889, RG112.



62. M. Sternberg, *GMS*, 14, 15, 16–17.
63. M. Sternberg, *GMS*, 16–17; Dobak, *Riley and its Neighbors*, 100, 120, 121; Post Returns, Ft. Riley, M617, Roll 1012, NARA.
64. Gibson, *Soldier in White*, 50.
65. Gibson, *Soldier in White*, 49. Although *GMS* had grown up in a home where alcohol was forbidden, it does not appear he was a teetotaler himself or a man who did not enjoy a friendly wager every now and again. He and Captain George Armes engaged in a horse race while in camp during the summer of 1868. The prize was a basket of wine, which Armes declared he would have won had his horse not commenced to bucking just short of the finish line. Armes, *Ups and Downs*, 271.
66. Gibson, *Soldier in White*, 41–42, 67–68; M. Sternberg, *GMS*, 16, 22–24, 38–39.
67. *GMS* to SGO, May 10, 1869 and Jul 1, 1869, Letters Received, SGO, 1818–1870, Box 96, RG112, NARA.
68. Hamilton to SGO, Jun 12, 1869, PPPMO, Box 551, RG94, NARA.
69. *Ibid.*
70. M. Sternberg, *GMS*, 14, 16–18; Gibson, *Soldier in White*, 45–49. The origin of *GMS*' interest in photography is unknown, but Mrs. Sternberg mentions it at this time. *GMS* probably used two types of photographic plates, depending on what he had access to and could afford. From 1856, dry photographic plates coated with an emulsion of collodion gel and iodide was available. In 1864, Bolton and Sayce of Liverpool replaced iodide with silver bromide—a faster developer—and by 1867 these were available in dry form. Gernsheim and Gernsheim, “The Photographic Arts: Photography,” 728. Experimentation with photomicrographs began in the early 1850s and, by 1856, had been refined enough that John W. Draper illustrated his text *Human Physiology* with original microscopic photographs. Cassedy, “The Microscope in American Medical Science,” 89, 90. Woodward and Major Edward Curtis pioneered the art of photomicrography in 1864. The description of their work in Circular #6, November 1, 1865 and in the second part of the Catalogue of the Microscopical Section of the Army Medical Museum were probably read by *GMS*. Henry, *AFIP*, 36. Bayne-Jones stated *GMS* made photomicrographs at the Army Medical Museum in the late 1860s. This author can find no other sources that substantiate or even discuss this event. Bayne-Jones, *Evolution of Preventive Medicine in the United States Army*, 112, 118; *GMS*, “Researches Relating to the Etiology of Yellow Fever,” 16; Flaumenhaft and Flaumenhaft, “Evolution of America’s Pioneer Bacteriologist: George M. Sternberg’s Formative Years,” 449.
71. For a comparison of the careers of *GMS* and Woodward, see Gillett, “A Tale of Two Surgeons,” 404–414.
72. Hume, *Victories of Army Medicine*, 58–60; Kober, “General Albert J. Myer and the United States Weather Bureau,” 65–82; *GMS*, “Sterility of the Plains”; Patent Application for an Improved Anemometer, Box 2, Folder 16, George M. Sternberg Papers, 1861–1917, MS C100, NLM *GMS* Papers, NLM; M. Sternberg, *GMS*, 17; Gibson, *Soldier in White*, 44–45.

73. G. M. Sternberg's Electro-magnetic Regulator for Dampers and Valves Secured by Letters Patent, No. 100, 462, Granted Mar 1, 1870, Ltrs Rec'd by the SGO, 1818-1870, Box 96, RG112, NARA.
74. *Scientific American*, Aug 27, 1870.
75. Gibson, *Soldier in White*, 41, 42, 50; Post History, Fort Harker, RG94; Miles, *A History of the National Library of Medicine*, 96-97. The *American Journal of Medical Sciences* was received from the SGO Library by the Fort Harker medical library. Medical History of Post, Ft Harker, RG94.
76. *Collected Papers of Joseph, Baron Lister*, v2, 2.
77. Pasteur's work (1857-1865) established a germ theory of fermentation and destroyed the concept of spontaneous generation. As early as 1864, British surgeons were evaluating the relationship of Pasteur's work on fermentation to postoperative infection. Lister believed the airborne germs that decomposed wine could also decompose human flesh in the same manner. At this time, he did not conceive of a specific germ theory of disease, i.e., individual microbes causing individual diseases. Lister's article, "On a new method of treating compound fracture, abscess, etc., with observations on the conditions of suppuration," appeared in the *Lancet* in the summer of 1867 and had reached Boston, Chicago, and New York a few weeks later. American medical journals, such as the *Medical Record*, *Chicago Medical Examiner*, and the *American Journal of Medical Sciences*, had reprinted or abstracted the article by the time autumn numbers were published. Progressive-minded surgeons J. Collins Warren, of Boston, and Faneuil Weisse, of New York, visited Glasgow and worked with Lister in 1868. Accounts of their experiences were published in U.S. journals in the spring of 1869. Pasteur, "On the Organized Bodies Which Exist in the Atmosphere," 43-48; Geison, *Private Science of Louis Pasteur*, 36; Brieger, "American Surgery and the Germ Theory of Disease," 136, 137; Garipey, "Introduction and Acceptance of Listerian Antisepsis in the United States," 167, 169, 170, 174; Tomes, "American Attitudes toward the Germ Theory," 21-28; Bulloch, *History of Bacteriology*, 159, 160, 165-166, 182-183; Curtis, "On the Cryptogamic Origin of Disease," 467-471; Letzrich, "Fungus as a Cause of Whooping Cough," 49.
78. GMS, "An Inquiry into the Nature of the Yellow Fever Poison," 405; Bacterial staining was first performed by Hermann Hoffman of Giesen in 1869 using carmine and fuchsin in water. More durable aniline dyes would not come into vogue for another year. Oil-immersion lens was developed in the 1880s. Bulloch, *History of Bacteriology*, 213-214; Clark and Kasten, *History of Staining*, 91, 92.
79. GMS to Barnes, Mar 6, 1870, PPPMO, Box 551, RG94, NARA. Garrison, *John Shaw Billings*, 150-151.

## Chapter Four

## A Career in Medical Science Begins

1. Gillett, *AMEDD, 1865–1917*, 28; Shryock, *American Medical Research*, 42–44. The Sternbergs occupied one of four sets of officer's quarters that faced onto the parade ground. Each of the two-story frame structures had a basement and attic, containing a total of 16 rooms and a backyard planted with fruit trees and shrubs. M. Sternberg, *GMS*, 20, 21.
2. Duffy, *History of Public Health in New York City*, 162; Shradly, "Yellow Fever and the Vagaries of the Board of Health," 397–398; *NYT*, "The Governor's Island Fever," Sep 21, "Yellow Fever," Oct 2, and "The Yellow Fever," Oct 5, 1870. *GMS* said at the time, "I fear yellow fever," but in 1880 he freely admitted he, Page, and the New York Board of Health "supposed they were dealing with a malignant form of malarial fever, until the distinguished Dr. Nott, formerly of Mobile, saw the cases and without hesitation made a diagnosis of yellow fever, which it undoubtedly was." Sternberg, *GMS*, 21, 22; *GMS*, Letter to the Editor, 486–487.
3. *NYT*, "Yellow Fever," Oct 2 and "The Yellow Fever," Oct 5, 1870; Shradly, "Yellow Fever and the Vagaries of the Board of Health," 397–398; Nott, "On the Natural History of Yellow Fever," 451–453; M. Sternberg, *GMS*, 22.
4. M. Sternberg, *GMS*, 22–23.
5. M. Sternberg, *GMS*, 23.
6. M. Sternberg, *GMS*, 23–24; Gibson, *Soldier in White*, 53–54.
7. Duffy, *Public Health in New York City*, 200–201; Smith, "The New York Quarantine Establishment," 202; Gibson, *Soldier in White*, 55; Smith, *Governor's Island*, 113, 141; McParlin to Barnes, Oct 2, 1870, PPPMO, Box 373 (McParlin), RG94, NARA.
8. *NYT*, "The Yellow Fever," Oct 5, 9, and 11, 1870.
9. Gibson, *Soldier in White*, 55–56; M. Sternberg, *GMS*, 24; Smith, *Governor's Island*, 189.
10. M. Sternberg, *GMS*, 24; Smith, *Governor's Island*, 111; SO#86, Apr 26, 1871, SO#110, May 26, 1871, and SO#129, Jun 20, 1871, HQ, Dept of the East, PPPMO, Box 551, RG94, NARA.
11. Billings, *Rpt Barracks and Hospitals*, 6–8; M. Sternberg, *GMS*, 25, 26; Gibson, *Soldier in White*, 59.
12. Simons to SGO, Sep 1, 1872, PPPMO, Box 524 (Simons), RG94, NARA; M. Sternberg, *GMS*, 26; SO#129, Jun 20, 1871, HQ Dept of the East, *GMS* to Adj Gen, Aug 21, 1872, *GMS* to Barnes, Aug 31, 1872, and SO#137, Sep 2, 1872, HQ Dept of the Gulf, PPPMO, Box 551, RG94, NARA; Gibson, *Soldier in White*, 62; Herrick, "Review of Yellow Fever in New Orleans," 645–652; Humphreys, *Yellow Fever and the South*, 57; Carrigan, *Saffron Scourge*, 90; Duffy, *History of Medicine in Louisiana*, v2, 459, 460, 461–464.
13. M. Sternberg, *GMS*, 28, 29; Simons to SGO, 3 Oct 1872, PPPMO, Box 524 (Simons), RG94, NARA; *GMS* to Barnes, Sep 4, 1872, *GMS* to Simons, Oct 11, 1872,

and GMS to Barnes, Oct 31, 1872, PPPMO, Box 551, RG94, NARA; Billings, *Report Hygiene of the United States Army*, 115, 116.

14. M. Sternberg, *GMS*, 29.
15. *Ibid.*
16. M. Sternberg, *GMS*, 30; Eales, *Army Wives on the American Frontier*, 65; GMS, "An Inquiry into the Yellow Fever Poison," 398.
17. GMS, "An Inquiry into the Yellow Fever Poison," 398.
18. *Ibid.*, 399.
19. *Ibid.*, 403.
20. *Ibid.*, 406.
21. *Ibid.*, 406.
22. Surgeon Harvey Brown disagreed with GMS's assessment that a port of entry could not be determined. He stated the disease "was undoubtedly due to the arrival... of vessels which...had evaded the New York quarantine by entering at Perth Amboy, New Jersey, and coming thence to New York. The tide in the channel between the island and Brooklyn is such that articles thrown overboard from these ships would readily be carried to the island." Brown, *Report on Quarantine*, 14. Dr. Carnochan, Health Officer for New York City, stated in the *New York Times* a number of ships infected with yellow fever arrived from August through September. *NYT*, "The Quarantine Troubles," Aug 17, "Quarantine Affairs," Sep 15, "Yellow Fever at Quarantine," Sep 28, and "The Yellow Fever," Oct 5, 1870.
23. GMS, "An Inquiry into the Yellow Fever Poison," 399.
24. *Ibid.*, 403, 404.
25. *Ibid.*, 403–405.
26. *Ibid.*, 406.
27. Reilly, "Yellow-Fever Epidemic of 1873," 225.
28. *Ibid.*
29. GMS, "Yellow Fever in Pensacola, Fla., in 1873, 1874, and 1875," n.1, 473, 474; Sternberg, *GMS*, 32. The urine of yellow fever patients will contain a small amount of albumin early in the infection and increase by days 4 and 5. During Sternberg's era, a diagnostic precipitation test, either by boiling the urine or using nitric acid, was employed on days 2 or 3 of the infection. Brown, *Medical Diagnosis*, 207.
30. Reilly, "Yellow-Fever Epidemic 1873," 210, 215; *ARSG 1874*, 12; Herrick, "Review Yellow Fever in New Orleans," 647; M. Sternberg, *GMS*, 33; GMS, "Yellow Fever in Pensacola," 473.
31. GMS, "Yellow Fever in Pensacola," 474.
32. GMS, "Yellow Fever in Pensacola," 474–476; John Milton Brannon, 218 ACP, 1881, Letters Received by the Appointment, Commission, and Personnel Branch, AGO, 1871–1894, RG94, NARA.

33. Petition of Grievances, 1874, George M. Sternberg Papers, MS C100, Box 2, Folder 9, NLM; SGO to Sec of War, Apr 2, 1869 and War Dept Paymaster Gen to SGO, Mar 31, 1869, M1064, Roll 446, NARA.
34. James Herron, "Yellow Fever at Pensacola in 1874," *Annual Report, Supervising Surgeon-General of the Marine Hospital Service of the United States for the Fiscal Year 1874* (Washington, DC: GPO, 1874), 195–196.
35. Tryon, "Epidemic of Yellow Fever at the Navy-Yard, 454; Hamersly, *Records of Living Officers of the U.S. Navy and Marine Corps*, 446–447; General Navy Records, RG45; NARA; GMS, "Yellow Fever in Pensacola," 476; M. Sternberg, *GMS*, 33, 34.
36. GMS, "Yellow Fever in Pensacola," 476; *ARSG 1875*, 6.
37. *Ibid.*, 477.
38. Gibson, *Soldier in White*, 66.
39. Woolsey to Sec Nav, Sep 12, 1874, Letters from Commandants, v235, General Records, Navy, E34, RG45, NARA. Why the mail from Florida was not fumigated is not mentioned. Since 1822, New Orleans had been fumigating mail during epidemics. This practice consisted of punching small holes in pieces of mail with a special mallet of nails and then exposing it to dilute fumes of sulfuric or carbolic acid gas in an enclosed railroad car. Meyer, *Disinfected Mail*, 311–320.
40. SO#99, Oct 2, 1873, General and Special Orders, Fort Barrancas, Box 13, Records US Army Continental Command, RG393, NARA; Tryon, "Epidemic of Yellow Fever at the Navy-Yard," 454; Woolsey to Sec Nav, Sep 18, 1874, Letters from Commandants, v235, E34, RG45, NARA.
41. Tryon, "Epidemic of Yellow Fever at the Navy-Yard," 454–456.
42. Gibson, *Soldier in White*, 67.
43. *Ibid.*, 68.
44. Correspondence, Sept-Oct, 1874, Letters from Commandants, v235, RG45, Gen Records, Navy, E34.
45. GMS, "Yellow Fever in Pensacola," 476, 478.
46. M. Sternberg, *GMS*, 34–35.
47. Herron, "Yellow Fever at Pensacola in 1874," 199; GMS, "An Inquiry into the Modus Operandi," 1–23, Billings, *Report, Hygiene of the United States Army, Circular #8*, 118.
48. Sternberg surmised from the location of the mound, the workmanship and decoration of the pots, and the iron nails he found that Natchez Indians had inhabited the area by during the time of DeSoto's exploration of Florida. His discovery was a small one, but proved to be significant enough to be reported to the American Association for the Advancement of Science in 1879. M. Sternberg, *GMS*, 35, 36–38; GMS to SGO, Dec 7, 1874, PPPMO, Box 551, NARA; SO#22, Ft. Barrancas, Apr 27, 1875, General and Special Orders, Fort Barrancas, Box 13, Records US Army Continental Command, RG393, NARA.
49. GMS, "Yellow Fever in Pensacola," 469–478; List of Members of the APHA, Appendix, *PHRP*, v5, 254.

50. GMS, "An Inquiry into the Modus Operandi of the Yellow Fever Poison," 1.
51. *Ibid.*
52. *Ibid.*, 2.
53. *Ibid.*, 3–11.
54. *Ibid.*, 7.
55. GMS, "An Inquiry into the Modus Operandi of the Yellow Fever Poison," 9, 11–23. Fungi continued to hold center stage as the most acceptable life form to support the germ theory of disease. Barnhard, "Germ Theory of Disease and its Relations to Hygiene," 71.
56. GMS, "Yellow Fever in Pensacola," 479; Cooper to Sec Nav, Jul 6, 1875, Letters from Commandants, v245, General Records, Navy, E34, RG45, NARA; Herron, "Yellow Fever at Barrancas," 139.
57. GMS, "Yellow Fever in Pensacola," 480; Herron, "Yellow Fever at Barrancas," 141.
58. GMS, "Yellow Fever in Pensacola," 480, 481, 484; Cooper to Sec Nav, Jul 22, 1875 Letters from Commandants, v245, General Records, Navy, E34, RG45, NARA; SO#47, Jul 22, 1875, SO#48, Jul 26, 1875, General Orders, Fort Barrancas, FL, RG393, Box 13, NARA; GMS, "Study of the Natural History of Yellow Fever," 638–674.
59. M. Sternberg, *GMS*, 38.
60. *Ibid.*
61. Apparently, GMS had discussed Martha's leaving with his commander earlier and he readily agreed. It is interesting that Brannan, experienced as he was with the disease, did not put his own wife in that wagon. He may have considered the effect of such action very demoralizing to the other wives, but the decision would soon come back to haunt him. M. Sternberg, *GMS*, 38, 39.
62. M. Sternberg, *GMS*, 39.
63. Beale to Cooper, Jul 23, 1875, Letters from Commandants, v245, RG45, Navy Records, NARA.
64. Cooper to Beale, Jul 23, 1875, Letters from Commandants, v245, RG45, Navy Records, NARA.
65. Cooper to Beale, 1:15 PM, Jul 26, 1875, Letters from Commandants, v245, RG45, Navy Records, NARA.
66. Cooper to Beale, 2:35 PM, Jul 26, 1875, Letters from Commandants, v245, RG45, Navy Records, NARA.
67. GMS, "Yellow Fever in Pensacola," 481, 482; Herron, "Yellow Fever at Barrancas," 146; PPPMO, Boxes 264 (Herron), 504 (Salomon), 379 (Mandeville), RG94, NARA; Billings, *Report Hygiene of the United States Army, Circular #8*, 116; GMS, "Study of the Natural History of Yellow Fever," 671.
68. GMS, "Study of the Natural History of Yellow Fever," 667.

69. GMS, "Study of the Natural History of Yellow Fever," 667–668 and "Yellow Fever in Pensacola," 481–483; Faget, "Type and Specific Character of True Yellow Fever," 157–160. For the standard therapeutics used in yellow fever, see Wood, *Treatise of Medicine*, v1, 331–337, and Reynolds, *System of Medicine*, v1, 674–676.
70. M. Sternberg, *GMS*, 39–40.
71. Surgeon General Barnes wired Brannan to do everything in his power to see Sternberg through this crisis and sent Assistant Surgeon Harvey E. Brown, post surgeon at Fort Jefferson, Key West to Barrancas to assume post surgeon duties. By the time Brown arrived on August 5, Sternberg was recovering and the epidemic was in its final stages. GMS, "A Study of the Natural History of Yellow Fever," 667 and "Yellow Fever in Pensacola," 483; Herron, "Yellow Fever at Barrancas," 139–140; M. Sternberg, *GMS*, 39; RG94, PPMO, Box 75 (H. E. Brown), NARA; SO#53, HQ Fort Barrancas, Aug 16, 1875, RG393, Box 13, General and Special Orders, Fort Barrancas, NARA; *Gibson, Soldier in White*, 77.
72. GMS, "Yellow Fever in Pensacola," 483.
73. GMS, "A Study of the Natural History of Yellow Fever," 667; "Yellow Fever in Pensacola," 483.
74. Mrs. Sternberg's parting from the brave, kindly old woman was somewhat bitter-sweet. For a month, she had provided shelter and comfort "even as my own mother would have done." The trip to Pensacola was not without its difficulties, however. A severe rainstorm required a night in a logger's camp, and once they were on the way again, a lone horseman hailed them. When the rider inquired if she were Mrs. Sternberg, her heart sank in fear of more bad news. He assured her that was not the case, and that he had been sent from Pensacola by Dr. Herron's mother to meet them. At the request of her son and Sternberg, she had made arrangements for Martha's travel and hoped that Martha would stop by for a rest and some tea before departing. Martha consented and the party continued on to Pensacola. M. Sternberg, *GMS*, 40, 41; SO#54, HQ Fort Barrancas, Aug 16, 1875, RG393, Box 13, General and Special Orders, Fort Barrancas, NARA; GMS to SGO, Aug 31, 1875, PPPMO, Box 551, RG94, NARA.

### Chapter Five

## Return to the Field

1. Theodore Sternberg, who had resumed his law practice in St. Louis once his father and younger brothers had firm control of the farm, most likely assisted with their rendezvous. M. Sternberg, *GMS*, 42; SGO to GMS, Aug 31, 1875, PPPMO, Box 551, RG94, NARA. Butter and milk from the Smoky Hill were of superior quality and highly prized in the area. Levi had expanded the ranch by another 280 acres and built a herd of cattle that provided one or two car-loads of steers for market each year. Already recognized as a leader among the agriculturists and dairymen of the county, Levi had been elected president of the Cattleman's Association in 1873.

His desire to remain active in higher education was well received at the Kansas State Agricultural College in Manhattan where he was appointed chairman of the examining committee and a few years later was elected to that institution's board of regents. L. Sternberg, *Story of My Life*, 24–27.

2. M. Sternberg, *GMS*, 42.
3. SGO to Adj Gen, Sept 26, 1875, SGO to Adj Gen, Oct 7, 1875, GMS to SGO, Nov 5, 1875, PPPMO, Box 551, RG94, NARA; ACP files (Brannan), NARA; GMS, "Yellow Fever in Pensacola," 484–485; Abstract of Minutes, Meetings of the APHA, Apr 18, 1872–Nov 12, 1875, *PHRP*, v2, 551.
4. M. Sternberg, *GMS*, 42–43, 45; GMS to SGO, Dec 24, 1875, PPPMO, Box 551, RG94, NARA.
5. M. Sternberg, *GMS*, 45; GMS to SGO, Nov 30, 1875, Jan 31, Feb 29, and Mar 31, 1876, PPPMO, Box 551, RG94, NARA.
6. M. Sternberg, *GMS*, 46–47; GMS to SGO, May 16, 1876, PPPMO, Box 551, RG94, NARA.
7. M. Sternberg, *GMS*, 46–47.
8. GMS to SGO, May 31, 1876, and GMS to SGO, Jun 8, 1876, PPPMO, Box 551, RG94, NARA; Utley, "Oliver Otis Howard," 55–64.
9. GMS to SGO, Aug 31, 1876, PPPMO, Box 551, RG94, NARA; M. Sternberg, *GMS*, 47–48; Utley, *Frontier Regulars*, 258–260; Connell, *Son of the Morning Star*, 383.
10. Old Joseph claimed the Wallowa country, bounded essentially by the Snake River on the east, the Grand Ronde River on the west, and the Wallowa Mountains to the south and southwest, for the Nez Percé from that moment forward. The other chiefs claimed ownership of land extending northeast of this region into the Idaho Territory. Beal, *I Will Fight No More Forever*, 14–18, 24–26, 29–30, 33–37; Hampton, *Children of Grace*, 19–21, 28; McWhorter, *Hear Me My Chiefs*, 94, 97, 102, 107–108, 132, 135.
11. Utley, "O. O. Howard," 59–60; Josephy, *The Nez Perce Indians*, 473–474, 475, 477; Birtle, *U. S. Counterinsurgency and Contingency Operations Doctrine*, 79.
12. GMS to SGO, Aug 31, 1876, PPPMO, Box 551, RG94, NARA; M. Sternberg, *GMS*, 48; Billings, *Report on Hygiene, Circular #8*, 490–491; Hart, *Tour Guide to Old Western Forts*, 190–191; Medical History of Posts, Ft Walla Walla, v797, RG94; Post Returns, Ft Walla Walla, M617, Roll 1344, NARA.
13. Weigley, *United States Army*, 271; Medical History of Posts, Ft Walla Walla, v797, RG94.
14. M. Sternberg, *GMS*, 49.
15. M. Sternberg, *GMS*, 49–52; C. Sternberg, *Life of a Fossil Hunter*, 171.
16. M. Sternberg, *GMS*, 51.
17. *Ibid.*, 52.
18. M. Sternberg, *GMS*, 51–52; GMS to SGO, Dec 15, 1878, PPPMO, Box 551, RG94, NARA.



19. Josephy, *Nez Perce Indians*, 484, 486–494; Beal, *I Will Fight No More*, 37–38, 40. Mrs. Sternberg and a number of other ladies of the garrison attended the meeting, and were impressed by Ollikot's tall, handsome, graceful presence and frank diplomatic manner. M. Sternberg, *GMS*, 54–55; Hampton, *Children of Grace*, 49–50.
20. Hampton, *Children of Grace*, 52–55; Josephy, *Nez Perce Indians*, 497, 500–505; Beal, *I Will Fight No More*, 40–42.
21. Beal, *I Will Fight No More*, 49–51, 55–56; ARSW 1877, v1, 601–602; Howard, *My Life and Experiences*, 287; Howard, *Saga of Chief Joseph*, 151, 153; Hampton, *Children of Grace*, 57, 60, 69–70, 81; Brown, *Flight of the Nez Perce*, 71–80, 131–133.
22. Josephy, *Nez Perce Indians*, 518, 524–525; Howard to Wood, Jun 18, 1877, Bailey to Adj, 19 Jun 1877 (#978 and #979), Kress to Wood, Jun 20, 1877, Ltrs Rec'd, Dept of the Columbia, RG393, E715; Howard, *Saga of Chief Joseph*, 154.
23. Post Returns, Ft Lapwai, Roll 594, and Ft Walla Walla, Roll 1344, M617, NARA; Gibson, *Soldier in White*, 95; Jocelyn, *Mostly Alkalai*, 223–224; Howard, *My Life and Experiences*, 286–287; M. Sternberg, *GMS*, 58; Howard to Grover, Jun 19, 1877, Grover to Adj Gen, Jun 19, 1877, Ltrs Rec'd, Dept of the Columbia, RG393, NARA; Laufe, ed., *An Army Doctor's Wife*, 254, 257, 259.
24. Sternberg's surgical kit, including ether anesthesia, had not changed significantly since the Civil War. However, his dressing technique now included carbolic acid solutions. While carbolic acid was a well-known disinfectant and carbolated oil and ointments had been used on wounds in the Army as early as 1868, Baron Joseph Lister's participation in the International Medical Congress at Philadelphia in June 1876 did a great deal to stimulate interest in, and acceptance of, his antiseptic method in the United States. In 1877, Captain and Assistant Surgeon Alfred C. Girard reported on the success German army surgeons were experiencing with Lister's method. He was greatly impressed with this system of wound care. He noted in his report to the Surgeon General that, with the exception of the antiseptic gauze, all of the equipment and materials used by Lister were available in the army supply table. Girard, "Report on the materials used in Lister's system," 4–12; M. Sternberg, *GMS*, 58–59; Gibson, *Soldier in White*, 95; ARSW 1877, 602; Brown, *Flight of the Nez Perce*, 144–145; Jocelyn, *Mostly Alkalai*, 224; Farrow, "Assembling of the Soldiers and the Battle of Clearwater," 151.
25. Gibson, *Soldier in White*, 95.
26. ARSW 1877, 602; Brown, *Flight of the Nez Perce*, 144–145; Jocelyn, *Mostly Alkalai*, 224.
27. Farrow, "The Assembling of the Soldiers and the Battle of Clearwater," 152–153; Jocelyn, *Mostly Alkalai*, 224–227; Muster Rolls, Co E, 4th Artillery, Box 1321, and Co H, 21st Infantry, Box, 625, RG94, NARA; Howard, *My Life and Experiences*, 287; Bancroft to Wood, Jun 19, 1877, Burton to Wood, Jun 20, 1877, Throckmorton to Wood, Jun 20, 1877, and Grover to Wood, Jun 20, 1877, Ltrs Rec'd, Dept of the Columbia, Box 43, E715, RG393, NARA; Hampton, *Children of Grace*, 84; Parnell, "The Salmon River Expedition," 127; ARSW 1877, 602; Gibson, *Soldier in White*, 97.
28. Hampton, *Children of Grace*, 87–88; ARSW 1877, 602; Brown, *Flight of the Nez Perce*, 158–159; Jocelyn, *Mostly Alkalai*, 227–228; Gibson, *Soldier in White*, 96.

29. Gibson, *Soldier in White*, 97; Parnell, "The Salmon River Expedition," 128; Hampton, *Children of Grace*, 90–91; ARSW 1877, 603.
30. Gibson, *Soldier in White*, 97.
31. Farrow, "Assembling of Soldiers and the Battle of Clearwater," 154; Hampton, *Children of Grace*, 91; ARSW 1877, 603; Hall to SGO, Jul 31, 1877, PPMO, Box 240 (Hall), RG94, NARA; Jocelyn, *Mostly Alkalai*, 228, 229; Brown, *Flight of the Nez Perce*, 160–161, 166.
32. Parnell, "The Salmon River Expedition," 128; Gibson, *Soldier in White*, 97; Brown, *Flight of the Nez Perce*, 173; Hampton, *Children of Grace*, 96.
33. Hampton, *Children of Grace*, 96; Gibson, *Soldier in White*, 96.
34. Parnell, "The Salmon River Expedition," 129.
35. Gibson, *Soldier in White*, 98.
36. Parnell, "The Salmon River Expedition," 129; Hampton, *Children of Grace*, 96.
37. ARSW 1877, 603–604; Gibson, *Soldier in White*, 98. Medical duties remained few, and GMS entertained himself productively by fishing, which made an "agreeable change in our [his and tent mate Captain Miller's] bill of fare." Gibson, *Soldier in White*, 98.
38. Captain Marcus Miller prepared a statement of the incident. Were it not for the tragedy of the event, Miller's concise summation would be rather amusing. Miller asked, "who shot the sentinel? Lt. Paddock came to my tent & said, 'I shot him, Colonel, I thought he was an Indian, he had a blanket about him.' I [Miller] said to him 'that is because you are a young Officer, don't you know better than that, no Indian would appear that way.' Did you challenge him? He answered, 'No, Sir.' I saw that he felt as badly as anyone would feel about it and that it was an accident. I heard in the morning that the Officer was a somnambulist & gave orders to his Captain (Morris, who tented with him) to see that Lt. Paddock had no musket with him hereafter at night.... No further action was taken by me with the [exception] to recommend to send the Officer to the rear." Miller to Wood, Jul 26, 1877, Ltrs Rec'd, Dept of the Columbia, Box 43, E715, RG393; Brown, *Flight of the Nez Perce*, 174–175.
39. McWhorter, *Hear Me My Chiefs*, 294–297; ARSW 1877, 604; Hampton, *Children of Grace*, 107–108.
40. Hampton, *Children of Grace*, 109–111; ARSW 1877, 604; McWhorter, *Hear Me My Chiefs*, 297, 299, 301; Beal, *I Will Fight No More*, 73; Jocelyn, *Mostly Alkalai*, 232.
41. McWhorter, *Hear Me My Chiefs*, 305; Trimble, "Battle of the Clearwater," 144–145; Farrow, "Assembling of the Soldiers and the Battle of Clearwater," 159; Parnell, "The Salmon River Expedition," 131; Jocelyn, *Mostly Alkalai*, 232, 237; ARSW 1877, 605; Post Returns, Fort Lapwai, Roll 594, and Fort Vancouver, Roll 1317, M617, NARA; McWhorter, *Hear Me My Chiefs*, 305; Brown, *Flight of the Nez Perce*, 188; Gibson, *Soldier in White*, 99.
42. Gibson, *Soldier in White*, 100–101; M. Sternberg, *GMS*, 60, 61.
43. Greenleaf to SGO, Jun 24, 1890.

44. SGO to Adj Gen, Jan 15, 1891, PPPMO, Box 551, RG94, NARA; Farrow, "Assembling of the Soldiers and the Battle of Clearwater," 159; Gibson, *Soldier in White*, 100–101; M. Sternberg, *GMS*, 60–61.
45. Farrow, "Assembling of the Soldiers and the Battle of Clearwater," 159–160; *ARSW 1877*, 605; Trimble, "Battle of the Clearwater," 145, 146–147; Jocelyn, *Mostly Alkalai*, 233.
46. Later at Ft Lapwai, *GMS* bought 4 or 5 ceremonial garments for \$10 to \$25 apiece. Laufe, *Army Doctors Wife*, 290; Post Returns, Ft Lapwai, Jul 1877, Roll 594 and Ft Vancouver, Aug-Sep, 1877, Roll 1317, M617, NARA; Muster Rolls, H troop, Jun–Aug 1877, Box 869 and L Troop, Jul–Aug 1877, Box 876, 1st Cavalry, RG94, NARA; Jocelyn, *Mostly Alkalai*, 237; *ARSG 1878*, 11; *ARSW 1877*, 606; Hampton, *Children of Grace*, 117; Field Orders #28, Jul 14, 1877, Ltrs pertaining to Chief Joseph & Nez Perce Campaign, E721, RG393, NARA; *GMS* to SGO, Jul 15, 1877, PPPMO, Box 551, RG94, NARA; Gibson, *Soldier in White*, 102. Horse litters were easier on the wounded than jostling over rough trails in a wagon, well known to frontier surgeons, and Sternberg had employed it during his campaigns in Kansas. Otis, *Report, Transport of Sick and Wounded*, 17; M. Sternberg, *GMS*, 61–62.
47. M. Sternberg, *GMS*, 62; *ARSW 1877*, 606; Jocelyn, *Mostly Alkalai*, 237; *ARSG 1878*, 11, 12.
48. Gibson, *Soldier in White*, 103.
49. Post Returns, Ft Vancouver, Sep 1877, Roll 1317, M617, NARA.
50. M. Sternberg, *GMS*, 62; Gibson, *Soldier in White*, 104.
51. M. Sternberg, *GMS*, 63; *GMS* to SGO, Jul 22, 1877, PPPMO, Box 551, RG94, NARA; Gibson, *Soldier in White*, 105.
52. M. Sternberg, *GMS*, 63, 64.
53. Gibson, *Soldier in White*, 105.
54. Gibson, *Soldier in White*, 105–106; M. Sternberg, *GMS*, 63; *GMS* to SGO, Jul 22, 1877, PPPMO, Box 551, RG94, NARA.
55. *M&SHCW*, v11, 410.
56. Medical History of Post, Ft Lapwai, Roll 3, 903, NARA; Post Returns, Ft Lapwai, Jul 1877, Roll 594, M617, NARA; Thompson, "Summer of '77 at Fort Lapwai," 15; *GMS* to SGO, Jul 31, 1877, PPPMO, Box 551, RG94, NARA; Laufe, *Army Doctor's Wife*, 281, 288.
57. Bailey to Wood, Aug 6, 1877, Ltrs Rec'd, Dept of the Columbia, Box 43, RG393, NARA; M. Sternberg, *GMS*, 64, 65; Thompson, "The Summer of '77 at Fort Lapwai," 15; Laufe, *Army Doctor's Wife*, 286.
58. M. Sternberg, *GMS*, 64, 65; Laufe, *Army Doctor's Wife*, 288.
59. M. Sternberg, *GMS*, 64.
60. *Ibid.*, 65.
61. Bailey to Adj Gen, Dept of the Columbia, Aug 6, 1877, SO#114, HQ, Dept of the Columbia, Aug 13, 1877, and SO#139, Sep 26, 1877, Ltrs Rec'd, Dept of the Columbia, Box 43, RG393; *M&SHCW*, v11, n1, 410; Brown, *Flight of the Nez Perce*, 198.

Chapter Six

## Debut on the National Stage

1. Kober, *Reminiscences*, v1, 41–43, 59–62, 67, 229, 359 and *Reminiscences*, v2, Part 10, 23–24, Box 18, MS C115 George M. Kober Papers, NLM.
2. M. Sternberg, *GMS*, 67. GMS declared he had initiated experiments with disinfectants in 1876, a year ahead of Robert Koch. GMS, “The Value of Carbolic Acid as a Germicide as Established by Experimental Data,” *Med Rec* 22 (Sep 1882):315.
3. GMS to SGO, December 15, 1878, GMS Papers, NARA. At this time, GMS was probably using collodion emulsion wet plates in his photographic work. Producing photomicrographs was a laborious, time-intensive process that began with a sunny day. The microscopic slide was placed on the stage and brought into focus, then the heliostat adjusted to direct sunlight onto the slide. In a darkroom, clean glass plates were then coated with collodion, a solution of cellulose nitrate in alcohol-ether saturated iodine. After the collodion drained off leaving a thin film, the plate was dipped in a bath of silver nitrate to form silver iodide crystals, the light-sensitive agent that would produce the desired image. The plate was enclosed in a wooden photographic plate holder and taken to the photomicrographic equipment. Once in place, the plate holder was opened and the exposure made that normally required four to five minutes. After exposure, the plate holder was closed and taken to the darkroom once again where it could be developed and fixed. This time-consuming, exacting, and expensive process could be completely ruined by a number of uncontrollable events, such as a fast-moving cloud that blocked the sun or by the reverberations of a wagon passing by the house that put the object out of focus. Gelatin emulsion dry plates, which developed faster than the collodion type, were on the market, but were not produced and exported in large quantities by British firms until early in 1878. Gernsheim, “The Photographic Arts: Photography,” 728.
4. Brock, *Robert Koch*, 58–60, 62–63, 68, 322; Woodward Obituary, 250.
5. Sternberg, *GMS*, 67, 68, 93; *M&SHCW*, v11, 410; GMS, “The Value of Carbolic Acid as a Germicide,” 315; Brieger, “American Surgery and the Germ Theory of Disease,” 139; Garipey, “The Introduction and Acceptance of Listerian Antisepsis,” 177–182; Wangensteen and Wangensteen, *Rise of Surgery*, 512–513. Sternberg may have had no more success with the technique in Idaho than German surgeons did during the Franco-Prussian War. Lister’s original method was a relatively complex process meant to be applied in a hospital setting, and it required specific materials, equipment, and assistance to obtain desired results. For a discussion of the German success with Lister’s method, see Schuppert, “Results of Lister’s Antiseptic Treatment of Wounds in German Hospitals,” 613–642.
6. GMS, “A Study of the Natural History of Yellow Fever and Some Remarks upon the Treatment Based upon the Same; with Cases and Tables of Observations upon the Temperature and Urine,” *NOM&S J* 5 (Mar 1877):638–674.
7. Bruton, *NBH*, 64–67, 110; Humphreys, *Yellow Fever and the South*, 61, 62. For the complete history of the yellow fever epidemic of 1878, see Khaled J. Bloom, *The Mississippi Valley’s Great Yellow Fever Epidemic of 1878* (Baton Rouge: Louisiana State University, 1993).

8. Duffy, *Sanitarians*, 95–98, 100, 102; Duffy, *History of Medicine in Louisiana*, v2, 460; Cavins, “National Quarantine and Sanitary Conventions,” 404–426.
9. This strange collection of allies occurred because yellow fever was not as large a threat to the northern cities as it was to those in the south, and federal control would terminate a profitable system for revenue and graft that lined the pockets of northern state and local officials. Humphreys, *Yellow Fever and the South*, 63; Brown, *Report on Quarantine*, 90; Bruton, *NBH*, 51–53, 55–60.
10. Bruton, *NBH*, 115–116, 120–121; Woodworth, “A Brief Review of the Organization and Purpose of the Yellow Fever Commission,” 167–168.
11. Bruton, *NBH*, 117; Barnes to Sec War, Nov 2, 1878 and Barnes to GMS, Nov 2, 1878, PPPMO, Box 551, RG94, NARA.
12. Woodworth found himself in trouble with the executive committee again the following morning when it became known the Yellow Fever Commission’s report had been published in New York newspapers against assurances to the contrary. Abstract of Discussions and Minutes, 6th Meeting, APHA, *PHRP*, v4, 352, 354, 369–370; Ellis, *Yellow Fever*, 66–67; Bruton, *NBH*, 121–122. Gibson stated GMS was on a special committee on disinfectants, but the minutes of the meeting make no reference to such a committee. Gibson, *Soldier in White*, 112.
13. GMS, “Public Health Association and Yellow Fever,” 45.
14. *Ibid.*
15. *Ibid.*, 46.
16. *Ibid.*
17. Bruton, *NBH*, 135.
18. Bruton, *NBH*, 166, 169–170; Miles, *History NBH*, Chap 17, MS C237, v2, 110, NLM.
19. Bruton, *NBH*, 169–170, 223, 224; Miles, *History NBH*, Chap 17, 112, 117, 118, 126–128.
20. Sec War to GMS, Apr 18, 1879, PPPMO, Box 551, RG94, NARA; M. Sternberg, *GMS*, 69.
21. GMS, “Preliminary Rpt, Havana Yellow Fever Commission,” 33.
22. *Ibid.*, 33–34.
23. GMS received intensive training in the latest photomicrographic techniques from LTC Woodward, who also recommended all of the microscopic equipment used in Havana. GMS, “Preliminary Rpt, Havana Yellow Fever Commission,” 34, 64–73; Gibson, *Soldier in White*, 114; Brock, *Robert Koch*, 31–37.
24. The auxiliary commission was presided over by Dr. Marcelina Astray de Canada and included Doctors Feline Rodriguez, Vincente L. Ferrer, Vincente B. Valdez, Joaquin Garcia Lebrede, Antonio Pardinias, Casimiro Rome, Raphael Fleitas, Carlos Finlay, Serafin Gallardo, Francisco Zayas, and Emilio N. de Villavicencia. GMS, “Preliminary Rpt, Havana Yellow Fever Commission,” 34, 35; Bruton, *NBH*, 224; GMS to Billings, Jul 13, 1879, Billings Gen Correspondence, MS C26, MS Film 25, Reel 4, NLM.

25. Gibson, *Soldier in White*, 114. On July 24, the steamer *Niagara* delivered dogs, cats, rabbits, guinea pigs, chickens, pigeons, geese, and a monkey for the proposed experiments on lower animals. GMS exposed these animals to an infected brig, the *John Welch*, for two days, had the dogs sleep on blankets from the bed of a yellow fever patient, and injected the dogs with blood from yellow fever patients and culture media. All of these attempts to generate the disease were negative. GMS, "Preliminary Rpt, Havana Yellow Fever Commission" 64, 66–70.
26. GMS to Billings, Jul 15 and Aug 29, 1879, Billings Gen Correspondence, MS C26, MS Film 25, Reel 4, NLM.
27. GMS to Billings, Jul 15, 1879, Billings Gen Correspondence, MS C26, MS Film 25, Reel 4, NLM.
28. GMS, "Preliminary Rpt, Havana Yellow Fever Commission" 66–70; GMS to Billings, Aug 19, 1879, Billings Gen Correspondence, MS C26, MS Film 25, Reel 4, NLM. Until Robert Koch perfected the solid culture media technique in 1881 obtaining pure cultures was difficult. Joseph Lister obtained the first pure liquid culture by using a limiting dilution technique. He published his results in 1878, and GMS very likely used this method in his experiments in Cuba. Joseph Schroeter (1872) successfully used potato, starch paste, bread, and meat to grow pure cultures. Brock, *Robert Koch*, 94–103; Bulloch, *History of Bacteriology*, 217–229.
29. GMS to Billings, Aug 29, 1879 and GMS to Billings, Sep 12, 1879, Billings Gen Correspondence, MS C26, MS Film 25, Reel 4, NLM.
30. Gibson, *Soldier in White*, 116.
31. *Ibid.*, 11.
32. GMS, "Preliminary Rpt, Havana Yellow Fever Commission," 64.
33. Gibson, *Soldier in White*, 116.
34. M. Sternberg, *GMS*, 72.
35. GMS, "Preliminary Rpt, Havana Yellow Fever Commission" 33–73; Miles, *History NBH*, 121.
36. Miles, *History NBH*, 124–125.
37. Miles, *History NBH*, 119; M. Sternberg, *GMS*, 93. Sternberg published his results in late 1880; Koch published in April 1881. GMS, "Experiments Designed to Test the Value of Certain Gaseous and Volatile Disinfectants," 320.
38. GMS, "Experiments Designed to Test the Value of Certain Gaseous and Volatile Disinfectants," 318–320; Bulloch, *History of Bacteriology*, 235; Brock, *Robert Koch*, 106–107.
39. GMS, "Microscopical Investigations of the Havana Yellow Fever Commission," 1019.
40. GMS, "Microscopical Investigations of the Havana Yellow Fever Commission," 1020–1023; NBH to GMS, Feb 4, 1880, PPPMO, Box 551, RG94, NARA; GMS, "Report of Microscopical Examination of Suspended Particles," 387–395.

41. GMS lodged at 22 Rampart Street. Sternberg, *GMS*, 73; *GMS, Malaria and Malarial Diseases*, 69; NBH to GMS, Feb 4, 1880, GMS to SGO, Feb 7 and 29, 1880, PPPMO, Box 551, RG94, NARA; GMS, “Experimental Investigations Relating to the Etiology of Malarial Fevers,” 1–10; Miles, *History NBH*, 119.
42. GMS found a large number of organisms—predominantly pollen, starch granules, and cryptogram spores—were constantly in the air of Havana and New Orleans, but fully developed bacteria were rarely found although their constant presence was proved by culture experiments. GMS, “Rpt, Microscopical Examination of Suspended Particles,” 395.
43. GMS, “Rpt, Microscopical Examination of Suspended Particles,” 387.
44. Dr. John Dell’Orto of New Orleans provided GMS with the translation. GMS, “Experimental Investigations Relating to the Etiology of Malarial Fevers,” 65. Neither Mrs. Sternberg nor Gibson mentioned the nature of his malady. GMS’s work history supports the notion he may have been suffering from fatigue brought on by too many hours in the laboratory and at his desk. Along with the two NBH studies, he was also translating Antoine Magnin’s *The Bacteria* from the French, and had just completed and presented a paper to the Louisiana State Medical Society. Once recovered he did not immediately return to New Orleans, but obtained leave for what he called a summer vacation. GMS to SGO, May 31, Jun 30, and Aug 31, 1880, PPPMO, Box 551, RG94, NARA.
45. Bemiss, “Fever on the Lower Coast,” 306; Bruton, *NBH*, 266–270, 279.
46. *Ibid.*
47. Carrigan, *Saffron Scourge*, 132; Gillson, *Louisiana State Board of Health*, 199–208; Ellis, *Yellow Fever*, 80–81; Humphreys, *Yellow Fever and the South*, 70–71.
48. GMS, “Report to Dr. Bemiss,” 384.
49. GMS, “Report to Dr. Bemiss,” 385.
50. Bemiss, “Fever on the Lower Coast,” 307; Bruton, *NBH*, 280–281.
51. GMS, “Report to Dr. Bemiss,” 386; Bruton, *NBH*, 280–281.
52. Bruns and Davidson, “The Rice Fever,” 391, 392.
53. Bruns and Davidson, “The Rice Fever,” 393, 394–395; GMS, “Letter to the Editor,” 482–486.
54. Bruns and Davidson, “The Rice Fever,” 394–395.
55. GMS, “Minority Report,” 382–398.
56. Gillson, *Louisiana State Board of Health*, 213. In late October, Dr. Hays published an attack on GMS’s epidemiological assessment in the *Picayune* to validate his diagnosis of malaria and destroy GMS’s yellow fever hypothesis. Hays’ criticisms were poorly constructed and provided GMS with material to strengthen the findings of his recent investigations. He pointed out glaring diagnostic inconsistencies and, perhaps, outright falsehoods told to him by local physicians who wished to please Joseph Jones. GMS, “Letter to the Editor,” 482–487 and “The Diagnosis of Yellow Fever,” 601–602.

57. Gillson, *Louisiana State Board of Health*, 214.
58. GMS, "Experimental Investigations Relating to the Etiology of Malarial Fevers," 84.
59. *Ibid.*, 5.
60. GMS, "Yellow Fever and Quarantine," 353.
61. *Ibid.*, 354.
62. *Ibid.*, 355.
63. *Ibid.*, 356–357.
64. Book reviews, *Med Rec* 19 (12 Mar 1881), 298, and *Am Jour Med Sci* 81 (Apr 1881), 496–497. Antoine Magnin wrote *Les Bactéries* in a competition for a professorship. Flaumenhaft, "Evolution of America's Pioneer Bacteriologist," 456, n20.
65. Sanitary Congresses were held in Paris, 1851 and 1859, Constantinople, 1866, and Vienna, 1874. Although the Department of State had authorized U.S. delegates to act as plenipotentiaries for the government, foreign delegates did not feel so empowered nor did they care to extend such privileges to consuls in their home ports. The U.S. proposal was not passed. Howard-Jones, *Scientific Basis of the Sanitary Conferences*, 12, 17, 23, 35, 43, 45. GMS's 1879 blood photomicrographs inspired Finlay's theory. Finlay, "The Mosquito Hypothetically Considered as the Agent of Transmission of Yellow Fever," 590–591, 606–607.
66. Howard-Jones, *Scientific Basis of the Sanitary Conferences*, 45.
67. The Sternbergs moved to 134 W. Madison Street in the Mount Vernon area of Baltimore. GMS to SGO, Feb 28, 1881, Mar 31, 1881, and GMS to Turner, Jul 26, 1881, PPPMO, Box 551, NARA; GMS, "A fatal form of septicaemia in the rabbit," 781–783; Pasteur, "Sur une maladie nouvelle provoquée par la salive d'un enfant mort de rage," 159. Klebs probably visualized *S. pneumoniae* in lung tissue preparations as early as 1875, as did Koch and Eberth prior to its recovery and culture in the laboratory. Austrian, *Life with the Pneumococcus*, 183–189. Dr. H. Newell Martin (1848–1896) taught physiology and conducted physiological research at Johns Hopkins from 1879–1891. Fye, "H. Newell Martin – A Remarkable Career destroyed by Neurasthenia and Alcoholism," 133–166; Gossel, "Institutional Growth and the Fate of Bacteriology at Johns Hopkins," 7; Chesney and Howell, *The Johns Hopkins Hospital and the Johns Hopkins University School of Medicine*, v1, 77–78.
68. GMS, "A fatal form of septicaemia," 781–783; GMS, "Etiology of Croupous Pneumonia – Parts 1 & 2," 309–312.
69. M. Sternberg, *GMS*, 76, 77. C. J. Davaine (1872) injected putrid blood into rabbits and produced a disease he termed septicaemia. He found serial passage of blood from one rabbit to the next increased its virulence, and the lethal dose depended on species and animal size. Robert Koch (1878) published the *Aetiology of Traumatic Infective Diseases* in which he described six different diseases from the injection of putrid fluids. Others engaged in similar investigations include Edwin Klebs (1871), Vulpian (1872), Clementi and Thin (1873), U. Dreyer (1874), and Feltz (1874). Bulloch, *History of Bacteriology*, 142–148.
70. M. Sternberg, *GMS*, 78–79.



71. Ibid., 81.
72. Ibid., 82.
73. Ibid., 83, 84.
74. Interestingly enough, neither Pasteur nor Sternberg were the first to see, culture, or describe the organism. Klebs cultured it in 1875, but gave it no significance. Eberth described it in 1880, but thought it was a variety of pyemia producing micrococci. In the same year, Matray found the micrococcus in normal and pneumonic sputum samples and named it *Pneummoniekokken*. Not until Carl Friedlander and Charles Talamon (1883) and Albert Fraenkel (1886) linked the organism to the production of lobar pneumonia would these previous investigations be recognized as illuminating. White, *The Biology of Pneumococcus*, 237; Garrison, *History of Medicine*, 582.

### Chapter Seven

## Exiled to California

1. Sanderson received his M.D. at Edinburgh. He began research work on infectious diseases for the medical department of the Privy Council, and, at the time of his communication with Martin, was professor of physiology at Oxford. Bulloch, *History of Bacteriology*, 395. Some of the non-gaseous disinfectants tested were iodine, chromic acid, ferric and cupric sulfates, thymol, caustic soda, and nitric, sulfuric, and hydrochloric acids. GMS, “Experiments with Disinfectants,” 210–211, “An Instructive Experiment,” 139, “A Contribution to the Study of the Bacterial Organisms Commonly Found upon Exposed Mucous Surfaces and in the Alimentary Canal of Healthy Individuals,” 157–181, “The Micrococcus of Gonorrhoeal Pus,” 67–70, 96–99, 323–325, *Bacteria*, 293, 302–303, and “Bacillus Anthracis,” 149.
2. GMS, “A Contribution to the Study of the Bacterial Organisms Commonly Found upon Exposed Mucous Surfaces and in the Alimentary Canal of Healthy Individuals,” 157–181; GMS, *Bacteria*, 175.
3. GMS, *Bacteria*, 175; GMS, *Manual of Bacteriology*, 245, 246.
4. This phenomenon was first proposed by John Muellendorf in his doctoral dissertation presented in Dresden in 1879. Cohn, Klebs, Koch, Weigert, Baumgarten, Sternberg, and presumably others were familiar with it, but none of them pursued it experimentally. In the autumn of 1883, Elie Metchnikoff, a Russian zoologist, put forth the theory of phagocytosis—the basis for understanding of cellular immunity—and his studies were published the following year. Bulloch, *History of Bacteriology*, 259; Bibel, “Sternberg, Metchnikoff, and the Phagocytes,” 550–553; GMS, “The Metchnikoff Theory,” 1, 1779–1780; Metchnikoff, *Life of Elie Metchnikoff*, 115, 19–122; Tauber and Chernyak, *Metchnikoff and the Origins of Immunology*, 106–107, 164–165.
5. GMS, “Experiments to Determine the Germicide Value of Certain Therapeutic Agents,” 323, and *Manual of Bacteriology*, 63–65.

6. Miles, *NBH*, Chap 17, MS C237, v2, 40–43; Dunnington, “A Sketch of Dr. John William Mallet,” 187; GMS to Turner, Jul 19 and 26, 1881, PPPMO, Box 551, RG94, NARA.
7. GMS to Turner, Jul 19, 1881, GMS to Turner, Jul 26, 1881, PPPMO, Box 551, RG94, NARA.
8. Cabell to GMS, Jul 17, 1881, PPPMO, Box 551, RG94, NARA.
9. GMS to Adj Gen, Jul 17, 1881, PPPMO, Box 551, RG94, NARA.
10. Cabell to GMS and GMS to Cabell, Jul 19, 1881, PPPMO, Box 551, RG94, NARA.
11. GMS to Cabell, Jul 19, 1881, PPPMO, Box 551, RG94, NARA.
12. GMS to Turner, Jul 26, 1881, PPPMO, Box 551, RG94, NARA.
13. GMS to Crane, Jul 26, 1881, PPPMO, Box 551, RG94, NARA.
14. GMS to Crane, Jul 31, 1881, PPPMO, Box 551, RG94, NARA.
15. Crane to GMS, Aug 2, 1881, PPPMO, Box 551, RG94, NARA.
16. AGO to Barnes, Aug 6, 1881, SO#182, AGO, Aug 10, 1881, and SO#148, HQ, Div of the Pacific & Dept of California, Sep 1, 1881, Box 2, Folder 9, MS C100, George M. Sternberg Papers, 1861–1917, NLM. Fort Mason was known as Fort Point San Jose when GMS arrived. For the purposes of clarity, Fort Mason will be used to designate this post.
17. Mrs. Sternberg preferred not to mention it, presumably from the embarrassment it caused, and likely too because it cast her husband in less than a heroic light. Gibson did not allude to it either, and Wyndham Miles, who reviewed *NBH* records in the National Archives at length, only stated that he could find no reason for Sternberg’s abrupt departure. GMS to Crane and GMS to Turner, Jul 26, 1881, PPPMO, Box 551, RG94, NARA.
18. M. Sternberg, *GMS*, 87.
19. Crane to GMS, Aug 10, 1881, Box 1, Folder 17, MS C100, George M. Sternberg Papers, 1861–1917, NLM.
20. M. Sternberg, *GMS*, 87.
21. GMS asked for a Keith’s heliostat, Woodward’s governor, actinic condensing lens, blue cell and holder with six diaphragms, diaphragm footplate, and a storage box for photomicrographic work totaling \$115.25. Woodward to GMS, Nov 2, 1881, Woodward Correspondence, Curatorial Record Book, Otis Archives, NMM. Woodward was never convinced bacteria were linked to disease causation, and he mockingly called those who did “bacteriafanatics”; however, he and GMS shared a passion for photomicrography that appears to have transcended Woodward’s disregard for bacteriologists. Henry, *AFIP*, 66, 67; *M&SHWR*, Part 2, v1, 370, 374, 595. See also Mary C. Gillett, “A Tale of Two Surgeons.”
22. GMS presented “Bacteria and the Germ Theory of Disease” to the State Medical Society of California, described research with the micrococcus to the local San Francisco Medical Society, and the continued professional response to his work on septicemia in rabbits generated editorials and another paper. Other scientists, such as

- William Henry Welch at the Bellevue Medical School, and later at Johns Hopkins, and T. Mitchell Prudden at the College of Physicians and Surgeons of New York, would establish laboratories that pursued similar investigations before the close of the decade. SO#9, Jan 16, 1882, SO#140, Aug 11, 1882, SO#29, Mar 28, 1883, HQ, Div of the Pacific, Jan 16, 1882, GMS to SGO, Jan 31, 1882, PPPMO, Box 551, RG94, NARA; GMS, "Bacteria and the Germ Theory of Disease," 193–198; *Photomicrographs and How to Make Them*, 20–21, 92–96; "Poisonous Effects of Saliva," 53; "Virulence of Human Saliva," 332–334; "Induced Septicemia in the Rabbit," 69–76; and "Is Tuberculosis a Parasitic Disease?," *Med News* 41 (Jul 1, 1882), 6; Sternberg, *GMS*, 73, 94; Lightman, *Victorian Science in Context*, 391–393; Read and Mathes, *History of the San Francisco Medical Society*, v1, 81.
23. Mettler, *History of Medicine*, 645–646.
  24. GMS, "The Micrococcus of Gonorrhoeal Pus," 67–70. Joseph Oakland Hirschfelder (1854–1920) initiated his medical studies at the Medical College of the Pacific in 1870. In 1872, he began a five-year medical sojourn in Germany. He completed his degree and was the first foreigner to sit for the German state examinations that he passed with honors. "Obituary, Dr. J. O. Hirschfelder," 137–138.
  25. GMS, "The Micrococcus of Gonorrhoeal Pus," 69.
  26. Jonsen, *Short History of Medical Ethics*, 89.
  27. GMS, "The Micrococcus of Gonorrhoeal Pus," and "Further Experiments with the Micrococcus of Gonorrhoeal Pus – 'Gonococcus' of Neisser," 426–429.
  28. His comments should not be considered an excuse for experimental failure. While GMS was a superb laboratory technician, he was also feeling his way in the dark abyss of a new field of science searching for facts that would illuminate his path. Since he did not find the gonococcus using a simple lab procedure and failed to produce the disease in volunteer subjects, his original diagnosis of the soldier at Ft Mason may have been wrong. Non-gonococcal urethritis (NGU), what was then known as non-specific urethritis, is extremely common today, but was considered a rare event by GMS. A more scientifically plausible explanation is that he was indeed working with the highly infectious gonococcus, but his culturing or inoculation techniques, and perhaps both, probably stymied his efforts. To obtain a pure culture for inoculation, he passed the organism through a series of cultures that reduced the virulence of the organism. Furthermore, his inoculation technique—inserting a cotton swab soaked with infected culture fluid into the distal urethra and allowing it to remain for one to two hours—may not have penetrated deep enough to reach the non-cornified epithelial cell layer of the urethra vulnerable to gonococcal invasion. Lastly, if his volunteers urinated within the first four to six hours after inoculation, they very possibly flushed out the inoculum. The two most common causes of NGU, *Chlamydia trachomatis* and *Ureaplasma urealyticum*, can cause urethral discharge and painful urination in males just as gonorrhoea does, but GMS would never have seen either of these small intracellular organisms with the microscopes and staining techniques of his day. Hook and Handsfield, "Gonococcal Infections in the Adult," 149, 152–153, 157; Evans and Brachman, *Bacterial Infections of Humans*, 2d, 265.
  29. Koch, "Etiology of Tuberculosis," 109–114.

30. Abstracts of Koch's work were published in the *Medical News* and *American Journal of the Medical Sciences*. Dr. Watson Cheyne of King's College Hospital attempted Koch's experiments without result for nearly a year. Koch, "Etiology of Tuberculosis," 109–114; Ehrlich, "A Method for Staining the Tubercle Bacillus," 118–120. Sternberg quoted a number of researchers – Toussaint, Schottelius, Brunet, and Burden-Sanderson among them – who had found tubercular nodules originated from non-infectious sources. GMS, "Is Tuberculosis a Parasitic Disease?," *Med News* 41 (Jul 1, 1882):6–7, (Jul 22, 1882):87–89, (Sep 16, 1882):311–314, (Nov 18, 1882):564–566, and (Dec 30, 1882):730–731; GMS, *Bacteria*, 391; Landis, "Reception of Koch's Discovery," 531–537; Dormandy, *The White Death*, 135, 136. Sternberg lamented that Koch had superb financial support for his work from a liberal government, whereas he had to keep his culture chamber continually operating with an alcohol lamp, an expensive and unreliable alternative to gas, but all that was available at Fort Mason. GMS, "Is Tuberculosis a Parasitic Disease?," (Nov 18, 1882):566; "Injection of Finely Powdered Inorganic Material into the Abdominal Cavity of Rabbits," 17–30; and "The Value of Carbolic Acid as a Germicide," 314–317.
31. Mercuric bichloride (corrosive sublimate) and iodine were excellent germicides in current therapeutic concentrations. Carbolic and sulfuric acids and ferrous chloride, however, failed as germicides in doses then used, but were potent antiseptics. GMS, "Experiments to Determine the Germicidal Value of Certain Therapeutic Agents," 321–343.
32. GMS, "Malaria," 31–54; GMS, *Malaria and Malarial Diseases*, iii.
33. M. Sternberg, *GMS*, 87. GMS, *Bacteria*, 2 ed., v. He was granted 10 days leave in early June, presumably to escape the responsibilities of the office, as the orders do not give him permission to leave the department nor was it sufficient time to travel to Kansas or Washington, DC. SO#63, Jun 8, 1883, SO#134, Oct 4, 1883, and GMS to SGO, Oct 6, 1883, HQ Dept of California, PPPMO Box 551, NARA.
34. Henry, *AFIP*, 73, 77, 79; Lamb, "The Army Medical Museum," 89–140; Ashburn, *History of the Medical Department*, 137; Otis obituary release from SGO, 990–991; Billings to GMS, Jan 15, 1884, Box 1, Folder 15, MS C100 George M. Sternberg Papers, NLM.
35. GMS to SGO, Nov 27, 1883, PPPMO Box 551, NARA, also in Sternberg, *GMS*, 87–89. Billings was commissioned in the army on Jul 16, 1862. Oblensky, "John Shaw Billings," 286–291.
36. Billings to GMS, Jan 15, 1884, Box 1, Folder 15, MS C100 George M. Sternberg Papers, NLM.
37. M. Sternberg, *GMS*, 89.
38. William H. Welch did not find the bacillus in his laboratory at the Bellevue Medical College until the fall of 1882; Dr. William T. Belfield, of Chicago, demonstrated it in October 1882 to the Chicago Pathological Society; T. Mitchell Prudden found it in his laboratory at the College of Physicians and Surgeons of New York in April 1883; and Edward L. Trudeau did not see the organism by his own hand, in T. Mitchell Prudden's laboratory, until at least the summer of 1883. Although Gibson gives Dr. Edward L. Trudeau his due for demonstrating the organism in T. Mitchell Prudden's laboratory, Trudeau did not have an English translation of Koch's paper

until Christmas 1882 at the earliest and did not begin work with Prudden and Dr. Hodenpyl until the summer of 1883. Gibson, *Soldier in White*, 125–127; Article IX. Chicago Pathological Society, 518; Trudeau, *An Autobiography*, 174–179; Landis, “Reception of Koch’s Discovery,” 533. McFarland mentions English language bacteriology manuals in his 1937 article – Klein’s *Microorganisms and Disease* (1884), Crookshank’s *Introduction to Bacteriology* (1886), Satterthwait’s *Introduction to Practical Bacteriology* (1887), and Senn’s *Surgical Bacteriology* (1889) – but does not mention either of Sternberg’s translations. McFarland, “Beginning of Bacteriology in Philadelphia,” 149–200.

## Chapter Eight

### Dean of American Bacteriology

1. M. Sternberg, *GMS*, 89, 91.
2. SO#45, Apr 16, 1884, SO#103, May 3, 1884, SO#131, Jun 6, 1884, *GMS* to SGO, 30 Apr, 1884, SGO to *GMS*, 12 May 1884, and *GMS* to SGO 8 Jun 1884, PPPMO, Box 551, RG94, NARA; Gossel, “Institutional Growth” 7; M. Sternberg, *GMS*, 91.
3. While Martha’s interest in bacteriology emanated from a desire to remain connected in a meaningful way to her husband’s professional interests, she also developed into a respectable laboratory technician. M. Sternberg, *GMS*, 91.
4. Sternberg, *GMS*, 111; Gossel, “Institutional Growth,” 2; Warner, “The Fall and Rise of Professional Mystery,” 131.
5. Duffy, *The Healers*, 229, 262; Flexner, *William Henry Welch and the Heroic Age of American Medicine*, 128, 129, 134, 137, 140; Chesney and Howell, *Johns Hopkins Hospital*, v1, 74–76, 83.
6. SGO to *GMS*, 2 Oct 1884, *GMS* to SGO, 19 Oct 1884, PPPMO, Box 551, RG94, NARA; *GMS*, “Disease Germs,” 452 and “Injection of Finely Powdered Inorganic Material,” 17–30.
7. *GMS*, “Disease Germs,” 453.
8. *Ibid.*
9. Coleman, “Koch’s Comma Bacillus,” 315–342. Koch led the German Cholera Commission in an eight-week investigation of a current disease outbreak and reported his isolation of the cholera organism from the rice water discharges of cholera patients in Calcutta on February 2, 1883. Brock, *Robert Koch*, 155, 159–162.
10. The Committee on Disinfectants consisted of Sternberg, Dr. Joseph H. Raymond, Professor of Physiology and Sanitary Science, Long Island College Hospital and Health Commissioner, City of Brooklyn, Dr. Victor C. Vaughn, Professor of Physiological Chemistry, University of Michigan, Major Charles Smart, NBH, Dr. W. H. Watkins, Medical Director of the Auxiliary Sanitary Association of New Orleans, Dr. Albert R. Leeds, Professor of Chemistry at Stevens Institute of Technology and Member of the New Jersey Board of Health, and Dr. George H. Rohe, Professor of

Hygiene, College of Physicians and Surgeons, Baltimore. GMS, et al., *Report of the Committee on Disinfectants*, 1885; Brock, *Robert Koch*, 167; Snowden, *Naples in the Time of Cholera*, 62, 64–67, 105; GMS, “The International Sanitary Conference at Rome,” 101–103.

11. GMS, et al., *Report of the Committee on Disinfectants*, 1885, xi.
12. *Ibid.*, xii.
13. *Ibid.*, vi–ix.
14. GMS, “Commercial Disinfectants,” 144–147 and “The Destruction of Cholera Germs,” 333.
15. Medicinal doses of mercuric chloride were 1:50,000 or 0.015 of a grain. GMS, “Commercial Disinfectants,” 144–147 and “The Destruction of Cholera Germs,” 334–335.
16. Manuscript Commissions for State Department Employees, 1 May 1848–30 Jun 1941, Gen Records, Dept of State, v2, E775, RG59, NARA; SGO to GMS, 24 and 25 Apr 1885, PPPMO, Box 551, RG94, NARA; GMS, “The Pneumonia-Coccus of Friedlander,” 109.
17. Countries represented at the conference included: the United States, Mexico, Argentina, Brazil, Chile, Peru, Uruguay, Guatemala, Great Britain, France, Belgium, The Netherlands, Germany, Spain, Portugal, Holland, Denmark, Norway/Sweden, Switzerland, Italy, Austria-Hungary, Romania, Serbia, Russia, India, China, and Japan. Howard-Jones, *Scientific Basis*, 52–56; Coleman, “Koch’s Comma Bacillus,” 326–327; Ogawa, “Uneasy Bedfellows,” n 106, 701; Moleschott and Erhardt, “Abstract of the Conclusions Adopted and Propositions Rejected by the Technical Commission,” 279–303; Brock, *Robert Koch*, 159–162, 167.
18. Howard-Jones, *Scientific Background*, 56; Moleschott and Erhardt, “Abstract of the Conclusions Adopted and Propositions Rejected by the Technical Commission,” 279–303; Hardy, “Cholera, Quarantine, and the English Preventive System,” 250–269; GMS, “International Sanitary Conference,” 101, 102, 103 and “Disinfection at Quarantine Stations,” 57–62.
19. GMS, “International Sanitary Conference,” 101.
20. *Ibid.*
21. GMS, “The Malarial Germ of Laveran,” 299; Gibson, *Soldier in White*, 139.
22. M. Sternberg, *GMS*, 91–92; Gibson, *Soldier in White*, 140. Upon returning from Rome, Sternberg was also notified that his essay, “Disinfection and Individual Prophylaxis Against Infectious Diseases” had won the Lomb prize at the annual APHA meeting for its content and his extended research on the practical value of disinfectants. GMS, “Disinfection and Individual Prophylaxis,” 101–136; Sternberg, *GMS*, 93.
23. de Fousta to Bayard, 29 Jul 1885, PPPMO, Box 551, RG94, NARA. The summer of 1885, although busy for Sternberg, was not without its family pleasures. His parents visited friends in Morristown, New Jersey, and he and Martha made time to see them. It was a bittersweet reunion for Sternberg. He had not seen his parents

- in some time, and in the interim his mother had apparently suffered a mild stroke leaving her, according to Levi, “with a partial paralysis which prevented the free use of her limbs.” Sternberg, *Story of My Life*, 28.
24. GMS may have discussed a visit with Koch during their time in Rome. However, neither Mrs. Sternberg nor Gibson discussed this trip and, with the exception of three fleeting references, two in Sternberg’s papers and one in his *Manual of Bacteriology*, it remains almost completely enigmatic. GMS to SGO, 31 Oct 1885, PPPMO, Box 551, RG94, NARA; GMS, *Manual of Bacteriology*, 293, “Pneumonia-Coccus of Friedlander,” 106–123, and *Report upon the Prevention of Yellow Fever by Inoculation*, 170.
  25. Austrian, *Life with the Pneumococcus*, 6–7; White, *Biology of Pneumococcus*, 5–7.
  26. GMS, “Pneumonia-Coccus of Friedlander,” 122.
  27. *Ibid.*, 113.
  28. White, *Biology of Pneumococcus*, 5–7, 9; GMS, “Micrococcus Pasteuri,” 123–131.
  29. *Reminiscences*, v2, Part 15, 185, Box 19, Kober Papers, NLM; Sternberg, *GMS*, 92, 93.
  30. Sternberg, *GMS*, 93.
  31. GMS, “Micrococcus Pasteuri,” 123, “Etiology of Croupous Pneumonia – Parts 1 & 2,” 281–285, 309–312, and *Manual of Bacteriology*, 291–294.
  32. GMS, “Micrococcus Pasteuri,” 123.
  33. GMS, “Etiology of Croupous Pneumonia – Parts 1 & 2,” 281–285, 309–312.
  34. GMS, “Pneumonia-Coccus of Friedlander,” 113, and *Manual of Bacteriology*, 40–41; White, *Biology of Pneumococcus*, 5–7, 33, 36–37; Joklik et al., eds., *Zinsser’s Microbiology*, 20th ed., 433, 434, 435; Austrian, “The Enduring Pneumococcus,” 3.
  35. Austrian, *Life with the Pneumococcus*, 8; Brock, *Milestones in Microbiology*, 215–217; White, *Biology of Pneumococcus*, 6, 11, 12, 13.
  36. Austrian, *Life with the Pneumococcus*, 6–13; Brock, *Milestones in Microbiology*, 215–217; White, *Biology of Pneumococcus*, 6, 11, 12, 13.
  37. GMS, “Micrococcus Pasteuri,” 123–131 and *Manual of Bacteriology*, 291, 293.
  38. GMS, *Manual of Bacteriology*, 294.
  39. *Ibid.*
  40. GMS, “The Etiology of Croupous Pneumonia – Parts 1 & 2,” 311–312.
  41. GMS to SGO, 27 Dec 1885, PPPMO, Box 551, NARA. Abbott studied bacteria in drinking water, William D. Booker studied bacterial flora in stools of children with summer diarrhea, and Christian A. Herter experimentally produced inflammation of the spinal cord. Flexner, *William Henry Welch*, 151–152, 153; Gossel, “Institutional Growth,” 7, 9; Chesney and Howell, *Johns Hopkins Hospital*, v1, 91–92; GMS, “The Bacillus of Typhoid Fever,” 197–202 and “Thermal Death-Point of Pathogenic Organisms,” 146–160; Cushing, *Life of Sir William Osler*, v1, 269–271, 270.

42. Dennis had requested \$50,000 from Andrew Carnegie to build a pathological laboratory in New York City to induce Welch to stay at Bellevue. Although Gilman trumped Dennis's offer, the Carnegie Laboratory was built. Prudden, *Biographical Sketches and Letters of T. Mitchell Prudden*, 50, 54; Flexner, *William Henry Welch*, 131; Winslow, *Life of Hermann Biggs*, 64–65; Eggerth, *The History of the Hoagland Laboratory*, 13, 17–18.
43. Hoagland may also have been familiar with Sternberg through his book on photomicrography. Eggerth, *The History of the Hoagland Laboratory*, 3, 4, 5–8, 17–18, 23–25.
44. Eggerth, *The History of the Hoagland Laboratory*, 29, 30–31.
45. Ashburn, *History Army Medical Department*, 139, 140.
46. Eggerth, *The History of the Hoagland Laboratory*, 31; M. Sternberg, *GMS*, 127; Edson, *Brooklyn First*, 71.
47. Eggerth, *The History of the Hoagland Laboratory*, 34–35.

## Chapter Nine

### Yellow Fever Investigations

1. "Notes and News," 535; Warner, "Hunting the Yellow Fever Germ," 361–382; *GMS, Prevention of Yellow Fever*, 141, 155–157; "Freire's Yellow Fever Microbe," 547–551; "Carmona's Yellow Fever Inoculation," 626.
2. Holt, "The Yellow Fever Commission," 623–625; "The Yellow Fever Commission," *NOM&SJ* 13 (Feb 1886), 629–632; "The Yellow Fever Commission," *NOM&SJ* 13 (Mar 1886), 722–728; "The Yellow Fever Commission," *NOM&SJ* 13 (Jun 1886), 964–972 and 990–994; "The President's Power in the Prevention of Epidemics, and the Yellow Fever Commission," 140–142; "Yellow Fever Inoculations," 623–624.
3. Holt to Bayard, 28 Feb 1887, Davis to *GMS*, 7 Mar 1887, Moore to Cleveland, 15 Apr 1887, *GMS* to SGO, 3 May and 30 May 1887, PPPMO, Box 551, NARA.
4. *GMS, Prevention of Yellow Fever*, 142, 146–147, 158–159, 184–185; Sternberg, *GMS*, 100.
5. As Sternberg spoke no Portuguese, he was assisted in his study of Freire's earlier results and visits to the inoculated population by Dr. R. Cleary and a Mr. Slaughter, both American ex-patriates who read and spoke Portuguese. *GMS, Prevention of Yellow Fever*, 142–143, 159, 164.
6. *GMS, Prevention of Yellow Fever*, 157, 159.
7. *Ibid.*, 159.
8. *Ibid.*, 168–169.
9. *Ibid.*, 178–182, 181.
10. *Ibid.*, 181–183.



11. *Ibid.*, 190.
12. *Ibid.*, 194–213.
13. During the latter part of their stay in Rio, smallpox broke out in the city, and Sternberg had been exposed to the disease through his work in a number of hospitals. Mrs. Sternberg therefore was vaccinated with an English-made smallpox vaccine. A few days out from port, Mrs. Sternberg awoke with a severe chill and generalized body aches. Over the next 24 hours, she developed a high fever, and the vaccination site became extremely red and painful. Sternberg, disturbed by this unexpected reaction, commented, “That English virus must have been contaminated. There must have been a germ in it that has taken a long time to incubate in your system. The time for the virus of smallpox to take effect has long since expired. . . . This germ that you have developed must be from another family, it has been so long in developing.” Sternberg was correct. The incubation period did not fit smallpox, and vaccine quills at that time were notorious for inducing infections from bacterial contamination. Fortunately, she recovered without complications. M. Sternberg, *GMS*, 102, 104–106.
14. M. Sternberg, *GMS*, 105.
15. *Ibid.*, 105.
16. *Ibid.*, 105, 106.
17. Mrs. Sternberg stayed home because she was tired of the excitement and tedium of traveling. Sternberg, *GMS*, 106.
18. *GMS*, “President’s Address,” 1–21, 9.
19. *GMS*, *Prevention of Yellow Fever*, 149.
20. *GMS*, *Prevention of Yellow Fever*, 149, 150, 213–217.
21. It was not known how many soldiers exposed to the epidemic in May were already immune to the disease. After exposure to the disease, these soldiers were inoculated, but another attack of yellow fever generated 28 cases and 19 deaths, a case-fatality rate of 68 percent. *GMS*, *Prevention of Yellow Fever*, 218–219; *GMS*, “Investigations Relating to the Etiology and Prophylaxis of Yellow Fever,” 339–365, 364.
22. *GMS*, *Prevention of Yellow Fever*, 166–168.
23. *GMS* to SGO, 3 Dec 87, *GMS* to SGO, 24 Oct 87, *GMS* to SGO, 12 Dec 87, and *GMS* to SGO, Sep 27, 1886, PPPMO, Box 551, NARA; *GMS*, “President’s Address,” 1–21.
24. Eggerth, *The History of the Hoagland Laboratory*, 34.
25. This appears to be the last time he gave it serious consideration until very late in 1887 or early 1888 even though he was aware that others, such as Dr. Edmund A. Parkes, a British military hygienist, considered fecal-oral transmission of the disease to be a genuine possibility. Gibson, *Soldier in White*, 148; *GMS*, “Hunting Yellow Fever Germs,” 253–256, 255; F. Chaumont, ed., *Parkes’ Hygiene*, 59, 131; *GMS*, *Report on the Etiology and Prevention of Yellow Fever*, 31.
26. *GMS*, “An Inquiry into the Modus Operandi of the Yellow Fever Poison,” 10, and *Report on the Etiology and Prevention of Yellow Fever*, 7, 31, 167–168.

27. GMS, *Etiology and Prevention of Yellow Fever*, 114, 167, 181.
28. Gibson, *Soldier in White*, 149; GMS, *Etiology and Prevention of Yellow Fever*, 181.
29. Gibson, *Soldier in White*, 149.
30. Gibson, *Soldier in White*, 149; GMS, *Etiology and Prevention of Yellow Fever*, 168.
31. Gibson, *Soldier in White*, 149, 150.
32. GMS, *Etiology and Prevention of Yellow Fever*, 182.
33. GMS, "Preliminary Note upon a New Method of Treating Yellow Fever," 524–526, and *Etiology and Prevention of Yellow Fever*, 78–87, 90, 91, 92, 95.
34. GMS, *Etiology and Prevention of Yellow Fever*, 91.
35. *Ibid.*, 91.
36. *Ibid.*, 85.
37. Kemp was given a salary of \$1,000 per year and the privilege of taking his medical degree at the Long Island College free of charge. Eggerth, *The History of the Hoagland Laboratory*, 36.
38. Eggerth, *The History of the Hoagland Laboratory*, 37.
39. New Orleans had had cases in all but three of the years from 1880 to 1887, but only nine deaths. Outbreaks had occurred at Matamoros and Brownsville, Texas, in 1882 and 1883, in Biloxi, Mississippi in 1886, and Key West in 1887; however, these visitations remained small and were locally contained. Dr. Joseph Holt's firm yet tactful diplomacy, understanding of state and national politics, and his system of maritime sanitation were crucial to the success of southern public health. Ellis, *Yellow Fever*, 121; Humphreys, *Yellow Fever and the South*, 113–118.
40. SO#203, Sep 1, 1888, SO#224, Sep 26, 1888, and GMS to SGO, Sep 29, 1888, PPP-MO, Box 551, NARA; GMS, *Etiology and Prevention of Yellow Fever*, 7, 12, 87–88, 98, 116, 117, 209–210.
41. GMS, *Etiology and Prevention of Yellow Fever*, 98, 116, 117, 209–210.
42. Sternberg's formula provided a patient with 285 milligrams of sodium bicarbonate, 1 milligram of inorganic mercury, and 53 milliliters of water per hour. If the nursing care was good, the patient probably received 12 to 15 doses per day, giving a moderate hourly dose of bicarbonate that probably provided some relief from stomach upset and allowed fluids to be retained; but it would not have had an appreciable effect on neutralizing acidic urine nor would it increase urine flow. Reduced urine production in yellow fever patients is due to virus-induced damage (acute tubular necrosis) of the kidney-filtering tubules in severe cases and dehydration secondary to vomiting and prolonged fever. As intravenous fluid replacement was unknown, fluid losses could only be corrected orally. The small amount of water in GMS's treatment, even when combined with other liquids not immediately regurgitated, would not by itself be sufficient to meet the dehydrated patient's fluid requirements and provide a diuretic effect. The amount of inorganic mercury he included as an antiseptic was also too small to cause an immediate toxic effect. However, mercury is extremely toxic to the filtering tubules of the kidney and is not rapidly cleared by them. At the end of 7 days of treatment—the average time in which a patient would

- be on the road to recovery—a patient would have accumulated about 84 to 105 milligrams of mercury in the kidneys, enough to produce toxic side effects in some individuals. GMS, *Etiology and Prevention of Yellow Fever*, 88–90, “Bicarbonate of Sodium and Bichloride of Mercury in the Treatment of Yellow Fever,” 298–304, and “Additional Note on the Treatment of Yellow Fever,” 388–389; Gibson, *Soldier in White*, 157.
43. GMS to SGO, Nov 4, 1888, PPPMO, Box 551, NARA; GMS, *Etiology and Prevention of Yellow Fever*, 140; Eggerth, *The History of the Hoagland Laboratory*, 46; BDE, “Dr. George M. Sternberg’s Lecture to his Professional Brethren,” Nov 18, 1888.
  44. Eggerth, *The History of the Hoagland Laboratory*, 41–43; BDE, “A Brilliant Crowd of Citizens Gather at the Opening of the Institution,” Dec 16, 1888.
  45. Eggerth, *The History of the Hoagland Laboratory*, 54; GMS, *Etiology and Prevention of Yellow Fever*, 8, 9, 12, 13, and “Hunting Yellow Fever Germs,” 253–256; GMS to SGO, Feb 11 and 28, Mar 3 and 16, and Aug 31, 1889, PPPMO, Box 551, NARA.
  46. Finlay, “The Mosquito Hypothetically Considered,” 605.
  47. *Ibid.*, 607.
  48. *Culex cubensis* was renamed *Stegomyia fasciata* and is known today as *Aedes aegypti*. Finlay, “Yellow Fever: Its Transmission by Means of the Culex Mosquito,” 395–406, and “Inoculations for Yellow Fever by Means of Contaminated Mosquitoes,” 264–268.
  49. Finlay, “The Mosquito Hypothetically Considered,” 591.
  50. *Ibid.*, 608–610.
  51. Manson, “On the Development of the Filaria Sanguinis Hominis and on the Mosquito Considered as a Nurse,” *Transactions Linnean Society* 14 (Aug 31, 1878):304–311. For a modern account of Manson’s work, see Douglas M. Haynes, *Imperial Medicine: Patrick Manson and the Conquest of Tropical Disease* (Philadelphia: Univ. of Pennsylvania Press, 2001).
  52. GMS, *Etiology and Prevention of Yellow Fever*, 164–165, and “Dr. Finlay’s Mosquito Inoculations,” 627–628.
  53. GMS, “Dr. Finlay’s Mosquito Inoculations,” 627–628; Finlay, “Transmission of Yellow Fever by the Culex Mosquito,” 183.
  54. GMS to Mall, Apr 6 and 15, 1889, PPPMO, Box 551, NARA.
  55. Eggerth, *The History of the Hoagland Laboratory*, 55.
  56. Billings, “Recent Work at the Pathobiological Laboratory State University,” 329.
  57. GMS to Mall, Apr 11, 1889 and GMS to Mall, 15, 1889, PPPMO, Box 551, NARA.
  58. GMS, *Etiology and Prevention of Yellow Fever*, 175–178.
  59. Gibson, *Soldier in White*, 154.
  60. *Ibid.*
  61. Gibson, *Soldier in White*, 155; GMS, *Etiology and Prevention of Yellow Fever*, 98, 121–131.

62. Gibson, *Soldier in White*, 155.
63. *Ibid.*, 156.
64. *Ibid.*
65. *Ibid.*, 157.
66. *Ibid.*
67. GMS, *Etiology and Prevention of Yellow Fever*, 187–188; GMS to SGO, Aug 31, 1889, PPPMO, Box 551, NARA. GMS sustained a rather tardy and severe personal attack from Dr. Freire in response to a summary article of the Brazilian investigations that GMS had published in the *Medical News* in April 1888. Freire accused him of incompetence, myopia, and improper conduct during the 1887 investigations. Although GMS felt a response to “the violent attack which he has made upon me in detail would be a waste of time...”, he devoted a postscriptum of seven pages in his final report to the subject and in May 1890 prepared two articles, one of which he read at the annual meeting of the AMA, on the obvious statistical failures of the Brazilian physician. GMS, *Etiology and Prevention of Yellow Fever*, 221.
68. GMS, “Investigations Relating to the Etiology and Prophylaxis of Yellow Fever,” 449–456, “Dr. Freire’s Protective Inoculation,” 524–526, “Facts Versus Figures,” 142–144, and *Etiology and Prevention of Yellow Fever*, 13.
69. GMS, *Etiology and Prevention of Yellow Fever*, 28.
70. *Ibid.*, 13.

### Chapter Ten

## Immunology and Cholera in New York City

1. Margaret Sternberg’s debilitating and wasting illness probably resulted from her earlier stroke or strokes. Levi to GMS, Dec 7, 1888, Box 2, Folder 2, George M. Sternberg Papers, 1861–1917, MS C100, NLM.
2. L. Sternberg, *Story of My Life*, 29.
3. M. Sternberg, GMS, 122, 124; SGO to GMS, Jun 11, 1890 and GMS to SGO, Jul 31, 1890, PPPMO, Box 551, NARA.
4. Greenleaf to SGO, Jun 24, 1890, PPPMO, Box 551, NARA; M. Sternberg, GMS, 66.
5. Schofield to Sec War, Aug 12, 1890, Daniel S. Lamont Papers, LOC.
6. Ashburn, *History Army Medical Department*, 143; M. Sternberg, GMS, 125.
7. SO#232, Oct 3, 1890 and GMS to SGO, Oct 7, 1890, PPPMO, Box 551, NARA; M. Sternberg, GMS, 125.
8. M. Sternberg, GMS, 125.
9. M. Sternberg, GMS, 125; GMS to SGO, Oct 15 and 31, 1890, PPPMO, Box 551, NARA; Eggerth, *The History of the Hoagland Laboratory*, 67.

10. Reasoner, "The Development of the Medical Supply Service," 2; Smith, *Medicines for the Union Army*, 7; ARSG 1891, 89.
11. Finlay, "Inoculations for Yellow Fever by Means of Contaminated Mosquitoes," 264–268; GMS, "Dr. Finlay's Mosquito Inoculations," 629.
12. GMS, "Dr. Finlay's Mosquito Inoculations," 630.
13. M. Sternberg, GMS, 297.
14. *Ibid.*, 126.
15. M. Sternberg, GMS, 126; Fishbein, *A History of the American Medical Association*, 676.
16. Gibson, *Soldier in White*, 160; Schofield to GMS, Dec 31, 1890, Box 2, Folder 2, George M. Sternberg Papers, 1861–1917, MS C100, NLM.
17. Schofield, *Forty-Six Years in the Army*, 183; GMS to Schofield, Jul 3, 1891, Series IV, Container 33, #237, John M. Schofield Papers, LOC.
18. GMS to Schofield, Aug 17, 1891, Series IV, Container 34, #305, John M. Schofield Papers, LOC.
19. SO#27, Feb 2, 1892 and SO#34, Mar 17, 1892, PPPMO, Box 551, NARA. In New York the Sternbergs lived first in a large house near the Windsor Hotel. Although the residence was spacious, Sternberg had a long and disagreeable early morning commute on the elevated streetcar to the south end of Broadway where the Army Building stood at 39 Whitehall Street. He soon tired of jostling in the crowded, poorly ventilated cars twice daily. They relocated to the Saint George Hotel in Brooklyn closer to his office, the Hoagland Laboratory, and a number of friends as well. M. Sternberg, GMS, 127; Eggerth, *The History of the Hoagland Laboratory*, 71; GMS, "Practical Results of Bacteriological Researches," 1–15.
20. Plotkin and Orenstein, *Vaccines*, 3rd, 1–3; Jenner, *An Inquiry into the Causes and Effects of the Variolae Vaccinae*. See also Ola Winslow, *A Destroying Angel*, Boston: Houghton Mifflin, 1974, and Elizabeth Fenn, *Pox Americana*, New York: Hill & Wang, 2001.
21. Baumgarten suggested the creation of an osmotically unfavorable environment in which bacterial cell walls ruptured, and von Behring suggested that an increasing alkalinity precluded further microbial growth. Silverstein, *History of Immunology*, 16–21; GMS, "Infectious Diseases, Causation and Immunity," 625–627 and "What Is the Explanation of the Protection from Subsequent Attacks, Resulting from an Attack of Certain Diseases, and of the Protective Influence of Vaccination against Smallpox?," 373–374.
22. GMS, "What Is the Explanation of the Protection from Subsequent Attacks, Resulting from an Attack of Certain Diseases, and of the Protective Influence of Vaccination against Smallpox?," 376.
23. *Ibid.*
24. Silverstein, *History of Immunology*, 16–21.

25. GMS, "Practical Results of Bacteriological Researches," 1–15, "Infectious Diseases, Causation and Immunity," 616–635, and "Protective Inoculations in Infectious Diseases," 273–291, 273.
26. Bulloch, *History of Bacteriology*, 256–258; Silverstein, *History of Immunology*, 47; Behring and Kitasato, "The Mechanism of Immunity in Animals to Diphtheria and Tetanus," 138–140 and "Studies on the Mechanism of Immunity to Diphtheria in Animals," 141–144.
27. GMS, "Practical Results of Bacteriological Researches," 73, and "Infectious Diseases, Causation and Immunity," 616–635.
28. GMS, "Practical Results of Bacteriological Researches," 80–81.
29. *Ibid.*, 81–82.
30. *Ibid.*, 82.
31. *Ibid.*, 84.
32. *Ibid.*
33. *Ibid.*, 85.
34. *Ibid.*
35. *Ibid.*, 86.
36. *Ibid.*
37. *Ibid.*, 84.
38. Evans, *Death in Hamburg*, 279–284; Markel, *Quarantine!*, 16–19.
39. Evans, *Death in Hamburg*, 286–290.
40. Duffy, *Public Health in New York City*, 85, 86, 92, 93; *NYT*, "Three More Doctors Out," Jul 6, 1892; Fee and Hammonds, "Science, Politics, and the Art of Persuasion," 158, 159.
41. Rauch, "Coast Defenses Against Asiatic Cholera," 130, 138, 140; Bell, "Report of the Committee on Disinfection of Rags," 170–196; Smith, "The New York Quarantine Establishment," 201–207.
42. Duffy, *Public Health in New York City*, 92, 94, 95; Fee and Hammond, "Science, Politics and the Art of Persuasion," 160; Winslow, *Life of Hermann M. Biggs*, 79, 81, 90, 95.
43. Markel, *Quarantine*, 90–91, 97–99, 108, 130.
44. Dr. Welch had been invited, but declined to attend. Markel, *Quarantine*, 126, 129; *NYT*, "Detention at Quarantine," Sep 22, 1892; M. Sternberg, *GMS*, 128, 129; Greenleaf to GMS, PPPMO, Box 151, NARA; GMS, "Disinfection at Quarantine Stations," 57.
45. GMS, "The Biological Characters of the Cholera Spirillum," 387–391, and "Disinfection at Quarantine Stations," 60; *NYT*, "Discussed By Physicians," Sep 20, 1892.

46. GMS, "Disinfection at Quarantine Stations," 60, 61.
47. *Ibid.*, 59.
48. *Ibid.*, 61.
49. Information Slip, Oct 31, 1892, Sutherland to GMS, Nov 29, 1892, and GMS to Sutherland, Dec 5, 1892, PPPMO, Box 551, NARA.
50. GMS, "Report on Typhoid Fever at Madison Barracks," 45–49.
51. Although Bolton claimed ill health—he had had a tuberculous kidney removed recently—both Cornelius Hoagland and GMS were somewhat irritated with his hasty departure that left no one in charge of bacteriology. Eggerth, *The History of the Hoagland Laboratory*, 71–72.
52. Eggerth, *The History of the Hoagland Laboratory*, 74, 75; M. Sternberg, *GMS*, 127.
53. M. Sternberg, *GMS*, 127, 128.
54. M. Sternberg, *GMS*, 128.
55. GMS encouraged Slee to establish his own private vaccine manufacturing laboratory. Four years later, he opened the Pocono Biological Laboratories in Swiftwater, Pennsylvania. It continues to produce vaccines today under the name Pasteur Merieux Connaught. Eggerth, *The History of the Hoagland Laboratory*, 73, 74; Jeff Widmer, *The Spirit of Swiftwater*, 11, 15, 17.
56. Welch to GMS, Dec 4, 1892, Box 2, Folder 4 and Osler to GMS, Mar 13, 1893, Box 1, Folder 29, George M. Sternberg Papers, 1861–1917, MS C100, NLM.
57. M. Sternberg, *GMS*, 127.
58. Greenleaf to GMS, Dec 7, 1892 Box 1, Folder 21, George M. Sternberg Papers, 1861–1917, MS C100, NLM.
59. Ashburn, *History Army Medical Department*, 147, 148.

### Chapter Eleven

## Surgeon General of the Army

1. M. Sternberg, *GMS*, 130.
2. *Ibid.*
3. Gibson, *Soldier in White*, 166, 167; Nevins, *Grover Cleveland*, v2, 129, 175.
4. Gillett, *AMEDD 1865–1917*, 95.
5. GMS to Dickinson, Feb 13, 1893, General Correspondence, Container 2, Lamont Papers, LOC.
6. Nevins, *Grover Cleveland*, v1, 196, v2, 467, 481.

7. GMS to Schofield, Apr 10, 1893, Letters Received, Container 34, #327, John M. Schofield Papers, LOC. Schofield, who had had a short tenure as Secretary of War (1868–1869), also replaced the traditional bureaucratic antagonism of the commanding general toward the Secretary of War with a cooperative spirit by assuming the role of a chief of staff, and he met regularly with the bureau chiefs to seek their advice and hear their concerns after he took command of the army in 1888. In the reform-minded, yet pragmatic, professionalism of Schofield, GMS had an understanding and sympathetic ally. Beaver, *Modernizing the American War Department*, 22; Connelly, *John M. Schofield*, 302–304.
8. Gibson, *Soldier in White*, 166, 167; Nevins, *Grover Cleveland*, v1, 129, 175.
9. M. Sternberg, *GMS*, 131.
10. *Ibid.*
11. M. Sternberg, *GMS*, 132; Information Slip, May 31 and Adj Gen to GMS, May 30, 1893, PPPMO, Box 152, NARA.
12. Welch to GMS, Jun 2, 1893, Box 2, Folder 4, George M. Sternberg Papers, 1861–1917, MS C100, NLM.
13. M. Sternberg, *GMS*, 135.
14. *Ibid.*
15. *Ibid.*, 136.
16. Box 1, Folders 14, 24, 28, 30, and Box 2, Folders 3 and 5, MS C100, George Miller Sternberg Papers, 1861–1917, NLM.
17. M. Sternberg, *GMS*, 135.
18. *Denver Medical Times*, May 31, 1893.
19. The 10 officers passed over were: Colonels Charles Page, Joseph E. Smith, Bernard J. D. Irwin, Charles T. Alexander, Joseph C. Bailey, Charles H. Alden, and Lieutenant Colonels Charles G. Byrne, Joseph P. Wright, Francis L. Town, and Dallas Bache. *Official Army Register*, 1893; *NYT*, “Surgeon General Sternberg,” May 31, 1893, 12.
20. J. C. Culbertson, “Surgeon General of the United States Navy,” 594, and “The Surgeon General of the United States Army,” 617; Kelly and Burrage, *Dictionary of American Medical Biography*, 1228.
21. Remembered primarily for civil service reform, Cleveland really saw this as a small piece of a broader program of general administrative change to reduce corruption in a number of departments. Secretary of War William C. Endicott put an end to the habitual homesteading of officers in Washington and other posts. When Surgeon General Murray retired in 1886, Cleveland broke from precedent and chose Lieutenant Colonel John Moore over six senior officers for the position. *NYT*, “New Naval Surgeon General,” May 10, 1893, 4; Nevins, *Grover Cleveland*, v1, 207, 214–215, 232, v2, 510.
22. Fryer to GMS, Jun 4, 1893, Box 1, Folder 19, George M. Sternberg Papers, 1861–1917, MS C100, NLM.



23. Bailey to GMS, May 31, 1893, Box 1, Folder 14, George M. Sternberg Papers, 1861–1917, MS C100, NLM.
24. Sherman and his successors also encouraged other professional activities, such as associations and journals. Through Sherman's support, officers such as Colonel William B. Hazen, Emory Upton, and others evaluated and reported upon European and Asian military organizations. In 1891, Schofield required all combat officers to prepare and present professional papers at regular meetings on post. This, in Schofield's words, was "to give officers an incentive to study...[and] stimulate professional zeal and ambition." Nenner, *The Leavenworth Schools and the Old Army*, 7; Weigley, *History of the United States Army*, 272, 273, 274, 276; Coffman, *Old Army*, 271, 272.
25. Rothstein, *American Physicians*, 285–286; Flexner, *Medical Education in the United States and Canada*, 234–235.
26. ARSG 1888–1891; Gillett, *AMEDD 1865–1917*, 18–20; Greenleaf, Excerpts from personal correspondence of BG Charles R. Greenleaf, MS C91 Charles R. Greenleaf Papers, 1890–1936, NLM; Senn, "Mission of the Association," 547–550.
27. ARSG 1890, 3, 11; ARSG 1891, 3; ARSG 1892, 3.
28. ARSG 1893, 7, 13, 35.
29. No sources reveal when GMS began thinking about an Army Medical School. ARSG 1894, 21–23; Brinton, *Personal Memoirs of John H. Brinton*, 257–259; Thomas and Hyman, *Life and Times of Lincoln's Secretary of War*, 366–368; Duncan, "The Strange Case of Surgeon General Hammond," 100–101, 104, 107–108; "This Week," 10; GO's #51 and #78, Records, AMS, WRAIR Archives.
30. GMS to Reed, Jul 3, 1893, Hench-Reed Collection, UVA. GMS and Reed may have met in early October 1890 as Sternberg packed his equipment and departed for San Francisco and Reed began his course work in Welch's lab. Whether they did or not, GMS did not know Reed well enough to take him outright. Essay by William H. Welch concerning Walter Reed's work at Johns Hopkins University. 19---, Hench-Reed Collection, UVA.
31. ARSG 1893, 15.
32. GMS, "Function of the Army Medical School," 547–551.
33. M. Sternberg, *GMS*, 138–139.
34. M. Sternberg, *GMS*, 137–140; Gibson, *Soldier in White*, 173.
35. GMS, "Address to Members of the Pan-American Medical Congress," 369.
36. *Ibid.*
37. *Ibid.*, 371.
38. *Ibid.*, 374.
39. *Ibid.*, 374–375.
40. Surgeons such as Charles Nancrede and W. W. Keen in Philadelphia, R. A. Kinloch in Charleston, T. G. Richardson of New Orleans, and Moses Gunn and Nicholas Senn in Chicago had collected and reported on the treatment of a large number of gunshot wounds.

41. Smith, "Nicholas Senn and the Origins of Association of Military Surgeons of the United States," 244.
42. *Proceedings*, AMSUS 1894, viii, xxiv, xxxii, xlv, xlvi, lxix, 1; Senn, "Mission of the Association," 547–550.
43. Gillett, *AMEDD 1865–1917*, 18–20; *ARSG 1893*, 15; *ARSG 1894*, 35–37, and *ARSG 1895*, 14; Greenleaf, Excerpts from personal correspondence of BG Charles R. Greenleaf, MS C91 Charles R. Greenleaf Papers, 1890–1936, NLM; John van R. Hoff, "What Is the Most Practicable Plan of Sanitary Organization for Active Service in the United States Army," *Proceedings*, AMSUS 1896, 208, 212, 220.
44. As the Indian Wars waned, Congress had been paring down the number of, and support to, military posts. In 1880, 185 posts and detachments with the same requirements were covered by 125 assistant and 111 contract surgeons; 10 years later, 164 posts were served by the same number of assistant surgeons and only 48 contract physicians. *ARSG 1894*, 14–15; Gillett, *AMEDD 1865–1917*, 15–17.
45. M. Sternberg, *GMS*, 137, 138; Gibson, *Soldier in White*, 176–177; *ARSG 1894*, 14–15, 16.
46. *ARSG 1894*, 15–21.
47. Of the five new medical first lieutenants, Deane C. Howard stood first in the class, followed by A. S. Porter, W. H. Wilson, W. W. Quinton, and T. S. Bratton. *ARSG 1893*, 15 and *ARSG 1894*, 35; Faculty Meeting Minutes, March 6, 1894, Records AMS, WRAIR Archives. For Osler's complete address, see: Osler, *Aequanimitas*, 3rd ed., 99–113.
48. Bean, *Walter Reed*, 56, 57; GMS to Reed, Jan 19, 1894, Hench-Reed Collection, UVA; Reed, "Germicidal Value of Trikresol," 204.
49. Bryant had orchestrated the President's clandestine surgery for a malignant oral tumor earlier in the year; an operation that was kept from Congress, the nation, and, most impressively, the news media for nearly 25 years. Nevins, *Grover Cleveland*, v2, 528–529; M. Sternberg, *GMS*, 136; Gibson, *Soldier in White*, 172.
50. GMS, "Introductory Address Delivered September 30 at the College Building, Georgetown University," 689–696, "A National Health Bureau," 529–533, "The Bacteriology of Pylonephritis," 664–669, and "The Proofs of Progress" 508–512; M. Sternberg, *GMS*, 149.
51. Gossel, "William Henry Welch and the Antivivisection Legislation," 405; *GMS, Immunity, Protective Inoculations in Infectious Diseases and Serum Therapy*, 234–235, and "Scientific Researches," 925, 927; Kinyoun, "Preliminary Report on the Treatment of Variola by Its Antitoxine," 31–33.
52. Kinyoun, "Preliminary Report on the Treatment of Variola by Its Antitoxine," 31–33. GMS thought a dried precipitate preparation of the serum, which could be reconstituted in a smaller amount of fluid, might eliminate the volume problem in treatment. Reed pursued this goal with some success in laboratory animals, but it was never tested in humans. GMS and Reed, "Report on Immunity Against Vaccination Conferred upon the Monkey," 57–58, 68.
53. M. Sternberg, *GMS*, 139; *ARSG 1895*, 7, 58.
54. *ARSG 1896*, 11–12, *ARSG 1897*, 14; Gillett, *AMEDD 1865–1917*, 99, 106–109.

55. GMS, "Scientific Researches Relating to the Specific Infectious Agent of Smallpox," 926-927.
56. French, *Antivivisection and Medical Science in Victorian Society*, 1-35, 61-71, 85-89. Gossel, "William Henry Welch and the Antivivisection Legislation," 398-400, 404-405, 406.
57. Gossel, "William Henry Welch and the Antivivisection Legislation," 406-408; 54th Congress, 1 sess., Senate Bill 1552, Jan 14, 1896, LOC.
58. M. Sternberg, *GMS*, 140-141. The Silver Purchase Act, which required the Treasury to buy large amounts of silver every month and turn it into coinage, had destabilized the nation's gold standard financial base. The tariff bill, meant to reduce federal income and protect farmers, tended to drive up the price of manufactured goods in the long run. Cherney, *American Politics in the Gilded Age*, 87-90, 110-111, 114-116, 119-121.
59. McKinley's struggle for the White House had received help from Cleveland and a splinter group, the Gold Democrats. They had sought not to win the election, but to ensure Bryan's defeat by siphoning off votes for themselves or encouraging conservative Democrats to vote for McKinley. McKinley was not so very different from Cleveland politically. He supported the gold standard and was willing to revise the tariff act that carried his name in a manner more to Cleveland's liking. Cherny, *American Politics in the Gilded Age*, 122, 126-128; M. Sternberg, *GMS*, 140-143; Leech, *In the Days of McKinley*, 17, 438; Hagedorn, *Leonard Wood*, v1, 133-135.
60. *ARSG 1896*, 13, 15-16 and *ARSG 1897*, 21-22; Chronology of events concerning the Army Medical Museum and Surgeon General's Library, Otis Archives, NMHM; SO#241, AGO, October 15, 1895, AMS Records, WRAIR.
61. *ARSG 1897*, 6-8, 22 and *ARSG 1896*, 14.
62. M. Sternberg, *GMS*, 251; *Reminiscences*, v2, Part 10, Box 18, MS C115 George M. Kober Papers, NLM; Rosen, "From Frontier Surgeon to Industrial Hygienist," 640, 641; Kober, *History and Development of the Housing Movement*, 11, 23-24. Kober began teaching hygiene and state medicine at Georgetown in 1892. Easby-Smith, *Georgetown University*, v1, 349-350.
63. Green, *Washington*, v2, 43-45; Lamb, *History of the Medical Society of the District of Columbia*, 153-156; *Report of the Committee on Public Health of the Medical Society of the District of Columbia*, 3, 4, 17, 18; "Purification of Water," Box 17, Kober Papers, NLM.
64. Kober, *History of Housing*, 4, 6-11, 13-20, 22-23; Hannold, "Comfort and Respectability," 24, 26; Jones, *Housing of Negroes*, 29-32; Borchert, *Alley Life in Washington*, 33-34.
65. Gould's company built sanitary tenements on Manhattan's East and West Sides. These structures had wide central courts, fire-proofed staircases and partitions, gas appliances, and were only two rooms deep to ensure adequate light and ventilation. Rented at \$8 to \$16 per month, they were affordable only to skilled laborers. Kober, *History of Housing*, 20-21, 23-24 and *Reminiscences*, v2, Part 18, 304-305; Lubove, *The Progressive and the Slum*, 88-89, 100-102, 109; Hannold, "Comfort and Respectability," 29.

66. Kober, *History of Housing*, 27, 29, *Reminiscences*, v2, Part 18, 304–305, and *Report on the Housing of the Laboring Classes*, 116; GMS, “Report of the Committee on Building of Model Homes,” 18, 19.
67. GMS, “Housing Conditions in the Nation’s Capital,” 2; *Ann. Rpts, Citizens Relief Association and Associated Charities*, 12.
68. GMS, “Report of the Committee on Building of Model Homes,” GMS, “Housing Conditions in the Nation’s Capital,” 2.
69. M. Sternberg, *GMS*, 144.
70. M. Sternberg, *GMS*, 144; GMS, “The Bacillus Icteroides of Sanarelli,” 305; Warner, “Hunting the Yellow Fever Germ,” 373.
71. M. Sternberg, *GMS*, 144; GMS, “The Bacillus Icteroides of Sanarelli,” 303–322.
72. Mrs. Sternberg’s account of the nearly 2-month-long trip, with the exception of site-seeing in St. Petersburg, is disappointingly vague. GMS had been so convinced that *Bacillus X* was the agent he sought he had tissue preparations from autopsied yellow fever victims sent to him from Havana by Dr. Burgess during the last two years of his research in an attempt to increase the number of reportable positive cases. He sent these fresh specimens to others, such as Dr. William Councilman at Johns Hopkins and Dr. James Reeves of Chattanooga, to review and hopefully confirm his earlier findings; this was a hope that did not materialize. Sternberg, *GMS*, 144–147; GMS, “Bacillus Icteroides of Sanarelli,” 307–308.
73. GMS, “Bacillus Icteroides of Sanarelli,” 308.
74. *Ibid.*, 312–317, 319–320.
75. M. Sternberg, *GMS*, 148; GMS, “Bacillus Icteroides and Bacillus X,” 233.
76. M. Sternberg, *GMS*, 149.

## Chapter Twelve

### War with Spain

1. Traxel, 1898, 82–84; Cashman, *America in the Gilded Age*, 3rd ed., 340–341; Trask, *War With Spain*, 8, 12, 21, 24, 28, 29, 41; Gould, *The Spanish-American War and President McKinley*, 29, 31, 32; Cosmas, *Army for Empire*, 2nd ed., 66.
2. Traxel, 1898, 82–84, 92–93; Trask, *War With Spain*, 41; Cosmas, *Army for Empire*, 2nd ed., 67; Gould, *The Spanish-American War and President McKinley*, 29, 31, 32.
3. Cosmas, *Army for Empire*, 70–71, 73–75, 77; *DCR*, v1, 169.
4. *ARSG 1890–1898*, budget reviews.
5. *ARSG 1894–1897*; Cosmas, *Army for Empire*, 81; Alger, *The Spanish-American War*, 9, 11–12; *DCR*, v1, 101, 169.

6. DCR, v1, 172, 717, 682–684, v6, 2812–2813, 2828, 2831, v7, 3325–3327; GMS, “Official Summary of the Annual Report of the Surgeon General of the Army,” 103; ARSW 1899, 490–496; M. Sternberg, GMS, 161–162; GMS to Alger, Mar 11 and 15, 1898; GMS to Hawley and GMS to Hull, Mar 30, 1898 Box 152, RG112, E26, NARA.
7. Alden to Superintendents, April 20, 1898, RG112, E26, Box 66, NARA; ARSG 1898, 107–108; Cosmas, *Army for Empire*, 81; Alger, *Spanish-American War*, 9, 11–12; DCR, v1, 169, v6, 2831–2833, v7, 3325–3327; GMS, “Official Summary of the Annual Report of the Surgeon General of the Army,” 103; ARSW 1899, 490–496; M. Sternberg, GMS, 161–162.
8. To fill the enlisted ranks of these units, individual states were named as recruiting areas for each regiment. Supplementary officers needed were drawn from the commissioned and non-commissioned ranks of the Regular Army and from civilian nominations by the President. Cosmas, *Army for Empire*, 82–84, 87–90, 98; Gould, *Spanish-American War*, 51.
9. Gould, *Spanish-American War*, 73–74; Cosmas, *Army for Empire*, 98, 108, 111, 114–116; Shafter, “Capture of Santiago de Cuba,” 612; Estimate of the Surgeon General, May 3, 1898, RG112, E26, Box 129, NARA.
10. Cosmas, *Army for Empire*, 114–115; NYT, “Plans for Invading Cuba,” May 6, 1898, 1, 9.
11. NYT, “Plans for Invading Cuba,” May 6, 1898, 9 and “Looking for Ships to Take Them,” May 10, 1898, 2.
12. Scott, *History of Tropical Medicine*, v1, 166–169.
13. ARSG 1898, 140.
14. Miles, “The War with Spain, I,” 522–523; DeMontravel, *A Hero to His Fighting Men*, 237.
15. Of the 97 physicians examined, 13 were accepted. ARSG 1898, 100–101; DCR, v6, 2813, 2814, 2816; ARSW, 370; Cosmas, *Army for Empire*, 81; GMS to Greenleaf, May 2, 1898, Box 339; GMS to Pope, Apr 20, 1898, Box 164, RG112, E26.
16. ARSG 1898, 101; DCR, v1, 170, v6, 2814, 2824.
17. DCR, v1, 171–172, v6, 2825–2827; ARSG 1898, 101; Sarnecky, *History of the U. S. Army Nurse Corps*, 30. Male nursing programs existed at Bellevue and Charity Hospitals, New York, Philadelphia and Western Pennsylvania Hospitals, Cook County Hospital, and at the University of Maryland. SGO to Superintendents, Male Nurse Training Schools, Apr 20, 1898, Box 66, RG112, E26, NARA; Kalisch, “Heroines of ’98,” 413.
18. DCR, v 1, 171.
19. Bache, “The Place of the Female Nurse in the Army,” 320.
20. Bache, “The Place of the Female Nurse in the Army,” 322; McGee, *Women Nurses*, 1.
21. DCR, v1, 725–726, v6, 2826.

22. Gillett, *AMEDD 1865–1917*, 123; Sarnecky, *Army Nurse Corps*, 30–32; McGee, *Women Nurses*, 1; M. Sternberg, *GMS*, 168; SGO Correspondence, Contract Nurses, Box 145, RG112, E26, NARA.
23. *ARSG 1898*, 140–142.
24. *DCR*, v1, 180, 643–644, v6, 2818–2619; *GMS* to Sec War, Jul 12, 1898, Box 164, RG112, E26.
25. *GMS* allowed 1 surgeon, 1 hospital steward, 10 privates, 10 beds, and supplies for 90 days per regiment, which were adequate and allowed mobility on campaign. *DCR*, v1, 173–174, 181.
26. Hospital facilities were established in convent buildings at Key West, empty barracks at Forts Thomas and Myer, and the Leiter Hotel at Chickamauga, while tents expanded existing hospitals at Forts McPherson and Monroe. Four nurses were on duty at the general hospital at Key West by mid-May, but only 50 contracts had been let by July 1, not more than 100 by mid month, and he continued to search for male nurses. *DCR*, v1, 172, 655–58, 731, v6, 2825; *GMS* to Ludington, May 30, 1898, Ludington to *GMS*, Jun 5, 1898, Box 189, and *GMS* to Matas, Jul 11, 1898, Box 171, E26, RG112, NARA.
27. Cosmas, *Army for Empire*, 119, 120.
28. For each regiment, this included two ambulances, four extra litters, a field hospital with a holding capacity for 10 patients, medical and surgical chests, and supplies for 90 days. *DCR*, v1, 681. Purveying officers Colonels Joseph P. Wright, J. V. D. Middleton, and Lieutenant Colonel J. M. Brown served at St. Louis, San Francisco, and New York, respectively. *ARSG 1898*, 105–106.
29. *ARSG 1898*, 103–106; *DCR*, v1, 681–682, 686, v6, 2836.
30. *ARSG 1898*, 104–106; *GMS* to Pope, May 17, 1898, Box 164, E26, RG112, NARA; Trask, *War with Spain*, 183; Cosmas, *Army for Empire*, 250.
31. Cosmas, *Army for Empire*, 173–174, 177, 193; Trask, *War with Spain*, 116, 132–134, 172–175.
32. *DCR*, v1, 717–719, v6, 2831–2833, v7, 3328–3329.
33. Trask, *War with Spain*, 178; *DCR*, v1, 190, 709.
34. *ARSG 1898*, 107–109; Trask, *War with Spain*, 194, 213, 217; *DCR*, v1, 151, 196, 720; Wood to *GMS*, Jun 30, 1898, Box 164, E26, RG112, NARA.
35. Greenleaf to *GMS*, Jun 11, Box 164, E26, RG112, NARA.
36. *GMS* to Greenleaf, Jun 12, 1898, Box 164, E26, RG112, NARA.
37. *GMS* to Byrne, Jun 9, 1898, Box 195, E26, RG112, NARA.
38. *DCR*, v1, 573, 718.
39. The nurses were Amy Farquharson, Amanda J. Armistead, Lucy Ashley Sharp, Elsie Lempe, Louise Jones Block, and Esther Voorhees Hasson. *NYT*, “The Hospital Ship Relief,” Jun 16 and “Departure of the Relief,” Jul 3, 1898.

40. Barton, *The Red Cross*, 557, 560, 561; *DCR*, v1, 195, 709–710, 720, v5, 2369; Wood to GMS, Jun 30, 1898, Box 164, and Barton to GMS, Jun 21, 1898, Box 195, E26, RG112, NARA.
41. *ARSG 1898*, 144–145; *DCR*, v1, 709, 710, v5, 1833–1834, 1836, 1966–1967; Trask, *War with Spain*, 295; *NYEP*, “The Yellow Fever Menace,” Jul 14, 1898; Shafter, “Capture of Santiago de Cuba,” 627–628.
42. GMS to Adj Gen and Adj Gen to Shafter, Jul 13, 1898, Box 212, E26, RG112, NARA.
43. Shafter to Adj Gen, Jul 14 1898, 139 and Greenleaf to GMS, Jul 14, 1898, 140, *Correspondence*, v1.
44. Greenleaf to GMS, Jul 14, 1898; *Correspondence*, v1, 140; *ARSG 1898*, 6.
45. *DCR*, v1, 719, 726; *NYT*, “Red Cross Relief Work,” Jul 17, 1898.
46. Concerned health officials in some of the Gulf Coast states had already registered their apprehensions about diseased soldiers returning to their states from Cuba and unfounded rumors were circulating that Tampa was now infected. Sanders to GMS, Jun 17, 1898, Corbin to Coppinger, and Coppinger to Corbin, Jul 17, 1898, and Porter to GMS, Jul 21, 1898, Box 194, E26, RG112, NARA.
47. *NYT*, “The Olivette’s Wounded,” Jul 18, 1898.
48. These vessels had not become filthy, pestholes overnight. The V Corps Surgeon and other medical officers had commented on the poor living conditions aboard the steamers before they left Tampa in June, but the urgency of the invasion necessitated their use. *DCR*, v1, 143–146, 616, v7, Torney Testimony, 3339–3340; *ARSG 1899*, 190; *NYT*, “Gen Sternberg’s Visit,” Jul 27, 1898; *NYEP*, “Arrival of the Seneca,” Jul 20 and “Dr. G. M. Sternberg Here,” Jul 26, 1898; Trask, *War with Spain*, 330; GMS, “The Medical Department of the Army,” 214; Byrne to GMS Aug 1, 1898, Box 219 and *NYT*, “The Concho,” Aug 2, 1898, Box 222, RG112, E26, NARA.
49. *NYT*, “Red Cross Relief Work,” Jul 17, 1898.
50. *NYT*, “Yellow Fever Checked,” Jul 20 and “Battling With the Fever,” Jul 31, 1898.
51. *DCR*, v1, 176; Trask, *War with Spain*, 328.
52. Trask, *War with Spain*, 328–329; Corbin to Shafter, Jul 19, 1898 and Shafter to Adj Gen July 25, 1898, Box 212, E26, RG112, NARA.
53. Trask, *War with Spain*, 330; Shafter to Adj Gen, July 29, 1898, *Correspondence*, v1, 186; Cosmas, *Army for Empire*, 258; *ARSG 1899*, 217.
54. Miley, *In Cuba with Shafter*, 216–217; Havard to GMS, Jul 31, 1898, Box 164, RG112, E26, NARA. GMS calculated later the admission rate on Cuba was 1,175 per thousand troops, or nearly 20,000 cases. Disease incidence of this magnitude, when the treatment was known and there was plenty of quinine available throughout the campaign, is attributed to GMS’s reticence to use quinine prophylaxis and the fact that many physicians still confused typhoid fever with malaria. “Surgeon General’s Report” in *ARWD*, 1899, 640.
55. Havard to GMS, Jul 31, 1898, Box 164, RG112, E26, NARA.

56. GMS and others had previously inspected the 15,000-acre site owned by the Long Island Railroad Company and recommended it to the Sec War. *DCR*, v1, 215–217; Cosmas, *Army for Empire*, 258–260; Trask, *War with Spain*, 330.
57. Shafter to Corbin, Aug 2, 1898, Box 164, E26, RG112, NARA; Miley, *In Cuba With Shafter*, 217–218.
58. Shafter to Corbin, Aug 3, 1898, Box 164, RG112, E26, NARA; *DCR*, v1, 217–218. Quite interestingly, “mild” type yellow fever was considered to be sporadic, not epidemic; however, they feared it had a very real potential to assume a virulent character at any time and become epidemic because of the weakened condition of the troops. Havard to GMS, Jul 31, 1898, Box 164, E26, RG112, NARA.
59. Shafter to Corbin, Aug 3, 1898, Box 164, RG112, E26, NARA; Miley, *In Cuba With Shafter*, 220–221.
60. *NYT*, “Generals Write a Round Robin,” Aug 5, 1898; Cosmas, *Army for Empire*, 261; Trask, *War with Spain*, 331–332; *BDE*, “Shafter Lays the Blame on Sternberg,” Aug 8, 1898; GMS to Corbin, Aug 3, 1898, Box 219; and Corbin to GMS, Aug 4, 1898, Box 164, E26, RG112, NARA.
61. GMS to Forwood, Aug 6, 1898, *DCR*, v2, 740–741, v5, Forwood Testimony, 1888; Cosmas, *Army for Empire*, 262.
62. Editorials, “The Army and Quarantine,” and “The Wounded After Siboney,” *Med Rec* 54 (Jul 30, 1898), 161–162; GMS to Senn, Jul 30, 1898, Box 222, E26, RG112, NARA.
63. GMS to Gould, Aug 3, 1898, Box 222, RG112, E26.
64. GMS, “The Medical Department of the Army,” 213–214, “The Medical Department of the Army – Letter from Gen. Sternberg,” 182–183, and “General Sternberg’s Answer to His Critics,” 335–337.
65. *NYS*, “The Concho,” Aug 2, 1898; Byrne to GMS, Aug 1, 1898, Box 219, E26, RG112, NARA.
66. *NYT*, “Medical Orders Violated,” Aug 5, 1898.
67. *Ibid.*
68. *Ibid.*
69. *NYEP*, “Surgeon-General Sternberg’s Responsibility,” Aug 5, 1898.
70. Forwood to GMS, Aug 6, and GMS to Forwood, Aug 8, 1898, Box 224 and GMS to Alger, Aug 8, 1898, Box 129, E26, RG112, NARA; *DCR*, v1, 218, v5, Forwood Testimony 1888, 1893; Cosmas, *Army for Empire*, 263, 264; Burtenshaw, “Caring for the Sick and Wounded,” 236; Prescott, “Camp Wikoff,” 83; *NYT*, “Montauk Camp Not Ready,” Aug 28, 1898. Allen, “Conditions at Camp Wikoff,” 326–327; Pritchard, “A True Pen-Picture of Camp Wikoff,” 333.
71. Forwood to GMS, Aug 10, 1898, Box 224, E26, RG112, NARA; Forwood to GMS, Aug 11, 1898, Correspondence Relating to Camp Wikoff, *DCR*, v2, 742, 745–746, 750, and Brown Testimony, *DCR*, v6, 2, 732.



72. Burtenshaw, "Caring for the Sick and Wounded," 235–236; Cosmas, *Army for Empire*, 263.
73. Forwood to GMS, Aug 10, 1898, Box 224, RG112, E26; GMS to Forwood and Byrne, Aug 14, Young to GMS and Doty to GMS, Aug 16, and GMS to Doty, Aug 18, 1898, Box 212, RG112, E26; *DCR*, v2, 743; *NYT*, "Contagion Feared at Camp Wikoff, Aug 17, and "No Quarantine at Camp Wikoff," Aug 18, 1898. One medical authority, Dr. Frederick Castle, claimed that the water was insufficient for any length of time and that a tetanus epidemic was imminent, as Montauk was the only place in North America, with the exception of Nova Scotia, where the tetanus bacillus thrived in the soil. *NYT*, "Bad Water at Montauk," Aug 11, 1898.
74. *DCR*, v1, 144 and v2, 746–748, 749, 750, v5, 1895.
75. The arrival of more ambulances alleviated difficulties with supply distribution, and although some physicians would complain later they could not get medicines, this was due more to obstinacy in not following request procedures than a genuine lack of items. *DCR*, v2, 754–755, 758, 759; Trask, *War with Spain*, 334.
76. *DCR*, v2, 749; Pritchard, "A True Pen-Picture of Camp Wikoff," 332; *NYT*, "Conditions at Montauk," Aug 31, 1898.
77. Forwood to GMS, Sep 10, 1898, Correspondence Relating to Camp Wikoff, *DCR*, v2, 758.
78. *DCR*, v1, 219.
79. *NYT*, "Camp Alger a Pest Hole," Aug 6, "The Disappointed Eighth," Aug 7, and "Awful Suffering at Camp Thomas," Aug 10, 1898; Trask, *War with Spain*, 357–365; Ashford, "Observations on the Campaign in Western Porto Rico," 162, 163, 167.
80. *ARSG 1899*, 109–115; Cirillo, *Bullets and Bacilli*, 62, 63, 69, 70; *NYT*, "Battling with the Fever," Jul 31, 1898, "Camp Alger a Pest Hole," Aug 6, 1898, and "Chickamauga a Pest Hole," Aug 14, 1898.
81. *NYT*, "Sickness Not Alarming," Jul 29, "Battling with the Fever," Jul 31, "Camp Alger a Pest Hole," Aug 6, and "The Disappointed Eighth," Aug 7, 1898; GMS to Corbin, Jul 29, 1898, Box 236, RG112, NARA; Reed, Vaughn, and Shakespeare, *Origin and Spread of Typhoid Fever*, 3; *ARSG 1899*, 173–183.
82. *DCR*, v2, 773–776, v6, 2816, 2821, 2823.
83. Reed, Vaughn, and Shakespeare, *Origin and Spread of Typhoid Fever*, 3. See also *ARSG 1899*, 620–625.
84. Reed, Vaughn, and Shakespeare, *Origin and Spread of Typhoid Fever*, 6–9, 167–174, 178–179, 182–184, 188, 190.
85. M. Sternberg, *GMS*, 184; *BDE*, "Shocking Scandal at Camp Thomas," and "A Time for Plainness of Speech, Aug 25, 1898; *NYEP*, "Surgeon General Sternberg's Responsibility," Aug 5, 1898; *NYT*, "Sternberg Answers Shafter," and "Sternberg May be Removed," Aug 10, "Yellow Fever at Montauk," and "Gen Sternberg Defense," Aug 30, and "Red Cross Works in Camps," Aug 31, 1898.
86. M. Sternberg, *GMS*, 185.

87. Secretary of War Alger and Adj. Gen. Corbin urged the President to order a formal investigation into the conduct of the war. Politicians and newspaper editors were quick to note that an investigation of the War Department was an investigation of the President, impartiality was impossible, and the entire effort would be a farce. Undaunted, McKinley made it clear he wanted to define the errors made, identify the guilty, and ensure they were prosecuted. This made finding a chair for the committee difficult, as many candidates saw a witch-hunt in the making to pacify voters and ensure Republican stability on Capitol Hill, while providing no legal protection for those accused. GMS, "The Medical Department of the Army," 213–214 and "The Medical Department of the Army – Letter from Gen. Sternberg," 182–183; Shradly, "Who is to Blame," 269; Editorial, "The Responsibility for Army Medical Defects," 453; *NYT*, "What Sternberg Says," Aug 28, 1898, "Seeks No Inquiry Now," Sep 2, "Alger Asks an Inquiry," Sep 9, and "Alger's Request Granted," Sep 10, 1898; Cosmas, *Army for Empire*, 284–286.
88. *NYT*, "What Sternberg Says," Aug 28 and "Seeks No Inquiry Now," Sep 2, 1898; *DCR*, v8, 37.
89. *DCR*, v1, 188.
90. *Ibid.*, 189.
91. *Ibid.*, 188–189.
92. Leech, *Days of McKinley*, 300.
93. Leech, *Days of McKinley*, 301–303; Cosmas, *Army for Empire*, 254; Trask, *War with Spain*, 160–161.
94. Curtin, *Disease and Empire*, 26–27; Osler, *Principles and Practice of Medicine*, 155; Manson, *Tropical Diseases*, 125; GMS, *Malaria and Malarial Diseases*, 121–122.
95. *ARSG 1899*, 365.
96. Sarnecky, *Army Nurse Corps*, 30.
97. Leech, *Days of McKinley*, 300; Trask, *War with Spain*, 160.

### *Chapter Thirteen*

## Empire and Insurrection

1. Linn, *Philippine War*, 3, 5, 6; Trask, *War with Spain*, 384; Cosmas, *Army for Empire*, 199–200; Lippincott, "Reminiscences of the Expedition," 168.
2. The engagement claimed 6 American lives and wounded 92, of whom 47 required hospitalization. Linn, *Philippine War*, 3, 5, 23–24, 27, 30–31; Trask, *War with Spain*, 413–414, 418–442; Woodhull to Adj Gen, Jan 30, 1900, Box 33, S26, RG112, S26, NARA; *ARSG 1899*, 451, 475.
3. Birtle, *U.S. Army Counterinsurgency and Contingency Operations*, 99–100; Foner, *Spanish-Cuban-American War*, 422.

4. Linn, *Philippine War*, 29–30, 31. Officers making up the Manila Board of Health were Major Frank S. Bourns, and Acting Assistant Surgeons Charles McQuesten and B. Ffoulkes. ARSG 1899, 452–453, 471, 488.
5. ARSG 1899, 357, 362–363, 376–377, 505, 545, 556.
6. ARSG 1900, 609; Greenleaf, “A Brief Statement of the Sanitary Work,” 157; Gillett, “U.S. Army Medical Officers,” 570.
7. ARSG 1899, 498–503, 502.
8. ARSG 1899, 365, 503, 504.
9. The Medical Department purchased and distributed 26,000 mosquito bars in 1899. This netting was meant to keep annoying mosquitoes at bay purely for comfort. ARSG 1899, 503; ARSG 1900, 745; Ward, “The Influence of Ronald Ross,” 208; Ross, *Memoirs*, 330–331, 528; Editorial, “Malaria and Mosquitoes,” *JAMA* 35 (Oct 20, 1900):1039.
10. Ross, *Memoirs*, 127.
11. GMS to Maus, Dec 30, 1898, Box 236, E26, RG112, NARA; ARSG 1899, 505–506, 626–627; Truby, *Memoir of Walter Reed*, 27–28.
12. ARSG 1899, 453.
13. *Ibid.*
14. *Ibid.*
15. Linn, *Philippine War*, 44, 46–52.
16. ARSG 1899, 461.
17. *Ibid.*
18. ARSG 1899, 462.
19. Linn, *Philippine War*, 56–57, 88–91.
20. ARSG 1899, 372; GMS to Sec War, 30 Nov 1898, E26, Box 152, RG112, NARA; ARSG 1900, 606.
21. GMS to Sec War, Feb 1, 1899, RG112, E26, Box 152, NARA; ARSG 1899, 372.
22. Gillette, *AMEDD 1865–1917*, 216.
23. Woodhull to GMS, May 23 and 24, Jun 4, 1899, Box 338, S26, RG112, NARA.
24. *Ibid.*
25. Woodhull to GMS, May 23 and 24, Jun 4, 1899, and Woodhull to Adj Gen, Jul 3, 1899, Box 338, S26, RG112, NARA; ARSG 1899, 465.
26. ARSG 1899, 505–506; GMS to Reed, April 19, 1899, Box 236, S26, RG112, NARA; Truby, *A Memoir*, 27–28.
27. ARSG 1899, 626, 631–632.
28. GMS, “Sanitary Lessons of the War,” 1287–1294.

29. Williams, *United States Public Health Service*, 222–223; GMS, “Bacillus Icteroides and Bacillus x,” 233, 234.
30. Agramonte, “Inside History,” 213.
31. ARSG 1899, 523; Truby, *A Memoir*, 37–39, 42, 43, 54; Geddings, “Causal Relationship of the Bacillus Icteroides,” 704; Agramonte to GMS, Oct 2, 1899, Box 1, Folder 13, NLM.
32. Geddings, “Causal Relation of the Bacillus Icteroides,” 704–705; Reed and Carroll, “Bacillus Icteroides and Bacillus Cholerae Suis,” 514; GMS to Agramonte, Jun 5, 1899, Reed-Hench Collection, UVA; GMS, “Yellow Fever Etiology,” 1039–1040.
33. Sanarelli, “Some Observations and Controversial Remarks,” 193–199 and Editorial, “Sanarelli and the Pathogenic Role of the Bacillus Icteroides,” 193–199; GMS, “Bacillus Icteroides as the Cause of Yellow Fever,” 225–228; Archinard, “Experiments Performed,” 85.
34. Woodhull to Adj Gen, Aug 3, 1899, Otis to Adj Gen, Aug 5, 1899, and Woodhull to GMS, Aug 15, 1899, Box 338, S26, RG112, NARA; Linn, *Philippine War*, 122–123, 139.
35. ARSG 1900, 535; GMS to Adj Gen, May 29, 1899, Box 133, S26, RG112, NARA.
36. Acting Surgeon Gen to Corbin, Jul 1, 1899, and GMS to Woodhull, Jul 19, 1899, Box 338, and GMS to Forwood, Jul 27, 1899, Box 10, S26, RG112, NARA.
37. GMS had the money and sent Major and Surgeon Daniel M. Appel to New Mexico to survey what was required. Appel reported the hospital, two sets of barracks, and 16 sets of officer’s quarters would establish a comfortable sanitarium. By the end of the year, tubercular officers and enlisted men were enjoying the salubrious dry climate of New Mexico. ARSG 1900, 538–539; Ludington to Sec War, Aug 19, Appel to GMS, Oct 10, and GMS to Appel, Oct 26, 1899, Box 359, E26, RG112, NARA.
38. Jessup, *Elihu Root*, v1, 220, 224, 241–242; Weigley, *History of the U.S. Army*, 314–319.
39. Sternberg, GMS, 219–220; GMS to Woodhull, Aug 28, Sep 23, and Oct 10, 1899, Box 338, S26, RG112, NARA.
40. GMS to Forwood, Sep 30 and Oct 10, 1899, Box 338, S26, RG112, NARA.
41. Linn, *Philippine War*, 142–143, 147–148, 149, 151, 154–155, 158–159; Woodhull to GMS, Nov 13, Box 339, S26, RG112, NARA.
42. Woodhull to GMS, Nov 16, 1899, and GMS to Forwood, Nov 16, 1899, Box 339, S26, RG112, NARA; Woodhull to GMS, Nov 20, 1899, McKinley Papers, Series 1, Reel 9, LOC; ARSG 1900, 604–605.
43. Linn, *Philippine War*, 160, 180; Greenleaf to GMS, Feb 16, 1900, Box 339, S26, RG112, NARA; Wolff, *Little Brown Brother*, 289.
44. Brands, *Bound to Empire*, 63; Linn, *Philippine War*, 216.
45. ARSG 1900, 531–532; Hume, *Victories of Army Medicine*, 175; Meacham to GMS, Aug 22, 1899, Box 1, Folder 27, MS C100, George Miller Sternberg Papers, 1861–1917, NLM; Ashford, *Soldier in Science*, 4–5; Curry, “U. S. Army Pathological Laboratories,” 175–176.

46. ARSG 1900, 531.
47. ARSG 1900, 532; Curry, "U. S. Army Pathological Laboratories," 175–176.
48. Linn, *Philippine War*, 187; Wolff, *Little Brown Brother*, 288–289.
49. Greenleaf to GMS, Feb 10, 1900, Box 339, S26, RG112, NARA.
50. Greenleaf to GMS, Feb 10, 1900, Box 339, S26, RG112 and PPPMO, Box 654 (Woodhull), RG94, NARA; ARSW 1900, 605.
51. Greenleaf to GMS, Feb 10, 1900, Box 339, S26, RG112, NARA.
52. Ibid.
53. ARSG 1900, 606; GMS to Root, Nov 29, 1899, GMS to McKinley, Dec 6, 1899, and GMS to Senator Hawley and Representative Hull, Apr 13, 1900, Box 152, E26, RG112, NARA.
54. GMS to Greenleaf, Mar 12, Letter, GMS to Greenleaf, and Telegram, GMS to Greenleaf, both Mar 29, 1900, Box 339, E26, RG112, NARA.
55. Sarnecky, *Army Nurse Corps*, 46.
56. More than just giving the Nurse Corps a black eye, these undesirables brought the difficulties of obtaining and maintaining competent female nurses in a combat zone to the fore once again. Sarnecky, *Army Nurse Corps*, 47; Circular No. 1, Mar 9, 1900, Box 171, and GMS to Greenleaf, Mar 13, 1900, Box 338, E26, RG112, NARA.
57. GMS to Greenleaf, Mar 13, 1900, Box 338, E26, RG112, NARA.
58. Sarnecky, *Army Nurse Corps*, 46; Greenleaf to GMS, Apr 30, 1900, Box 338, E26, RG112, NARA.
59. GMS to Greenleaf, Jun 30, 1900, Box 338, E26, RG112, NARA.
60. ARSG 1899, 377–382, and ARSG 1900, 534; GMS to Greenleaf, Jun 30, 1900, Box 338; Sarnecky, *Army Nurse Corps*, 49–50; GMS, "Surgeon General Sternberg's Report," 123–125; Kalisch, "Heroines of '98," 425–426.
61. GMS to Greenleaf, Jun 22, 1900, Box 339, Girard to GMS, Dec 28, 1899, Wells to GMS, Dec 31, 1899, and Hoff to GMS, Jan 2, 1900, Box 373, E26, RG112, NARA.
62. Linn, *Philippine War*, 206, 202, 208–209; Gates, *Schoolbooks and Krags*, 171; Wolff, *Little Brown Brother*, 309–310, 318.
63. Linn, *Philippine War*, 209–210; Wolff, *Little Brown Brother*, 310–312; Gates, *Schoolbooks and Krags*, 177.
64. Gates, *Schoolbooks and Krags*, 135; Greenleaf, "Brief Statement of the Sanitary Work," 158; GMS to Greenleaf, Jun 23, 1900, Box 339, E26, RG112, NARA.
65. Greenleaf to Taft, June 27, 1900, Box 339, E26, RG112, NARA.
66. Ibid.
67. Ibid.
68. Ibid.
69. Taft Endorsement, Jun 30, 1900, Box 339, E26, RG112, NARA.

70. Corbin Endorsement, Aug 3, 1900, Box 339, RG112, E26, NARA.

71. Ibid.

72. Ibid.

#### *Chapter Fourteen*

### Yellow Fever Loses Its Mystique

1. Hagedorn, *Leonard Wood*, 240, 242–243, 280–281.
2. Bean, *Walter Reed*, 108; Truby, *A Memoir*, 181.
3. GMS, “Transmission of Yellow Fever by Mosquitoes,” 229, 230.
4. GMS, “Etiology and Classification of Infectious Diseases,” 660; GMS to Reed, May 29, 1900, Box 460, E26, RG112, NARA.
5. GMS to Reed, May 29, 1900, Box 460, E26, RG112, NARA.
6. GMS to Reed, May 29, 1900, Box 460, E26, RG112, NARA; Agramonte, “Inside Story,” 216; Truby, *A Memoir*, 61, 82–84; Bean, *Walter Reed*, 110; GMS to T. Roosevelt, Jan 25, 1905, Box 2, Folder 1, MS C100 George Miller Sternberg Papers, 1861–1917, NLM; Welch to GMS, Jan 12, 1900, Box 425, E26, RG112, NARA.
7. Truby, *A Memoir*, 87–89; Carroll to Surgeon General, 18 Aug 1906, Box 236, E26, RG112, NARA; Furman, *Profile of the USPHS*, 234, 236, 237.
8. Carter to Lazear, Jun 26, 1900, Box 1, Folder 3, MS C160 Henry Rose Carter Papers, 1899–1968, NLM.
9. Carter, “A Note on the Interval between Infecting and Secondary Cases,” 636; Truby to Hench, Nov 30, 1941, Box 39, Philip Showalter Hench Series, Reed-Hench Collection, UVA; Finlay, “Transmission of Yellow Fever,” 73; John J. Moran, “Memoir of a Human Guinea Pig,” 6, Walter Reed Series, Box 25, #02571001, Reed-Hench Collection, UVA; Reed, “Propagation of Yellow Fever,” 203.
10. Reed to GMS, Jul 24, 1900, Walter Reed Series, Box 20, #02064001, Reed-Hench Collection, UVA.
11. Ibid.
12. Bean, “Walter Reed and the Ordeal of Human Experiments,” 84–85; Carroll, Statement to the Surgeon General, Aug 18, 1906, Box 236, E26, RG112, NARA; Truby, *A Memoir*, 104.
13. Hagedorn, *Leonard Wood*, v1, 324.
14. Ibid.
15. Preston, *The Boxer Rebellion*, 22–23, 32, 39, 92–96; Daggett, *America and the China Relief Expedition*, 13–14, 24–25; *ARSW 1900*, Part 7, 5–6.

16. GMS to Stephenson, Jul 3, 1900, Box 101, E25, RG112, NARA and GMS to Adj Gen, Jun 27, 1900, Box 133, S26, RG112, NARA; GMS to Greenleaf, Jul 3 and Greenleaf to GMS, Jul 4, Jul 7, and Jul 14, 1900, Box 339, E26, RG112, NARA.
17. MacArthur to Corbin, Jul 26, 1900, Box 339, E26, RG112, NARA.
18. GMS to Corbin, Subject Hospital Corps, Jul 26, 1900, Box 339, E26, RG112, NARA.
19. Ibid.
20. Ibid.
21. GMS to Corbin, Subject Hospital Corps, Jul 26, 1900, Box 339, E26, RG112, NARA; *ARSG 1900*, 575.
22. Corbin to GMS, Jul 27, 1900, Box 339, E26, RG112, NARA.
23. GMS to Root, Aug 7, 1900, Box 339, E26, RG112, NARA.
24. Ibid.
25. *ARWD 1900*, Part 7, 9–11, 13, 33–40, 42.
26. This action resulted in a quick rebuke from MacArthur, who thought his total medical supplies were being reduced by half because of a miscommunication from the supply officer in the SGO, but Sternberg held firm on his decision. GMS to Root and MacArthur to Corbin, Aug 9, 1900, Box 339, E26, RG112, NARA.
27. GMS to Greenleaf, Aug 9, and GMS to Greenleaf Aug 11, 1900, Box 339, E26, RG112, NARA. 1st Reserve Hospital: 187 sick; 5 surgeons (3 commissioned); 2d Reserve Hospital: 255 sick; 5 surgeons (2 commissioned); 3d Reserve Hospital: 212 sick; 5 surgeons (2 commissioned); Santa Mesa Hospital: 448 sick; 10 surgeons (5 commissioned); Corregidor Hospital: 175 sick; 3 surgeons (1 commissioned); Board of Health: 6 surgeons (4 commissioned); Supply Depot: 2. GMS to Greenleaf, Aug 11, 1900, Box 339, E26, RG112, NARA.
28. GMS to Root, Aug 15, 1900, Box 339, E26, RG112, NARA.
29. Greenleaf put military and Manila hospitals in quotation for clarification in his letter to Sternberg. Greenleaf to GMS, Aug 15, 1900, Box 339, E26, RG112, NARA.
30. Greenleaf to GMS, Sep 23, 1900, Box 339, E26, RG112, NARA
31. GMS to Greenleaf, Sep 10, 1900, Box 339, E26, and Kean to GMS, Sep 24, 1900, Box 93, E25, RG112, NARA.
32. GMS to Kean, Sep 25, 1900, Box 425, E25, RG112, NARA.
33. Agramonte, “Inside Story,” 220, 223, 224; Carroll, Statement to the Surgeon General, Aug 18, 1906, Box 236, E26, and Kean to GMS, Sep 26, 1900, Box 93, E25, RG112, NARA; Truby, *A Memoir*, 120.
34. Reed, Carroll, Agramonte, and Lazear, “The Etiology of Yellow Fever: A Preliminary Note,” 792–793; Bean, *Walter Reed*, 136, 141; GMS to Adj Gen, 19 Oct 1900, Box 236, E26, RG112, NARA; GMS to Howard Kelly, Dec 12, 1902, Jefferson Randolph Kean Series, Box 143, #14347001, Reed-Hench Collection, UVA.
35. Greenleaf to GMS, Aug 19 and GMS to Greenleaf, Oct 1, 1900, Box 339, E26, RG112, NARA.

36. GMS to Greenleaf, Oct 18, 1900, Box 339, E26, RG112, NARA.
37. GMS to Corbin, Oct 8, 1900, Box 339, E26, RG112, NARA.
38. Linn, *Philippine War*, 272–273; Saxton, *Soldiers in the Sun*, 248–251; MacArthur to Corbin, Nov 22, 1900, Box 339, E26, RG112, NARA.
39. Bean, *Walter Reed*, 141–142; GMS to Reed, Oct 23, 1900, Box 236, E26, RG112, NARA; *NYT*, Oct 27, 1900.
40. Bean, *Walter Reed*, 142; Truby, *A Memoir*, 133.
41. Hagedorn, *Leonard Wood*, v1, 326; Bean, *Walter Reed*, 169, 175–176.
42. Reed, “The Etiology of Yellow Fever: A Preliminary Note,” 796.
43. Welch, Novy, and Archinard in the U.S., Roux in Paris, Lutz in Brazil, and the editor of the *Centralblatt für Bacteriologie* in Berlin received copies of Reed’s article. Bean, “Walter Reed and the Ordeal of Human Experiments,” 86; Truby, *A Memoir*, 133–134; GMS to DeArmond, May 16, 1901, Box 511, RG112, NARA; GMS to Reed, Nov 17, 1900, Walter Reed Series, Box 22, #02204001, Reed-Hench Collection, UVA.
44. Truby, *A Memoir*, 104.
45. GMS, “Yellow Fever and Mosquitoes,” 1391.
46. Truby, *A Memoir*, 132, 136; Hagedorn, *Leonard Wood*, v1, 326–328; Reed, “The Etiology of Yellow Fever: An Additional Note,” 132.
47. Reed, “The Etiology of Yellow Fever: An Additional Note,” 132; Sternberg, *GMS*, 222; Truby, *A Memoir*, 159–160.
48. Reed to Emilie Reed, Dec 11, 1900, Walter Reed Series, Box 22, 02233001, Reed-Hench Collection, UVA.
49. *Ibid.*
50. Reed, “The Etiology of Yellow Fever: An Additional Note,” 434, 438; Truby, *A Memoir*, 150.
51. Sternberg, *GMS*, 223, 224.
52. GMS to Reed, Dec 17, 1900, Box 236, E26, RG112, NARA; Reed to Emilie, Dec 18, 1900, Walter Reed Series, Box 22, #02248001, Reed-Hench Collection, UVA.
53. GMS to Reed, Dec 19, 1900, Walter Reed Series, Box 22, #02250001, Reed-Hench Collection, UVA.
54. GMS to Adj Gen, Dec 27, 1900, Box 236, E26, RG112, NARA; and GMS to Reed, Dec 27, 1900, Jefferson Randolph Kean Series, Box 143, #14333001, Reed-Hench Collection, UVA.
55. Reed, “The Etiology of Yellow Fever: An Additional Note,” 431, 436; Sternberg, *GMS*, 224; Reed to Emilie Reed, Jan 3, 1901, Walter Reed Series, Box 24, #02403001, Reed-Hench Collection, UVA.
56. Reed, “The Etiology of Yellow Fever: An Additional Note,” 431, 436; Bean, *Walter Reed*, 164, 165.



57. Morgan, *William McKinley*, 443; Linn, *Philippine War*, 273–275; Young, *The General's General*, 280–281.
58. Clary and Whitehorne, *Inspectors General*, 391; Gillette, *AMEDD 1865–1917*, 318–319; ARSG 1901, 571, 574, 576.
59. ARSG 1901, 571, 574–575.
60. GMS to Chief Surgeon, Department of California, Aug 24, 1901, Box 513, E26, RG112, NARA; ARSG 1901, 576.
61. ARSG 1901, 575, 577; Greenleaf to GMS, Jan 29, 1901, Box 513, E26, RG112, NARA.
62. Forwood to GMS, Feb 25, 1901, Box 529, E26, RG112, NARA.
63. Torney to GMS, Mar 1 and Bannister to GMS, Feb 21, 1901, Box 529, and Byrne to GMS, Mar 27, 1901, Box 406, E26, RG112, NARA.
64. ARSG 1902, 28.
65. Gorgas, *Sanitation in Panama*, 42.
66. Gorgas, *Sanitation in Panama*, 50–61; Havard to Kean, April 19, 1925, KAMD0790, Reed-Hench Collection, UVA.
67. Smallpox vaccination techniques gave validity to this idea. The natural history of the disease on Cuba and the experimental results of the yellow fever board added weight to the theory. Of the 26 cases of experimentally induced yellow fever, the majority of them had been mild attacks. Gorgas, *Sanitation in Panama*, 42–43, 47, 50, 52, 58; Gorgas to GMS, Feb 25, 1901, Box 218, E26, RG112, NARA.
68. Gorgas, *Sanitation in Panama*, 43–44.
69. GMS to Adj Gen, Mar 8 1901, Box 133, and GMS to Greenleaf, Mar 19, 1901, Box 339, E26, RG112, NARA; Leech, *Days of McKinley*, 575; Sternberg, *GMS*, 228; Clary and Whitehorne, *Inspectors General*, 386.
70. Record Card #78292, Box 108, E25, RG112, E25; Sternberg, *GMS*, 227–228.
71. GMS to Nicholson, Jun 18, 1901, Box 133 and GMS to Adj Gen, Jan 17, 1901, Box 236, E26, RG112, NARA; GMS, *Manual of Bacteriology*, 331.
72. Bean, *Walter Reed*, 164; Carroll to Surgeon General, Aug 18, 1906, Box 236, E26, RG112, NARA; Pierce and Writer, *Yellow Jack*, 198–200; Reed to Gorgas, Jul 29, 1901, Box 1, Folder 9, MS C6 Walter Reed Memorial Association, NLM.
73. Reed to Emilie Reed, Dec 9, 1900, Walter Reed Series, Box 22, #02231001, Reed-Hench Collection, UVA.
74. GMS, “The Transmission of Yellow Fever by Mosquitoes,” 228–229.
75. Reed to Gorgas, Jun 27, 1901, Box 1, Folder 9, MS C6 Walter Reed Memorial Association, NLM.
76. Bean, *Walter Reed*, 166, 171; Warner, “Hunting the Yellow Fever Germ,” 374; Gillette, *AMEDD 1865–1917*, 246; Pierce and Writer, *Yellow Jack*, 205–206.
77. GMS, “Etiology and Classification of Infectious Diseases,” 658, 659–660.

78. GMS to Chaille, Feb 15, 1898, Walter Reed Series, Box 18, #01827001, Reed-Hench Collection, UVA.
79. Sternberg, *GMS*, 228–229; GMS to Forwood, Jul 21, 1901, Box 133, E26, RG112, NARA.
80. *ARIG* 1902, 433–434; Sternberg, *GMS*, 229–233; GMS to Forwood, Jul 21, 1901, Box 133, E26, RG112, NARA.
81. Dysentery was still the major killer, followed by killed in action and drowning, but it only accounted for 13% of hospitalizations, behind venereal disease (16.8%) and malaria (13.5%), and just ahead of wounds and injuries (11.8%). *ARSG* 1902, 433–434; M. Sternberg, *GMS*, 230–233; GMS to Forwood, Aug 5, 1901, Box 133, E26, RG112, E26, Box 133.
82. GMS to Forwood, Aug 13, 1901, McKinley Papers, Reel 16, LOC, GMS to Forwood, Jul 21, Aug 5, and Aug 17, 1901, Box 133, E26, RG112, NARA.
83. GMS to Forwood, Aug 17, 1901, Box 133, E26, RG112, NARA.
84. GMS to Chief Surgeon, Department of California, Aug 24, 1901, Box 513, E25, RG112, NARA; Corbin to Root, Sep 28, 1901, Root Papers, Box 16, LOC.
85. M. Sternberg, *GMS*, 233–234.
86. Sternberg, *GMS*, 235; Chaffee to Corbin, Sep 2, 1901, Corbin Papers, Box 1, LOC.
87. Gorgas, *Sanitation in Panama*, 43, 47, 50, 52, 58; Bean, *Walter Reed*, 164; Carroll to Surgeon General, Aug 18, 1906, Box 236, E26, RG112, NARA; Pierce and Writer, *Yellow Jack*, 198–200; Reed to Gorgas, Jul 29, 1901, Box 1, Folder 9, MS C6 Walter Reed Memorial Association, NLM.

## Chapter Fifteen

### A Proper Progressive in Washington

1. Sternberg, *GMS*, 235–236; Morgan, *McKinley*, 513, 520–525.
2. Hofstadter, *Age of Reform*, 131, 136, 144, 167; Cashman, *America in the Gilded Age*, 23, 27; Wiebe, *Search for Order*, 12, 22, 45, 47, 53, 166, 167; Glaab and Brown, *History of Urban America*, 108–109, 136–138; Noble, *The Progressive Mind*, 3–4.
3. Pope to GMS, Dec 10, 1901, Box 340, E26, RG112, NARA.
4. GMS to Adj Gen, Dec 14, 1901, Box 1, Folder 12, MS C100, George Miller Sternberg Papers, 1861–1917, NLM.
5. GMS to Adj Gen, Dec 14, 1901, Box 1, Folder 12, MS C100, George Miller Sternberg Papers, 1861–1917, NLM.
6. *ARSG* 1902, 13.
7. Sen Docs 1679 and 3344, House Rpt 10075, LOC; GMS to Sec War, Feb 3, 1902, Box 133, E26, RG112, NARA.

8. GMS to Sec War, Feb 3, 1902, Box 133, E26, RG112, NARA.
9. Senate Bill 4889, Mar 10, 1902, LOC. Johnson to Hull, Apr 12, 1902, Box 1, Folder 24 MS C100 George Miller Sternberg Papers, 1861–1917, NLM.
10. Hawley to GMS, 26 Apr 1902, Box 1, Folder 23 and Senate Calendar No. 1420, Report on Retirement of Medical Officers in the Army, 7 May 1902, Box 2, Folder 2, MS C100 George Miller Sternberg Papers, 1861–1917, NLM; Sen. Doc. S4889 and 5213, and HR 13725, LOC.
11. Hull to Johnson, May 13, 1902, Box 1, Folder 23 and John F. Lacey to GMS, May 26, 1902, Box 1, Folder 25, MS C100 George Miller Sternberg Papers, 1861–1917, NLM; “Association News,” *JAMA* 38 (Apr 19, 1902): 1024; Sternberg, *GMS*, 238.
12. GMS, “Function of the Army Medical School,” 547.
13. *Ibid.*, 549.
14. *Ibid.*, 547.
15. Edward G. Janeway presided as master of ceremonies and attendees included Frank Billings, William Welch, Alexander Abbott, George Kober, James Wilson, S. B. Ward, Victor Vaughn, Hermann Biggs, William Osler, Roswell Park, Navy Surgeon General Rixey, Marine Hospital Service Surgeon General Walter Wyman, Simon Flexner, William Gorgas, and Henry Lippincott. Forwood, Reed, and Borden to GMS, May 22, 1902, Box 1, Folder 20, MS C100 George Miller Sternberg Papers, 1861–1917, NLM; Sternberg, *GMS*, 238–250.
16. Sternberg, *GMS*, 149, 249.
17. Sternberg, *GMS*, 149. GMS became a member of the hospital Board of Incorporators and Directors and the Executive Committee in 1897. The following year, he became a member of the nurse Training School Committee. *Annual Reports*, Garfield Memorial Hospital.
18. By this time, Secretary of State John Hay and Sir Julian Pauncefote, British Minister in Washington, had signed a treaty in which the British gave up their claims in the region. The second Hay-Pauncefote Treaty was signed in Washington on November 18, 1901. Campbell, *Anglo-American Understanding*, 237.
19. Gorgas, *Sanitation in Panama*, 139.
20. Gorgas, *Sanitation in Panama*, 139–142; GMS “Sanitary Problems,” 379.
21. GMS “Sanitary Problems,” 385–386.
22. GMS “Sanitary Problems,” 387.
23. Elizabeth Fee, *Disease and Discovery*, 61; Duffy, *Sanitarians*, 251–252.
24. Circular of Information, Georgetown University School of Medicine, 1903–1904, 19, George M. Kober Papers, Georgetown University Archives; Sternberg, *GMS*, 237, 250; GMS, “Preventive Medicine,” 348, 358; Record of the Board of Trustees, Columbian University, Jun 18, 1902–May 26, 1910, 169–171, 174, 242, 419, Gelman Library Archives, GWU; WES, “Opening Session Monday,” Jan 10, 1903.

25. Hofstadter, *Age of Reform*, 186–187, 202; Tomes, *Gospel of Germs*, 139–141; GMS, *Infection and Immunity*, iii, 126–139, 159–180.
26. At the time Sternberg wrote, Congress had finally appropriated money to address the problem. GMS, *Infection and Immunity*, 130–131, 160–161, 164–165, 167, 169; Green, *Washington*, v1, 12–12, v2, 43–47, 89, 149; Lamb, *History of the Medical Society of DC*, 155–156; *Report on Typhoid Fever in the District of Columbia*, 3, 4, 5, 15, 17, 18; “Purification of Water in the National Capital,” Box 17, MS C115, George M. Kober Papers, NLM; *Annual Reports, Association for the Prevention of TB, 1908–1909*, 9.
27. Kober, *History of Housing*, 31, 33, 50, 53–55; Rodgers, *Atlantic Crossings*, 15–16; “My Services on the Anti-Tuberculosis Campaign,” 13, Box 17, and *Reminiscences*, v2, Part 18, 305, Box 19, MS C115, George M. Kober Papers, NLM; Sternberg, *GMS*, 254.
28. Kober, *History of Housing*, 27, 39.
29. Kober, *History of Housing*, 27; GMS, “Housing Conditions in the Nation’s Capital,” 3.
30. Kober, *History of Housing*, 40–41, 46 and *Reminiscences*, v2, Part 18, 322, Box 19, MS C115, George M. Kober Papers, NLM; GMS, “Housing Conditions in the Nation’s Capital,” 4, and *Report on Building Model Homes*, 17.
31. This became evident when the popularity of two-room flats, constructed by the WSHC on an experimental basis, failed to materialize because tenants had no parlor in which to receive guests. GMS, *Report on Building Model Homes*, 88–89.
32. GMS, *Report on Building Model Homes*, 88–89 and “Housing Conditions in the Nation’s Capital,” 2.
33. Some form of meat and milk inspection existed in 62 cities, and milk pasteurization was becoming more common. Shryock, *National Tuberculosis Association*, 49, 51–54, 67–68; Knopf, *History of the National Tuberculosis Association*, 8–9, 16, 18–20, 86; Ravenel, “Relation Between Human and Bovine Tuberculosis,” 31–38.
34. Koch’s introduction of tuberculin as a cure for the disease in 1890 was enthusiastically received by American physicians. Although a failure, tuberculin continued to be studied, prescribed, and fiercely debated for years. Koch, “Etiology of Tuberculosis,” 109; Ott, *Fevered Lives*, 13–16, 70, 101; Shryock, *National Tuberculosis Association*, 40, 42, 46–47, 107–108; Feldberg, *Disease and Class*, 37, 38, 44, 47, 55–58; GMS, *Manual of Bacteriology*, 375, and “Contribution to the Study of the Bacterial Organisms.”
35. By 1904, 96 sanatoriums and special tuberculosis hospitals had been established in the United States. Many were operated for the poor. Feldberg, *Disease and Class*, 52–53. Shryock, *National Tuberculosis Association*, 46–47; S. Knopf, “Sanitariums for the Treatment and Prophylaxis of Pulmonary Phthisis,” 419, “The Urgent Need of Sanatoria,” 303, *Prophylaxis and Treatment of Pulmonary Tuberculosis*, 169, and *History of the National Tuberculosis Association*, 10–11, 12; Trudeau, *An Autobiography*, 89, 99, 154–155, 158, 304; Rothstein, *American Physicians*, 270–271; Dormandy, *White Plague*, 178–179. For construction details see, Thomas S. Carrington, *Tuberculosis Hospital and Sanatorium Construction*, New York, 1911. Sternberg’s younger brother, Albert, died at Saranac Lake in 1894. Sternberg, *Story of My Life*, 30.

36. Shryock, *National Tuberculosis Association*, 49, 70–72; Knopf, *History of the National Tuberculosis Association*, 24.
37. Knopf, *History of the National Tuberculosis Association*, 22–23.
38. Knopf, *History of the National Tuberculosis Association*, 28–29; Shryock, *National Tuberculosis Association*, 75–76.
39. Shryock, *National Tuberculosis Association*, 76–77, 80–82; Knopf, *History of the National Tuberculosis Association*, 30–32.
40. “My Service on the Anti-Tuberculosis Campaign,” 6, Box 17, MS C115, George M. Kober Papers, NLM; Lamb, *History of the Medical Society of DC*, 177; M. Sternberg, *GMS*, 257, 260–262; Kober, *Charitable and Reformatory Institutions*, 1, 148, 149.
41. *GMS*, “Sanatorium Treatment,” 305–306, 308.
42. Trudeau claimed 20 percent of Adirondack Cottage patients were cured and 30 percent improved; the Loomis Sanatorium in Liberty, New York, reported 25 percent cured and 50 percent improved; and Dettweiller at the sanatorium in Falkenstein, Germany, boasted 28 percent cured or arrested and 45 percent improved. Nearly a year later, *GMS* presented treatment results from the first 50 cases admitted at Starmont to members of the Washington Medical Society. Although he had had far fewer incipient cases than he would have liked and many more advanced cases, he declared that all of the early cases had recovered and were sent home, and that 60 percent of advanced cases had shown marked improvement. Starmont’s success paved the way for other sanatoriums in Maryland and Virginia. *GMS*, “Sanatorium Treatment,” 306–308, “First Fifty Cases of Tuberculosis,” 340–343, 345, and “Results of Treatment,” 1, 52; M. Sternberg, *GMS*, 258–259.
43. Knopf, *History of the National Tuberculosis Association*, 143; Borchert, *Alley Life*, 47. M. Sternberg, *GMS*, 259–260.
44. Reynolds, “Report on the Housing of the Poor,” 2, 4; M. Sternberg, *GMS*, 260–261.
45. M. Sternberg, *GMS*, 261–262; Kober, *History of Housing*, 33, 37–38.
46. Reynolds, “Report on the Housing of the Poor,” 3–8, 10–15; Weller, *Neglected Neighborhoods*, 116–117; Greene, *Washington*, v2, 155. In 1905, the Sternbergs moved to 2005 Massachusetts Avenue on Dupont Circle. Today, it is the Washington headquarters of the Konrad Adenauer Foundation. M. Sternberg, *GMS*, 262–263.
47. Baldwin, *Report of the Committee on Improvement of Existing Houses*, 4, 7, 9, 13, 23.
48. Kober, *Report of the Committee on Social Betterment*, 5–9.
49. *GMS*, *Report of Committee on Building Model Houses*, 3–7, 41–60, 64, 66, 108–111.
50. Morris, *Theodore Rex*, 486, 496, 514–519; Roosevelt, *An Autobiography*, 445, 447; “Purification of Water Supply of the National Capital,” *Reminiscences*, Box 17, MS C115, George M. Kober Papers, NLM; Fisher, *Report on National Vitality*, 14–15; Shryock, *National Tuberculosis Association*, 100; Rosen, “The Committee of One Hundred,” 261, 262.
51. Knopf, *History of the National Tuberculosis Association*, 141, 144–145; Shryock, *National Tuberculosis Association*, 101, 103–105; M. Sternberg, *GMS*, 264; *Transactions, 6th International Congress on Tuberculosis*, v3, 1.

52. WES, "Cortelyou Greets White Plague Foes in World Congress," Sep 28, 1908, "American Methods Best in the World," Sep 30, "Health Supervision by Nation Favored"; Knopf, *History of the National Tuberculosis Association*, 146–147; *Trans, 6th International Congress on TB*, v1, part 1, 1.
53. Shyrock, *National Tuberculosis Association*, 107–110; Knopf, *History of the National Tuberculosis Association*, 147.
54. WES, "Delegates Dined," Oct 2, and "In the World of Society," Oct 3, 1908; M. Sternberg, *GMS*, 264.
55. WES, "Roosevelt Cheered by World Congress," Oct 3, 1908; Shryock, *National Tuberculosis Association*, 111–112; Knopf, *History of the National Tuberculosis Association*, 148–149; *Annual Report, Association for the Prevention of TB, 1908–1909*, 10–11.
56. *Annual Report, Association for the Prevention of TB, 1908–1909*, 12, 15, 16–17, 20.
57. *Annual Report, Association for the Prevention of TB, 1908–1909*, 12–13, 1909–1910, 24–25, 1910–1911, 10–12, and 1912, 17. Jacobs, "Tuberculosis Preventorium for Children," 362; Shryock, *National Tuberculosis Association*, 119–120.
58. *Annual Report, Association for the Prevention of TB, 1911*, cover.
59. Alley residents established their own anti-tuberculosis campaign. Clubs for women and children were organized in Blagden's Alley, a Children's Temporary Home that was founded, and an Alley Improvement Association worked for the social betterment of the alley population. Green, *Washington*, v2, 156–157; Jones, *Housing of Negroes*, 39, 41.
60. *Reminiscences*, v2, Part 18, 333, Box 19, MS C115, George M. Kober Papers, NLM; Hannold, "Comfort and Respectability," 35; Borchert, *Alley Life*, 47.
61. *Reminiscences*, v2, Part 18, 337, Box 19, MS C115, George M. Kober Papers, NLM; *Annual Report, Assn for the Prevention of Tuberculosis, 1912–1914*; M. Sternberg, *GMS*, 265, 266; Farrand to GMS, Nov 21, 1912, May 13, and May 16, 1913, Box 1, Folder 20, MS C100 George Miller Sternberg Papers, 1861–1917, NLM.
62. Dr. Richard Slee established the Sternberg Medal and invited GMS to present it. In 1920, Slee relinquished his right of presentation to Mrs. Sternberg, who endowed the medal in perpetuity. The Sternberg Medal is still awarded for academic proficiency in preventive medicine. Hume, "Medals of the United States Army Medical Department," 30–33, 34, 35.
63. *Reminiscences*, v2, Part 18, 337, Box 19, MS C115, George M. Kober Papers, NLM.
64. Howard was in the Army Medical School's first graduating class. *GMS Death Certificate*.
65. Martha Sternberg to Kober, undated, Box 4, MS C115 George M. Kober Papers, NLM.
66. *GMS Death Certificate*, District of Columbia Vital Records Office.

67. Over the next decade, standard curricula evolved, physicians began to lose dominance in the field, and public health became recognized as a multi-occupational profession. Fee and Acheson, *History of Education in Public Health*, 159, 162–168. The national anti-tuberculosis crusade was just beginning to gather steam under the executive leadership of Charles J. Hatfield, 1914–1922. Shryock, *National Tuberculosis Association*, 192–193, 198; Rodgers, *Atlantic Crossings*, 189.
68. “Memorial Meeting in Honor of George Miller Sternberg,” *Washington Medical Annals*, 15 (Mar 1916), 93–94; Baldwin, “General George M. Sternberg,” *Journal of the Outdoor Life* 12 (Dec 1915):389.

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1. M. Sternberg, *GMS*, 219–220, 298–300.
2. *Ibid.*, 220, 299.
3. *Ibid.*, 218.
4. *Ibid.*, 300.
5. *Ibid.*, 304.
6. *Ibid.*, 305–314, 317.
7. Martha Louise Pattison Sternberg Death Certificate, District of Columbia Vital Records Office.





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