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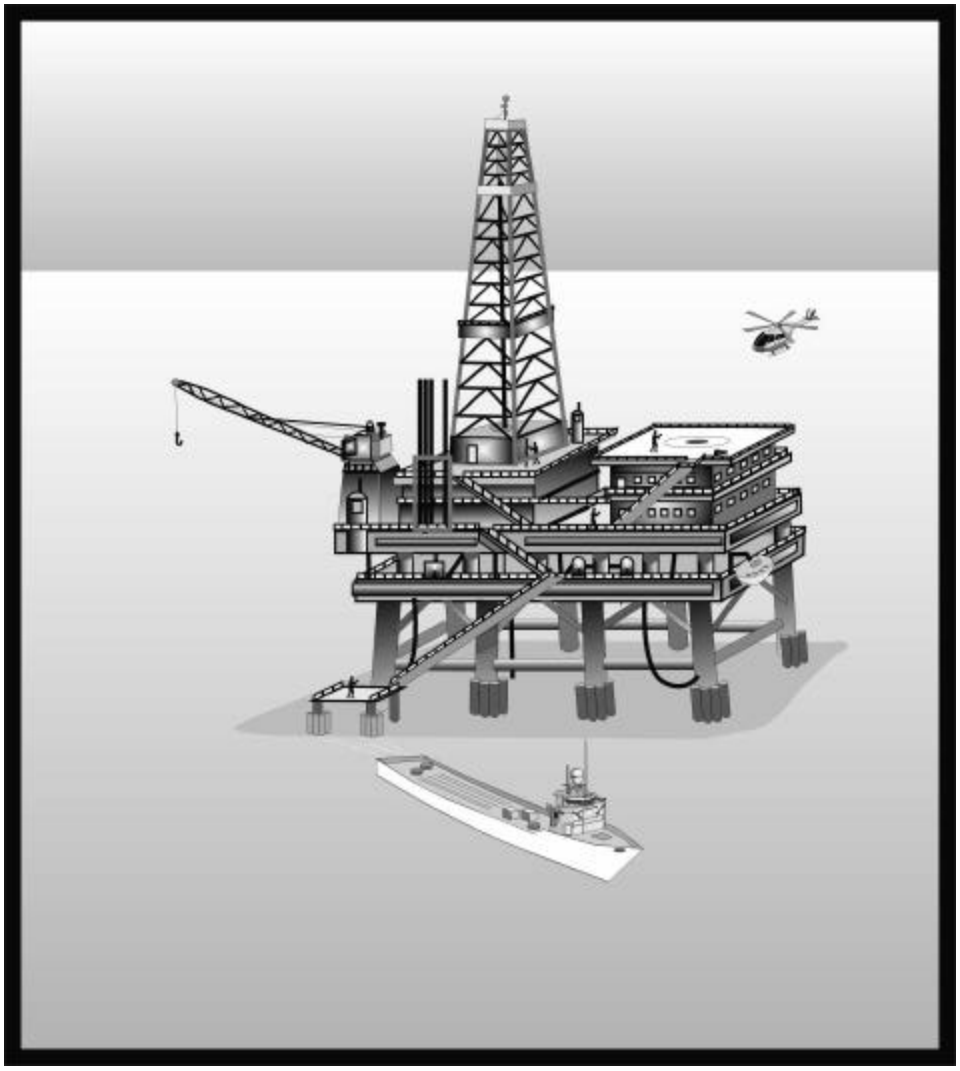
Effects of Oil and Gas Development: A Current Awareness Bibliography, 2000-2004



U.S. Department of the Interior
Minerals Management Service
Gulf of Mexico OCS Region

Cooperative Agreement
Coastal Marine Institute
Louisiana State University

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Effects of Oil and Gas Development: A Current Awareness Bibliography, 2000-2004

Compilers

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March 2005

Prepared under MMS Contract
1435-01-99-CA-30951-18179
by
Louisiana Universities Marine Consortium
8124 Highway 56
Chauvin, Louisiana 70344-2124

Published by

U.S. Department of the Interior
Minerals Management Service
Gulf of Mexico OCS Region

Cooperative Agreement
Coastal Marine Institute
Louisiana State University

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CITATION

Suggested citation:

Conover, J. and S. Duhon, compilers. 2005. Effects of Oil and Gas Development: A Current Awareness Bibliography, 2000-2004. U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2005-019. 245 pp.

ACKNOWLEDGMENTS

We gratefully acknowledge Dr. Michael Dagg, Dr. Nancy Rabalais, Dr. Rodney Powell and Dr. Christopher Finelli for scientific consultation; Dr. Mary Boatman and everyone at the Minerals Management Service who supported this project; and all the patrons who have received the bibliography.

This report was prepared with the assistance of several electronic databases subscribed to by LUMCON. The databases were searched electronically using products available from the Institute for Scientific Information (ISI), Cambridge Scientific Abstracts Internet Database Service (CSA), and the Louisiana Library Network (LOUIS). The following databases were searched:

Academic Search Premier (LOUIS)

Aquatic Sciences and Fisheries Abstracts (CSA)

BIOSIS (LOUIS)

Current Contents (ISI)

Dissertation Abstracts (LOUIS)

Ingenta (LOUIS)

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Zoological Record (LOUIS)

PREFACE

Effects of Oil and Gas Development: A Current Awareness Bibliography was created as part of the research initiative between the Louisiana Universities Marine Consortium (LUMCON), the Minerals Management Service (MMS) and the Coastal Marine Institute (CMI), with the aim of providing current awareness in all aspects of offshore oil and gas development. Sixteen quarterly issues were prepared from January 2001 to October 2004 that contained approximately 2,250 citations, and were compiled into *Effects of Oil and Gas Development: A Current Awareness Bibliography.*

The bibliography evolved from 1990 to 1994 in response to increased demand and MMS's changing needs. Initially, there were no subject divisions and circulation was relatively limited. Eventually, the bibliography was sent quarterly to over 300 patrons who have direct ties to or interest in MMS and coastal marine issues. In January 2000, a web-based electronic database was created. The database includes all citations from inception. The database can be displayed either by quarterly issues or cumulative reports. Other types of searches are that are applicable are: Author, Subject or Keyword Phrases. The database allows users to print their own copy of the published report. Starting in January 2001, the bibliography was distributed sparingly, with notification of issue publication being mailed out in replacement of the physical issue in most instances. Web-based access of the bibliography grew accordingly, as anticipated.

Denise Landry, LUMCON Librarian, compiled the first three issues of the bibliography. Ms. Landry's successor as LUMCON Librarian, Jacqueline Riley, prepared the October 1990 through January 1993 issues. Sue Ann Lewandowski, Ms. Riley's successor, prepared the April 1993 through October 1994 issues and edited the first cumulative bibliography. Ms. Lewandowski was succeeded by Christopher Hooper-Lane, who compiled the January 1995 through April 1997 issues. Shanna Bonvillain, LUMCON Library Assistant Librarian, compiled the July 1997 issue with the assistance of Glenda Carter. Shanna Bonvillain and Mr. Hooper-Lane's successor, Donna Rice, compiled the second cumulative bibliography, as well as the January 1998-April 1999 quarterly issues. Shanna Bonvillain, in the absence of a Librarian, compiled the July 1999 to April 2000 quarterly issues, with occasional help from Dr. Quay Dortch. John Conover, Ms. Rice's successor as LUMCON Librarian, compiled the July 2000 quarterly issue and edited the third cumulative bibliography with the assistance of Shanna Bonvillain. Mr. Conover, with the assistance of Shanna Duhon, compiled all quarterly issues from January 2001 to October 2004, as well as the final cumulative publication.

The bibliography was compiled at the Louisiana Universities Marine Consortium's Marine Center Library (LUMCON Library) on a *Microsoft* SQL server and uploaded to *Microsoft Word for Windows* for editing. The quarterly issues were formatted, photocopied, and mailed out from the LUMCON Library.

Contained in the following bibliography are citations from approximately 2000 through 2004.

The citations are arranged by main entry, which is author, if known, and title if there is no acknowledged author or if the author's name was unavailable to the bibliographers. Corporate author citations were used whenever appropriate. The title main entry citations are listed at the beginning of each of the five sections followed by the author main entry citations.

The bibliography is alphabetized in an order represented by the example in Table 1.

Table 1. Example of Alphabetization.
(The first few words of hypothetical citations are listed.)

1 tanker…	LAB Laboratories	Nednor, G.
1 a becomes the…	LaBrea, L.	The next phase…
96 sites…	MacAllister, T.	Norton, J. C.
Abernathy, C.	MacPherson, A. J.	A novel plan…
Al-Ahmed, M.	McMahon, S.	US Congress, Director…
Albanny, P. K.	Manuel, A. T.	US Congress, Office of…
Al-Sarif, B.	Manuel, A. T. D.	US Congress, Personnel…
Axon Corporation	Manuel, J.	USA all the way…
Bertram, D. J. M.	NAF database is…	United Industries says…
Bertram-Xavier, A.	NETCO cited in…	
La Link, O.	Nash, C. S.	

Information that appears in square brackets, [], in a citation is tentatively correct. As much information as was available was included.

The majority of citations are to journal articles, books, book chapters, conference proceedings and papers in conference proceedings. A few audio-visual and electronic works are cited and their format is indicated, though the citations are not divided into sections by format.

The broad subject areas covered in the bibliography are biology, chemistry/geochemistry/geology, engineering/physics, environment/ecosystem management/spills, and socioeconomic/regulation/general.

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BIOLOGY

Al-Hassan, J. M.; Afzal, M.; Chava, V. N. R.; Fayad, S. **Hydrocarbon pollution in the Arabian Gulf catfish.** *Bulletin of Environmental Contamination and Toxicology*. 2001; 66 (5):646-652. ISSN: 0007-4861.
Arabian Gulf catfish (*Arius bilineatus*) were caught in several locations, and liver, gills and muscle were tested for the presence of PAHs. Authors note that catfish caught at collection sites with mud bottoms had higher levels of PAHs than those fish caught on hard bottom sites associated with coral colonies, suggesting that bottom sediments act as a reservoir for hydrocarbon pollutants.

Al-Hassan, J. M.; Afzal, M.; Rao, C. V. N.; Fayad, S. **Petroleum hydrocarbon pollution in sharks in the Arabian Gulf.** *Bulletin of Environmental Contamination and Toxicology*. 2000; 65 (3):391-398. ISSN: 0007-4861.
Sharks are used as bioindicators in this study to determine hydrocarbon pollution in the Gulf waters. Determining exposure rates in sharks is important because of their consumption by humans, especially in this region.

Al-Hassan, J. M.; Afzal, M.; Rao, C. V. N.; Fayad, S. **Polycyclic aromatic hydrocarbons (PAHs) and aliphatic hydrocarbons (AHs) in edible fish from the Arabian Gulf.** *Bulletin of Environmental Contamination and Toxicology*. 2003; 70 (2):205-212. ISSN: 0007-4861.
Twelve species of edible demersal fish, pelagic fish, and shrimp were collected and gill, liver, and muscle samples were assessed for evidence of ongoing hydrocarbon accumulation. Evidence shows PAH and AH accretion over time, which can be hazardous to local fish consumers.

Al-Mohanna, M. M. **Effect of aromatic hydrocarbons on the liver of five different species of fishes along a Red Sea Coast of Jeddah and Gizan.** *Journal of Environmental Biology*. 2000; 21 (4):287-292. ISSN: 0254-8704.

Al-Rasheid, K. A. S. **A review of marine and brackish water interstitial ciliates from the Arabian Gulf, its offshore islands and Al Hassa Oasis with notes on their ecological status and recovery after the 1991 Gulf War oil spill.** *Arab Gulf Journal of Scientific Research*. 1999; 17 (2):336-368. ISSN: 1015-4442.

Al-Thukair, Assad A. **Effect of oil pollution on euendolithic cyanobacteria of the Arabian Gulf.** *Environmental Microbiology*. 2002; 4 (2):125-129. ISSN: 1462-2912.
Data collected between 1989 and 1992 demonstrated the effects of crude oil on community profiles of cyanobacteria found at various depths in the Arabian Gulf. The lack of attempts to clean up or restore these contaminated areas guarantees that population dynamics will be impacted into the future.

Amodio-Cocchieri, Renata; Grillo, Teresa. **Aliphatic hydrocarbons in biota from the Gulf of Naples (Italy).** *Marine Pollution Bulletin*. 2003; 46 (3):374-377. ISSN: 0025-326X.
Monthly samples of biota were taken from three zones, established along the Gulf of Naples, during the period of May to November 2000. Data compiled from these sites were analyzed for levels of hydrocarbon contaminants in the environment, and were used to determine aliphatic hydrocarbon concentrations in relation to shellfish and individual fish species.

Anderson, O. R.; Gorrell, T.; Bergen, A.; Kruzansky, R.; Levandowsky, M. **Naked amoebas and bacteria in an oil-impacted salt marsh community.** *Microbial Ecology*. 2001; 42 (3):474-481. ISSN: 0095-3628.
A microcosm experiment was conducted using amoeba populations to determine community concentrations in highly oil-impacted sediments and then compare those dynamics to populations in unimpacted oil sediments.

Annavarapu, S.; Foran, C. M.; Gardinali, P.; Metzger, C.; Willett, Kristine L. **Comparison of two sites in Mobile Bay using *in vivo* biomarkers in largemouth bass, sediment bioassays, and sediment contaminant analysis.** *Archives of Environmental Contamination and Toxicology*. 2004; 46 (4):502-510. ISSN: 0090-4341.
EROD activity was found to be higher in older bass caught at two sites in Mobile Bay, but no residual change in testosterone or estradiol was observed in all fish sampled. Sediment analysis discovered some PAH contamination, but researchers believe that chemical and biomarker analyses, when combined, suggest low contamination at the sites tested.

BIOLOGY

Ansari, Zakir Ali; Ingole, Baban. **Effect of an oil spill from *M V Sea Transporter* on intertidal meiofauna at Goa, India.** *Marine Pollution Bulletin*. 2002; 44 (5):396-402. ISSN: 0025-326X.
Immediately after an oil spill, a significant reduction in the abundance of meiofauna was recorded. Community densities of nematodes and harpacticoid copepods were most affected, as they comprised the majority of fauna in the study area. Long-term assessment did not demonstrate significant effects on population levels of resident species.

Archambault, D. J; Slaski, J. J.; Li, X.; Winterhalder, K. **A rapid, sensitive, seedling-based bioassay for the determination of toxicity of solid and liquid substrates and plant tolerance.** *Soil & Sediment Contamination*. 2004; 13 (1):53-63. ISSN: 1532-0383.
Authors describe the development of a seedling-based bioassay, a method that can work with a wide variety of plant species. With this approach, ecotoxicological data can be understood in terms of the integrative effects of biological, chemical and physical dynamics of soil on seedling growth.

Arzuaga, Xabier; Elskus, Adria. **Evidence for resistance to benzo[a]pyrene and 3,4,3 ' 4 '-tetrachlorobiphenyl in a chronically polluted *Fundulus heteroclitus* population.** *Marine Environmental Research*. 2002; 54 (3-5):247-251. ISSN: 0141-1136.
HAH-resistant fish were examined to better understand the role of enzymes in resistance to the toxicological effects of environmental pollutants. The aryl hydrocarbon receptor is thought to control the lack of CYP1A induction in the fish studied in this investigation.

Au, D. W. T. **The application of histo-cytopathological biomarkers in marine pollution monitoring: a review.** *Marine Pollution Bulletin*. 2004; 48 (9-10):817-834. ISSN: 0025-326X.
In this review, the author critiques the use of histo-cytopathological biomarkers and includes the reliability, advantages and limitations of their use in pollution monitoring studies.

Baars, Bert-Jan. **The wreckage of the oil tanker '*Erika*'-human health risk assessment of beach cleaning, sunbathing and swimming.** *Toxicology Letters*. 2002; 128 (1):55-68. ISSN: 0378-4274.
Human health risks to the oil pollution from the *Erika* spill were limited to those who aided in the cleanup. Exposure of oil to skin resulted in skin irritation and dermatitis.

Ballachey, B. E.; Bodkin, J. L.; Howlin, S.; Doroff, A. M.; Rebar, A. H. **Correlates to survival of juvenile sea otters in Prince William Sound, Alaska, 1992-1993.** *Canadian Journal of Zoology - Revue Canadienne de Zoologie*. 2003; 81 (9):1494-1510. ISSN: 0008-4301.
Survival rates of juvenile sea otters were compared among groups occupying either oiled or nonoiled areas. Oiling history and length of occupation in a given area were found to influence juvenile survival rates. Blood analysis suggests liver damage of otters in oiled areas, possibly due to continued exposure to contaminants.

Banks, Patrick D.; Brown, Kenneth M. **Hydrocarbon effects on fouling assemblages: the importance of taxonomic differences, seasonal, and tidal variation.** *Marine Environmental Research*. 2002; 53 (3):311-326. ISSN: 0141-1136
Exposure of hydrocarbons to three marine species (bryozoans, oysters and barnacles) focused on recruitment, settlement of larvae, and growth. Recruitment in bryozoans was inhibited by the pollutant, but not in the two other species. Hydrocarbon exposure negatively impacted the survival of oyster larvae and settlement and growth of oyster spat.

Banta, Gary. T.; Andersen, Ole. **Bioturbation and the fate of sediment pollutants - experimental case studies of selected infauna species.** *Vie et Milieu*. 2003; 53 (4):233-248. ISSN: 0240-8759.
Authors review results of recent research on the effects of bioturbation and fate of sediment pollutants on polychaetes. They conclude by recommending the use of models to better predict the effects of interactions between infauna and pollutant fate.

BIOLOGY

Barlow, M. J.; Kingston, P. F. **Observations on the effects of barite on the gill tissues of the suspension feeder *Cerastoderma edule* (Linné) and the deposit feeder *Macoma balthica* (Linné).** *Marine Pollution Bulletin*. 2001; 42 (1):71-76. ISSN: 0025-326X.
During an 8 day experiment, *C. edule*, a suspension feeder, and *M. balthica*, a deposit feeder, were treated with daily doses of 1, 2, and 3-mm depth equivalents of barite, to determine the effects of the drilling muds on overall gill condition. Damage to gill tissues of both species was clearly apparent from both the qualitative observations and quantitative measurements.

Barra, R.; Sanchez-Hernandez, J. C.; Orrego, R.; Parra, O.; Gavilan, J. F. **Bioavailability of PAHs in the Biobio river (Chile): MFO activity and biliary fluorescence in juvenile *Oncorhynchus mykiss*.** *Chemosphere*. 2001; 45 (4-5):439-444. ISSN: 0045-6535.
Levels of bile PAH metabolites and cytochrome P450-dependent monooxygenase (MFO) activity were measured in fish exposed to PAH fractions in the Biobio river. After monitoring for and discovering MFO activity and PAH metabolites in the fish, the authors conclude that these two screening methods are excellent for assessing PAH exposure.

Barseine, Janina. **Genotoxic impacts in Klaipeda Marine port and Butinge oil terminal areas (Baltic Sea).** *Marine Environmental Research*. 2002; 54 (3-5):475-479. ISSN: 0141-1136.
Cytogenetic damage was found in the gonadal and somatic cells of marine snails, crustaceans, and mussels taken from areas with sediments known to be contaminated by oil-related activities.

Barth, Hans-Jörg. **The influence of cyanobacteria on oil polluted intertidal soils at the Saudi Arabian Gulf shores.** *Marine Pollution Bulletin*. 2003; 46 (10):1245-1252. ISSN: 0025-326X.
Cyanobacteria prevent the microbial degradation of oils and subsequent macrofaunal settlement. For this reason, the author looked at the processes following establishment of cyanobacterial mats and events that lead to changes towards resettlement by macrofauna and benthic organisms.

Basu, Niladri et al. **Ethoxyresorufin-*O*-deethylase induction in trout exposed to mixtures of polycyclic aromatic hydrocarbons.** *Environmental Toxicology and Chemistry*. 2001; 20 (6):1244-1251. ISSN: 0730-7268.
Differences were noted in exposure levels and EROD induction between PAHs that behave similarly and PAHs of different potencies. Authors conclude that risk assessment for these groups of PAHs require either induction equivalency factors (for the former) or bioassays (for the latter).

Baun, Anders; Justesen, Kasper B.; Nyholm, Niels. **Algal tests with soil suspensions and elutriates: a comparative evaluation for PAH-contaminated soils.** *Chemosphere*. 2002; 46 (2):251-258. ISSN: 0045-6535.
Algal tests are recommended as a supplement to elutriate testing of soil suspensions, because of the sensitivity to pollutants and their effect on reproductive success of the algae. Further development of algal testing should result in a cost-effective screening method for contaminants in soil.

Baussant, Thierry; Sanni, Steiner; Jonsson, Grete; Skadsheim, Arnfinn; Børseth, Jan Fredrek. Bioaccumulation of polycyclic aromatic compounds: 1. **Bioconcentration in two marine species and in semipermeable membrane devices during chronic exposure to dispersed crude oil.** *Environmental Toxicology and Chemistry*. 2001; 20 (6):1175-1184. ISSN: 0730-7268.
A continuous-flow system was used in experiments to simulate dispersed oil in a marine environment. Investigations revealed that bioaccumulation of types of PAHs differed between blue mussels and turbot, possibly due to biological and ecological factors.

Beckett, K. J.; Aulerich, R. J.; Duffy, L. K.; Patterson, J. S.; Bursian, S. J. **Effects of dietary exposure to environmentally relevant concentrations of weathered Prudhoe Bay crude oil in ranch-raised mink (*Mustela vison*).** *Bulletin of Environmental Contamination and Toxicology*. 2002; 69 (4):593-600. ISSN: 0007-4861.
Mink exposed to crude oil in diets showed effects of anemia and possible protein malnutrition. Data also suggested altered kidney and/or liver function, although this was not confirmed by histological evidence.

BIOLOGY

Beg, M. U. et al. **Biomarker response in sheim (*Acanthopagrus latus*) exposed to polycyclic aromatic hydrocarbons.** *Bulletin of Environmental Contamination and Toxicology*. 2001; 67 (2):210-216. ISSN: 0007-4861.
Cultured sheim, a native fish of the Arabian Gulf, were used as biomarkers to establish a dose-response relationship for the use of biomonitoring PAH pollution in the marine environment.

Behrens, A.; Schirmer, K.; Bols, N. C.; Segner, H. **Polycyclic aromatic hydrocarbons as inducers of cytochrome P4501A enzyme activity in the rainbow trout liver cell line, RTL-W1, and in primary cultures of rainbow trout hepatocytes.** *Environmental Toxicology and Chemistry*. 2001; 20 (3):632-643. ISSN: 0730-7268.
Nine PAHs were tested to compare the induction of cytochrome P4501A in primary hepatocytes and the liver cell line, RTL-W1. The RTL-W1 cell line was found to be substantially more sensitive in its EROD response, compared to primary hepatocytes.

Ben-David, Merav; Blundell, Gail M.; Blake, John E. **Post-release survival of river otters: effects of exposure to crude oil and captivity.** *Journal of Wildlife Management*. 2002; 66 (4):1208-1223. ISSN: 0022-541X.
Authors studied the effect of rehabilitation on post-release survivability of river otters in Prince William Sound, Alaska.

Ben-David, Merav; Duffy, Lawrence K.; Bowyer, R. Terry. **Biomarker responses in river otters experimentally exposed to oil contamination.** *Journal of Wildlife Diseases*. 2001; 37 (3):489-508. ISSN: 0090-3558.
Biomarker responses were studied in river otters that inhabited oiled and non-oiled shores in Prince William Sound following the *Exxon Valdez* oil spill. Investigators explored the effects of crude oil contamination on river otters experimentally. Researchers hypothesize that exposure to oil would result in elevated values of biomarkers, indicating induced physiological stress.

Ben-David, Merav; Williams, T. M.; Ormseth, O. A. **Effects of oiling on exercise physiology and diving behavior of river otters: a captive study.** *Canadian Review of Zoology - Revue Canadienne de Zoologie*. 2000; 78 (8):1380-1390. ISSN: 0008-4301.
Following the *Exxon Valdez* oil spill, investigations compared otters living on non-oiled shores to otters living in the contaminated areas of Prince William Sound. These observed differences between river otters from oiled shores and those from non-oiled areas strongly suggest that oil contamination had an effect on physiological and behavioral processes in otters.

Bergen, A.; Alderson, C.; Bergfors, R.; Aquila, C.; Matsil, M. A. **Restoration of a *Spartina alterniflora* salt marsh following a fuel oil spill, New York City, NY.** *Wetlands Ecology and Management*. 2000; 8 (2-3):185-195. ISSN: 0923-4861.
In 1990 a broken underwater pipeline spilled 2.5 million liters of No. 2 fuel oil into the Arthur Kill, a tidal strait separating Staten Island, New York from the State of New Jersey. This fuel oil spill caused catastrophic damage and destruction of 8 ha of *Spartina alterniflora*, and the mortality of 684 birds. The restoration of *S. alterniflora* was critical because of its fixed carbons source in the intertidal zone, and to the wading birds that bred on regionally significant island rookeries and fed in area salt marsh.

Beyrem, H.; Aissa, P. **Free-living nematodes, bio-indicators of the evolution of hydrocarbon concentrations in the bay of Bizerta (Tunisia).** *Cahiers de Biologie Marine*. 2000; 41 (3):329-342. ISSN: 0007-9723.
Authors found a significant decrease in the numbers and types of nematodes between 1992 and 1996. Research also discovered that, after an apparent improvement in the quality of wastewaters, the amount of hydrocarbons in sediment actually increased, further affecting the nematode community.

BIOLOGY

Bhattacharyya, S.; Klerks, Paul L.; Nyman, John A. **Toxicity to freshwater organisms from oils and oil spill chemical treatments in laboratory microcosms.** *Environmental Pollution*. 2003; 122 (2):205-215. ISSN: 0269-7491.
South Louisiana crude and diesel fuel were tested on *Chironomus tentans*, *Daphnia pulex*, and *Oryzias latipes* for toxicity and changes in toxicity with cleaner or dispersant added in additional experiments. Investigators found that the addition of cleaner and dispersants did not help the survivability of the benthic and water column organisms used in this study.

Binelli, A.; Provini, A. **POPs in edible clams from different Italian and European markets and possible human health risk.** *Marine Pollution Bulletin*. 2003; 46 (7):879-886. ISSN: 0025-326X.
Commercially available clams collected from Atlantic, Mediterranean and Adriatic waters were analyzed for a number of contaminants, including PAHs. B(a)P concentrations were relatively high in some samples, which authors stress could be a potential health hazard to humans.

Blanchard, Arny L.; Feder, Howard M.; Shaw, David G. **Variations in benthic fauna underneath an effluent mixing zone at a marine oil terminal in Port Valdez, Alaska.** *Marine Pollution Bulletin*. 2003; 46 (12):1583-1589. ISSN: 0025-326X.
Polychaetes were used as biomarkers to assess spatial and temporal characteristics of hydrocarbon distributions in sediments below the permitted mixing zone in areas of disposed treated ballast waters. Researchers found only minor accumulations of hydrocarbons, leading to the conclusion that outside of pockets of high levels of PAHs, resident organisms were not stressed by the presence of residual hydrocarbons.

Bodkin, J. L. et al. **Sea otter population status and the process of recovery from the 1989 '*Exxon Valdez*' oil spill.** *Marine Ecology - Progress Series*. 2002; 241;237-253. ISSN: 0171-8630.
Sea otter recovery lagged behind averages in areas where initial oil effects were greatest, perhaps due to residual spill effects.

Bodour, Adria A.; Wang, Jiann-ming; Brusseau, Mark L.; Maier, Raffia M. **Temporal change in culturable phenanthrene degraders in response to long-term exposure to phenanthrene in a soil column system.** *Environmental Microbiology*. 2003; 5 (10):888-895. ISSN: 1462-2912.
Examination of pre- and post-PAH contaminated soil showed substantial changes in phenanthrene degrading microbial community structure. From this research, researchers isolated 25 different types from 19 genera, eight of which were not previously known to degrade phenanthrene.

Boehm, Paul D.; Neff, Jerry M.; Page, David S. Letter to the editor: Jewett, Stephen C., Dean, Thomas A., Woodin, Bruce R., Hoberg, Max K., Stegeman, John J. (2002). **Exposure to hydrocarbons 10 years after the *Exxon Valdez* oil spill: evidence from cytochrome P4501A expression and biliary FACs in nearshore demersal fishes.** Marine Environmental Research 54, 21-48. *Marine Environmental Research*. 2003; 55 (5):459-461. ISSN: 0141-1136.
Researchers challenge the authors in the above referred study to provide evidence for their logistical findings of persistent background hydrocarbons found in biota that live in the intertidal and subtidal regions of Prince William Sound, Alaska, 10 years following the *Exxon Valdez* oil spill.

Bonacci, S.; Corsi, I.; Chiea, R.; Regoli, F.; Focardi, S. **Comparative induction of liver EROD and BaPMO activities in European eel (*Anguilla anguilla*) by benzo[a]pyrene and 2,3,7,8-tetrachlorodibenzo-p-dioxin: a laboratory study.** *Polycyclic Aromatic Compounds*. 2003; 23 (4):377-400. ISSN: 1040-6638.
Research was undertaken on European eels to assess changes in EROD and benzo(a)pyrene monooxygenase (BaPMO) levels related to increasing exposure to contaminants, including PAHs. Results suggest dose-related changes in enzymatic activities, with higher induction for EROD than BaPMO.

BIOLOGY

Botello, A. V.; García-Ruelas, C.; Ponce-Vélez, G. **PAH levels in bivalve mollusks from the Mexican Subtropical Pacific.** *Bulletin of Environmental Contamination and Toxicology*. 2002; 69 (4):486-493. ISSN: 0007-4861.
PAH levels were collected for various bivalve species. Data was compared to previously published information from the same geographical location, showing higher concentrations in the species than those reported in earlier studies.

Boveng, Peter L.; Bengston, John L.; Withrow, David E.; Cesarone, Jack C.; Simpkins, Michael A. **The abundance of harbor seals in the Gulf of Alaska.** *Marine Mammal Science*. 2003; 19 (1):111-127. ISSN: 0824-0469.
Aerial surveys were conducted under optimal conditions during the hauling out period of harbor seals in the Gulf of Alaska to ascertain the causes for population declines in recent decades at several Alaskan locations.

Bowyer, R. Terry et al. **Effects of the *Exxon Valdez* oil spill on river otters: injury and recovery of a sentinel species.** *Wildlife Monographs*. 2003; 153;1-53. ISSN: 0084-0173.
In comparing data on river otters sampled from heavily oiled and lightly oiled areas, researchers found that individuals in the former areas had lower body mass, elevated biomarkers, higher levels of fecal porphyrins, less diverse diets, and different habitat selection habits than otters found in the latter sites.

Brack, Werner.; Schirmer, K. **Effect-directed identification of oxygen and sulfur heterocycles as major polycyclic aromatic cytochrome P4501A-inducers in a contaminated sediment.** *Environmental Science & Technology*. 2003; 37 (14):3062-3070. ISSN: 0013-936X.
Rainbow trout were exposed to PAHs from contaminated sediments and a combination of tests, including liver cell line bioassay, a multistep fractionation procedure, and chemical characterization methods were used to identify major CYP1A1-inducing compounds.

Brandt, Charles A.; Becker, James M.; Porta, Augusto. **Distribution of polycyclic aromatic hydrocarbons in soils and terrestrial biota after a spill of crude oil in Trecate, Italy.** *Environmental Toxicology and Chemistry*. 2002; 21 (8):1638-1643. ISSN: 0730-7268.
Researchers investigated long-term effects of PAH pollution in soil following a blowout at an oil well. The three-year study focused on biota-soil accumulation factors in plant and animal species in the immediate area within the release of crude oil.

Brannon, E. L. **Perception or reality: oil spill risks on salmon.** *In* Garcia-Martinez, R.; Brebbia, C. A. (Eds.). *Oil and Hydrocarbon Spills, Modelling, Analysis and Control*. Billerica, Ma.: Computational Mathematics, Inc.; 1998; p. 241-252. ISBN: 1-85312-526-1.
The author argues that, due to several factors, the long-term risk of salmon exposed to oil following the *Exxon Valdez* spill is not as bad as reported by governmental agencies.

Brannon, Ernest L.; Collins, Keya C. M.; Moulton, Lawrence L.; Parker, Keith R. **Resolving allegations of oil damage to incubating pink salmon eggs in Prince William Sound.** *Canadian Journal of Fisheries and Aquatic Sciences*. 2001; 58 (6):1070-1076. ISSN: 0706-652X.
Data subsets of mortality rates for incubating pink salmon eggs were taken by the Alaska Department of Fish and Game, following the *Exxon Valdez* oil spill. This data was re-analyzed to resolve allegations of increased mortality rates due to oil damage. New data subsets show that a higher rate of fatalities was induced from early sample timing in the oiled areas. Therefore, the increased egg mortality was misinterpreted as an oil-related fatality.

Bredholt, Harald; Bruheim, Per; Potocky, Martin; Eimhjellen, Kjell. **Hydrophobicity development, alkane oxidation, and crude-oil emulsification in a *Rhodococcus* species.** *Canadian Journal of Microbiology*. 2002; 48 (4):295-304. ISSN: 0008-4166.
Results of research on *Rhodococcus* sp. support the likelihood that oil-emulsifying bacteria are simultaneous inducers of an alkane oxidation system and cell-surface hydrophobicity. In addition, growth substrate and growth phase in this species are critical to oil emulsion.

BIOLOGY

Brils, Jos M. et al. **Oil effect in freshly spiked marine sediment on *Vibrio fischeri*, *Corophium volutator* and *Echinocardium cordatum*.** *Environmental Toxicology and Chemistry*. 2002; 21 (10):2242-2251. ISSN: 0730-7268.
Authors determine lethal rates of exposure of gasoil fractions on specific marine organisms. Results indicate that toxicity seems to be correlated with low oil boiling-point fractions within the C10-C19 range.

Brown, Amanda. **Study aims to help oil-spill seabirds.** *Press Association Newsfile*. Press Association Limited; December 5, 2000.
A new study aimed at improving the survival rate of seabirds caught in oil spills was launched by an animal charity. The RSPCA project will compare different ways of caring for the birds in captivity, in order to improve their chances of survival.

Brown, B. E. **The significance of pollution in eliciting the 'bleaching' response in symbiotic cnidarians.** *International Journal of Environment and Pollution*. 2000; 13 (1-6):392-415. ISSN: 0957-4352.

Cabello, Marta Noemí. ***Glomus tortuosum* (Glomales), an arbuscular-mycorrhizal fungus (AMF) isolated from hydrocarbon-polluted soils.** *Nova Hedwigia*. 2001; 73 (3-4):513-519. ISSN: 0029-5035.
This paper describes morphological features of a species of fungus, noted for its high tolerance of hydrocarbon pollution.

Callaham, Mac A.; Stewart, Arthur J.; Alarcón, Clara; McMillen, Sara J. **Effects of earthworm (*Eisenia fetida*) and wheat (*Triticum aestivum*) straw additions on selected properties of petroleum-contaminated soils.** *Environmental Toxicology and Chemistry*. 2002; 21 (8):1658-1663. ISSN: 0730-7268.
The presence of *E. fetida* and straw improved soil quality and plant root growth in petroleum-contaminated soil. Authors believe that appropriate combinations of plant species, wheat straw, and earthworms can be effective in reducing hydrocarbon concentrations in soils undergoing phytoremediation.

Camphuysen, C. J.; Heubeck, M. **Marine oil pollution and beached bird surveys: the development of a sensitive monitoring instrument.** *Environmental Pollution*. 2001; 112 (3):443-461. ISSN: 0269-7491.
After showing a correlation between oiled birds found during beached bird surveys and the existence of offshore oil pollution in the North Sea, authors discuss ways of improving the monitoring of beached birds. Suggestions include surveying by foot, accurate species identification, along with age and sex of bird, and marking birds to avoid double counting.

Camus, Lionel et al. **Biomarker responses and PAH uptake in Mya truncata following exposure to oil-contaminated sediment in an Arctic fjord (Svalbard).** *Science of the Total Environment*. 2003; 308 (1-3):221-234. ISSN: 0048-9697.
Researchers placed arctic clams in crude oil-contaminated sediment and measured rates of response in respiration, plasma stability of hemocytes, and total oxyradical scavenging capacity to assess oxidative stress in bivalves exposed to PAHs.

Camus, Lionel; Jones, M. B.; Børseth, Jan Fredrik; Depledge, M. H. **Heart rate, respiration and total oxyradical scavenging capacity of the Arctic spider crab, *Hyas araneus*, following exposure to polycyclic aromatic compounds via sediment and injection.** *Aquatic Toxicology*. 2002; 61 (1-2):1-13. ISSN: 0166-445X.
Arctic spider crabs were exposed to oil to understand the bioavailability of the pollutant on organisms at cold temperatures. Investigators noted a limited toxic effect possibly due to low uptake and metabolism.

Carballeira, A. **Considerations in the design of a monitoring program of the biological effects of the *Prestige* oil spill.** *Ciencias Marinas*. 2003; 29 (1):123-139. ISSN: 0185-3880.
An environmental risk assessment design has been applied to regions of the Iberian Coast suffering devastating effects from the *Prestige* oil spill. Aspects of the design include analyses of the environment's ability to immobilize pollutants, the capacity of microorganisms to metabolize hydrocarbons, and the biodegradation rate of weathered PAHs.

BIOLOGY

Carls, Mark G. et al. **Persistence of oiling in mussel beds after the *Exxon Valdez* oil spill.** *Marine Environmental Research*. 2001; 51 (2):167-190. ISSN: 0141-1136.
Mussel beds and sediment from both Prince William Sound and the Gulf of Alaska were monitored between the years 1992 and 1995. Results show that hydrocarbon concentrations in both sediment and mussels were still higher than background levels in the last year of the study, indicating continuing contamination.

Carls, Mark G.; Holland, Larry G.; Short, Jeffrey W.; Heintz, Ron A.; Rice, Stanley D. **Monitoring polynuclear aromatic hydrocarbons in aqueous environments with passive low-density polyethylene membrane devices.** *Environmental Toxicology and Chemistry*. 2004; 23 (6):1416-1424. ISSN: 0730-7268.
Laboratory and field investigations confirm that polyethylene membrane devices (PEMDs) not filled with trioleine work well as passive environmental samplers.

Carls, Mark G.; Hose, Jo Ellen; Thomas, Robert E.; Rice, Stanley D. **Exposure of pacific herring to weathered crude oil: assessing effects on ova.** *Environmental Toxicology and Chemistry*. 2000; 19 (6):1649-1659. ISSN: 0730-7268.
In experiments covering a 16 day period, mature Pacific herring (*Clupea pallasi*) and herring eggs were exposed to PAHs. Exposure of contaminants to mature herring did not have any general affect on their progeny, but exposed eggs did show critical sensitivity to PAHs during cell division and growth.

Carls, Mark. G.; Marty, G. D.; Hose, Jo Ellen. **Synthesis of the toxicological impacts of the *Exxon Valdez* oil spill on Pacific herring (*Clupea pallasi*) in Prince William Sound, Alaska, USA.** *Canadian Journal of Fisheries and Aquatic Sciences*. 2002; 59 (1):153-172. ISSN: 0706-652X.
Published data from industry and government sources was compared and reinterpreted in order to understand short- and long-term effects of the *Exxon Valdez* oil spill on Pacific herring.

Carlson, E. A.; Li, Y.; Zelikoff, J. T. **The Japanese medaka (*Oryzias latipes*) model: applicability for investigating the immunosuppressive effects of the aquatic pollutant benzo[a]pyrene (BaP).** *Marine Environmental Research*. 2002; 54 (3-5):565-568. ISSN: 0141-1136.
The role of the AhR pathway in mediating B(a)P-induced immunotoxicity in fish was investigated. Authors found that the mechanisms by which B(a)P affects immune responses in mammals also occur in fish.

Carlson, Ruth I. et al. **Ecotoxicological risks associated with land treatment of petrochemical wastes. II. Effects on hepatic phase I and phase II detoxification enzymes in cotton rats.** *Journal of Toxicology and Environmental Health - Part A* . 2003; 66 (4):327-343. ISSN: 1528-7394.
Induction of hepatic EROD and MROD in cotton rats collected near treatment sites suggests exposure to polyaromatic hydrocarbons.

Casavant, N. Carol; Thompson, Dan; Beattie, Gwyn A.; Phillips, Gregory J.; Halverson, Larry J. **Use of a site-specific recombination-based biosensor for detecting bioavailable toluene and related compounds on roots.** *Environmental Microbiology*. 2003; 5 (4):238-249. ISSN: 1462-2912.
Authors create and describe a plasmid-based genetic system capable of being used as a biosensor that detects the presence of toluene-related compounds in bacteria exposed to environmental contaminants.

Castro, Roberto. **Toxicity of Dispersants and Dispersed Oil to Marine Organisms.** Thesis (M.S.): Texas A&M University--Kingsville; 1999;99 leaves.

Cavalca, L. et al. **Survival and naphthalene-degrading activity of *Rhodococcus* sp. strain 1BN in soil microcosms.** *Journal of Applied Microbiology*. 2002; 92 (6):1058-1065. ISSN: 1364-5072.
The existence of a dynamic naphthalene-degrading bacterial population did not impede the survival and subsequent growth of a microbial strain that enhanced the rate of mineralization.

BIOLOGY

Cavret, Séverine; Laurent, Claire; Feidt, Cyril; Laurent, François; Rychen, Guido. **Intestinal absorption of ^{14}C from ^{14}C-phenanthrene, ^{14}C-benzo[a] pyrene and ^{14}C-tetrachlorodibenzo-para-dioxin: approaches with the Caco-2 cell line and with portal absorption measurements in growing pigs.** *Reproduction Nutrition Development*. 2003; 43 (2):145-154. ISSN: 0926-5287.

Certik, Milan; Dercova, Katarina; Sejakova, Zuzana; Findova, Michaela; Jakubik, Tibor. **Effect of polyaromatic hydrocarbons (PAHs) on the membrane lipids of bacterial cell.** *Biologia, Bratislava*. 2004; 58 (6):1111-1117. ISSN: 0006-3088.

Cheung, C. C. C.; Zheng, G. J.; Li, A. M. Y.; Richardson, B. J.; Lam, P. K. S. **Relationships between tissue concentrations of polycyclic aromatic hydrocarbons and antioxidative responses of marine mussels, *Perna viridis*.** *Aquatic Toxicology*. 2001; 52 (3-4):189-203. ISSN: 0166-445X.
Mussels were taken from relatively clean sites and placed in polluted areas around the island of Hong Kong in a 30-day experiment. Researchers note that the majority of antioxidant responses correlated with increased PAH concentrations in mussel tissue.

Chial, Belgis Z.; Persoone, Guido; Blaise, Christian. **Cyst-based toxicity tests. XVIII. Application of ostracodtoxkit microbiotest in a bioremediation project of oil-contaminated sediments: sensitivity comparison with *Hyalella azteca* solid-phase assay.** *Environmental Toxicology*. 2003; 18 (5):279-283. ISSN: 1520-4081.
Three sample periods over 21 weeks monitored sensitivity of the ostracod *Heterocypris incongruens* in toxicity tests compared with a species of amphipod. Results suggest that the ostracod microbiotest can successfully be used for routine monitoring of contaminated sediments.

Ching, Eric W. K. et al. **DNA adduct formation and DNA strand breaks in green-lipped mussels (*Perna viridis*) exposed to benzo[a]pyrene: dose- and time-dependent relationships.** *Marine Pollution Bulletin*. 2001; 42 (7):603-610. ISSN: 0025-326X.
Results from experiments controlling B(a)P levels and duration of exposure in green-lipped mussels suggest that there is not a correlation between DNA adduct activity and DNA strand breaks. The occurrence and relationship between these two anomalies should be better understood before being considered as a biomarker in pollution monitoring.

Choi, Jonghoon. **Mechanistic Studies of the Phototoxicity of Polycyclic Aromatic Hydrocarbons Using the Topminnow (*Poeciliopsis lucida*) Hepatoma Cell Line.** Thesis (Ph. D.): Miami University; 2000;159 leaves.

Christensen, Mette; Andersen, Ole; Banta, Gary T. **Metabolism of pyrene by the polychaetes *Nereis diversicolor* and *Arenicola marina*.** *Aquatic Toxicology*. 2002; 58 (1-2):15-25. ISSN: 0166-445X.
Absorption experiments used water-soluble and water-insoluble pyrene metabolites on two marine worm species to monitor rates of bioaccumulation and elimination of the metabolites. *A. marina* increased production of water-soluble metabolites over time, suggesting that it has a PAH metabolizing system.

Clement, Bernard; Muller, Caroline; Verrhiest, Ghislaine. **Influence of exposure conditions on the bioavailability of fluoranthene to *Daphnia magna* (Cladocera).** *Polycyclic Aromatic Compounds*. 2000; 20 (1-4):259-274. ISSN: 1040-6638.
A dual approach (bioavailability and measurement of bioaccumulation) to testing toxicity on daphnids was carried out, suggesting that fluoranthene is acutely toxic, even in dark conditions. Authors note that the presence of microalgae tends to lessen the toxicity to daphnids, although no conclusive evidence could explain why.

Coelho, J.; Rivonkar, C. U.; Bhavesh, N. S.; Jothi, M.; Sangodkar, U. M. X. **Biosurfactants production by the quinoline degrading marine bacterium *Pseudomonas* sp. strain GU 104, and its effect on the metabolism of green mussel *Perna viridis* L.** *Indian Journal of Marine Sciences*. 2003; 32 (3):202-207. ISSN: 0379-5136.

Cohen, A. M.; Nugegoda, D. **Toxicity of three oil spill remediation techniques to the Australian bass *Macquaria novemaculeata*.** *Ecotoxicology and Environmental Safety*. 2000; 47 (2):178-185. ISSN: 0147-6513.
In experiments to compare toxicity rates of remediated oil, fish were exposed to Bass Strait crude oil, dispersed crude oil, burnt crude oil, and 4-chlorophenol.

Cohen, A. M.; Nugegoda, D.; Gagnon, M. M. **Effect of different oil spill remediation techniques on petroleum hydrocarbon elimination in Australian bass (*Macquaria novemaculeata*).** ***Archives of Environmental Contamination and Toxicology.*** 2001; 40 (2):264-270. ISSN: 0090-4341.
Juvenile fish were exposed (via the water column and diet) to the water accommodated fraction of Bass Strait crude oil, chemically dispersed crude oil, and burnt crude oil in experiments lasting 16 days. Analysis of the fish indicated that fish exposed to chemically dispersed crude showed the highest PAH-type metabolite concentrations, from both water column and diet.

Cohen, A. M.; Nugegoda, D.; Gagnon, M. M. **Metabolic responses of fish following exposure to two different oil spill remediation techniques.** *Ecotoxicology and Environmental Safety*. 2001; 48 (3):306-310. ISSN: 0147-6513.
The effects of two remediation techniques on fish were investigated by looking at changes in aerobic and anaerobic enzyme activities. Experiments took place with crude oil water accommodated fraction (WAF) and chemically dispersed crude oil WAF, while changes in cytochrome C oxidase and lactate dehydrogenase were tracked.

Cohen, A.; Gagnon, M. M.; Nugegoda, D. **Biliary PAH metabolite elimination in Australian bass, *Macquaria novemaculeata* following exposure to Bass Strait crude oil and chemically dispersed crude oil.** *Bulletin of Environmental Contamination and Toxicology*. 2003; 70 (2):394-400. ISSN: 0007-4861.
Australian bass were measured for their biliary PAH metabolite concentrations after being exposed to Bass Strait crude oil and chemically dispersed crude oil in a controlled experiment. After a 12 day depuration period in clean seawater, naphthalene-type metabolites had returned to background levels, but high levels of B(a)P-type metabolites remained in the fishes.

Colombo, Anita; Bonfanti, Patrizia; Orsi, Federica; Camatini, Marina. **Differential modulation of cytochrome P-450 1A and P-glycoprotein expression by aryl hydrocarbon receptor agonists and thyroid hormone in *Xenopus laevis* liver and intestine.** *Aquatic Toxicology*. 2003; 63 (2):173-186. ISSN: 0166-445X.
Adult female African Clawed frogs were used to discover the response of CYP450 1A and P-glycoprotein to B(a)P exposure after injection of AHR agonists and a thyroid hormone (T_3). Researchers found that the two mechanisms, one from the liver and the other from intestines, reacted differently to the treatments.

Conrad, A. U.; Comber, S. D.; Simkiss, K. **Pyrene bioavailability; effect of sediment-chemical contact time on routes of uptake in an oligochaete worm.** *Chemosphere*. 2002; 49 (5):447-454. ISSN: 0045-6535.
The amount of bioavailable material in a contaminant was found to decline over time, which influenced uptake rates in a freshwater oligochaete. Researchers propose that the decline in bioavailable compounds occurs in a three-stage process.

Cranford, Peter J. et al. **Modelling potential effects of petroleum exploration drilling on northeastern Georges Bank scallop stocks.** *Ecological Modelling*. 2003; 166 (1-2):19-39. ISSN: 0304-3800.
Numerical models were used to predict the effect of drilling wastes from exploratory drilling on sea scallop communities. The magnitude of impacts on scallop stocks was influenced by time of redistribution and dilution of drilling mud after settling on the seabed.

Crawford, R. J. M. et al. **Initial impact of the *Treasure* oil spill on seabirds off western South Africa.** *South African Journal of Marine Science*. 2000; 22;157-176. ISSN: 0257-7615.

Cronin, Matthew A.; Wickliffe, Jeffrey K.; Dunina, Yelena; Baker, Robert J. **K-*ras* oncogene DNA sequences in pink salmon in streams impacted by the *Exxon Valdez* oil spill: no evidence of oil-induced heritable mutations.** *Ecotoxicology*. 2002; 11 (4): 233-241. ISSN: 0963-9292.
Results of DNA analysis contradict previous published research linking heritable mutations in salmon to oil from the *Exxon Valdez* spill. Authors discuss possible reasons for the difference in results from both experiments.

Crowe, Tasman P.; Smith, Emma L.; Donkin, Peter; Barnaby, Deborah L.; Rowland, Steven J. **Measurements of sublethal effects on individual organisms indicate community-level impacts of pollution.** *Journal of Applied Ecology*. 2004; 41 (1):114-123. ISSN: 0021-8901.
An integrated assessment of ecological stress called scope for growth was applied to a mussel population in an area where unresolved complex mixtures of hydrocarbons reside. Researchers believe that results are an important beginning for understanding complex community relationships in contaminated areas.

Cruz-Rodríguez, Luis A.; Chu, Fu-Lin E. **Heat-shock protein (HSP70) response in the eastern oyster, *Crassostrea virginica*, exposed to PAHs sorbed to suspended artificial clay particles and to suspended field contaminated sediments.** *Aquatic Toxicology*. 2002; 60 (3-4):157-168. ISSN: 0166-445X.
Heat shock protein (HSP70) response was determined in oysters after being exposed to different concentrations of PAHs in suspended clay particles between 5 and 40 days. Researchers found no direct relationship between PAH concentration and HSP70 response.

Cunningham, Laura; Stark, Jonathan S.; Snape, Ian; McMinn, Andrew; Riddle, Martin J. **Effects of metal and petroleum hydrocarbon contamination on benthic diatom communities near Casey Station, Antarctica: an experimental approach.** *Journal of Phycology*. 2003; 39 (3):490-503. ISSN: 0022-3646.
Changes in algal community structure were observed over time after the addition of a number of contaminants, including PAHs, to sediments in three locations in Antarctica.

Danovaro, Roberto. **Benthic microbial loop and meiofaunal response to oil-induced disturbance in coastal sediments: a review.** *International Journal of Environment and Pollution*. 2000; 13 (1-6):380-391. ISSN: 0957-4352.
In this paper, Danovaro synthesizes a wealth of published research on the effects of oil spills in the Mediterranean and the short- and long-term effects on community structure, diversity, and abundance.

de Knecht, Joop A. et al. **Characterization of enzymes involved in biotransformation of polycyclic aromatic hydrocarbons in terrestrial isopods.** *Environmental Toxicology and Chemistry*. 2001; 20 (7):1457-1464. ISSN: 0730-7268.
Experiments were undertaken to study the activities of phase I and II enzymes after exposure to pyrene and 1-hydroxypyrene. Terrestrial isopods were found to have a high, noninductable capacity for biotransformation.

Dean, Thomas A. ; Bodkin, James L.; Jewett, Stephen C.; Monson, Daniel H. ; Jung, D. **Changes in sea urchins and kelp following a reduction in sea otter density as a result of the *Exxon Valdez* oil spill.** *Marine Ecology Progress Series*. 2000; 199;281-291. ISSN: 0171-8630.
A decline in the sea otter population in Prince William Sound offered scientists the opportunity to chart changes over time in densities of their preferred prey, large sea urchins, and kelp, a main food source of sea urchins.

Dean, Thomas A. et al. **Food limitation and the recovery of sea otters following the '*Exxon Valdez*' oil spill.** *Marine Ecology - Progress Series*. 2002; 241;255-270. ISSN: 0171-8630.
The recovery of sea otter populations in heavily oiled areas was not limited by food availability, but other factors associated with anthropogenic disturbances related to the oil spill.

Dean, Thomas A.; Jewett, Stephen C. **Habitat-specific recovery of shallow subtidal communities following the *Exxon Valdez* oil spill.** *Ecological Applications*. 2001; 11 (5):1456-1471. ISSN: 1051-0761.
In this paper researchers focus on those communities associated with eelgrass and kelp beds in the shallow (<11 m) subtidal zone in heavily oiled embayments in western Prince William Sound. In order to properly assess impacts and recovery rates of these nearshore subtidal communities, researchers review previously published data up to 10 years following the *Exxon Valdez* oil spill, and present new information on impacts and recovery of these benthic communities.

DeLaune, Ronald D.; Pezeshki, S. Reza; Jugsujinda, Aroon; Lindau, Charles Wayne. **Sensitivity of US Gulf of Mexico coastal marsh vegetation to crude oil: comparison of greenhouse and field responses.** *Aquatic Ecology*. 2003; 37 (4):351-360. ISSN: 1386-2588.
Native salt marsh plants exposed to South Louisiana and Arabian Medium crude oils reacted differently between greenhouse studies versus field studies. Because plants from the greenhouse studies showed greater short- and long-term impacts to oil exposure, authors caution against using data from these types of studies to predict effects on vegetation in field situations.

den Besten, P. J. et al. **Bioaccumulation and biomarkers in the sea star *Asterias rubens* (Echinodermata: Asteroidea): a North Sea field study.** *Marine Environmental Research*. 2001; 51 (4):365-387. ISSN: 0141-1136.
This article describes two field trips that were carried out in March 1995 and September 1996 to study the relation between biomarkers and accumulation levels in sea stars collected at various stations along pollution gradients in the North Sea.

Deshpande, A. D.; Huggett, R. J.; Halbrook, R. A. **Polycyclic aromatic hydrocarbon metabolites in the bile of a territorial benthic fish, oyster toadfish (*Opsanus tau*) from the Elizabeth River, Virginia.** *Archives of Environmental Contamination and Toxicology*. 2002; 42 (1):43-52. ISSN: 0090-4341.
Authors propose that oyster toadfish should be considered as a sentinel species for early detection of hydrocarbon contamination, due to high levels of PAH metabolites discovered in bile analysis, correlation with existing PAH levels at test sites, and the fact that the fish has a limited migration range.

Di Gregorio, Simona et al. **Identification of two new sets of genes for dibenzothiophene transformation in *Burkholderia* sp DBT1.** *Biodegradation*. 2004; 15 (2):111-123. ISSN: 0923-9820.
Researchers discover genes responsible for the initial steps of oxidative degradation of dibenzothiophene in a microbial strain isolated from oil refinery wastewater.

Donde, S. S.; Nayak, R. R.; Sawant, K. B. **Comparative studies on acute toxicity of water soluble fractions of Persian Gulf and Bombay High crude oil on *Gafrarium divaricatum* (Gmelin).** *Pollution Research*. 2002; 21 (1):31-34. ISSN: 0257-8050.

Donkin, Peter; Smith, Emma L.; Rowland, Steven J. **Toxic effects of unresolved complex mixtures of aromatic hydrocarbons accumulated by mussels, *Mytilus edulis*, from contaminated field sites.** *Environmental Science & Technology*. 2003; 37 (21):4825-4830. ISSN: 0013-936X.
The narcotic effect of PAHs on marine mussels was established after exposure led to a 40% reduction in feeding rates. Similarly, a fraction of unresolved complex mixtures of monoaromatic hydrocarbons given to juvenile mussels reduced feeding rates by 70%.

Drachuk, S. V.; Koksharova, N. V.; Firsov, N. N. **Microflora of soils polluted with petroleum products.** *Russian Journal of Ecology*. 2002; 33 (2):135-137. ISSN: 1067-4136.
Petroleum-polluted soil was analyzed to determine abundances of different types of bacteria and fungi. The number of petroleum-oxidizing bacteria was roughly three orders as great as the number of purple bacteria and fungi. This led investigators to suggest to that nonsulfur purple bacteria could be used as bioindicators of petroleum pollution.

Driskell, William B.; Ruesink, Jennifer L.; Lees, Dennis C.; Houghton, Jonathan P.; Lindstrom, Sandra C. **Long-term signal of disturbance: *Fucus gardneri* after the *Exxon Valdez* oil spill.** *Ecological Applications*. 2001; 11 (3):815-827. ISSN: 1051-0761.
The explosive growth of brown algae, followed by a subsequent decline in presence after the EVOS, was investigated. Researchers concluded that a synchronous decline in the species, rather than predation from herbivores, was the cause of the population change.

Duesterloh, Switgard; Short, Jeffery W.; Barron, Mace G. **Photoenhanced toxicity of weathered Alaska North Slope crude oil to the calanoid copepods *Calanus marshallae* and *Metridia okhotensis.*** *Environmental Science & Technology*. 2002; 36 (18):3953-3959. ISSN: 0013-936X.
Mortality levels were measured in two species of copepods after exposing the organisms to polyaromatic compounds and various doses of UV radiation from natural sunlight. Bioaccumulation factors were also measured in these species.

Duke, Norman C.; Watkinson, Andrew J. **Chlorophyll-deficient propagules of *Avicennia marina* and apparent longer term deterioration of mangrove fitness in oil-polluted sediments.** *Marine Pollution Bulletin*. 2002; 44 (11):1269-1276. ISSN: 0025-326X.
This paper discusses the possibility that mutations found in one species of mangroves as a result of exposure to oil contamination may also show up in Australian mangroves.

Durand, Fabrice; Peters, Laurence D.; Livingstone, David R. **Effect of intertidal compared to subtidal exposure on the intake, loss and oxidative toxicity of water-born benzo[a]pyrene in the mantle and whole tissue of the mussel, *Mytilus edulis* L.** *Marine Environmental Research*. 2002; 54 (3-5):271-274. ISSN: 0141-1136.
Researchers investigated B(a)P accumulation and reductions in whole tissues and mantle of blue mussels in both tidal and subtidal conditions.

Dyrynda, E. A. et al. **Changes in immune parameters of natural mussel *Mytilus edulis* populations following a major oil spill ('*Sea Empress*', Wales, UK).** *Marine Ecology - Progress Series*. 2000; 206;155-170. ISSN: 0171-8630.
Immunosuppression in mussels was linked to exposure to PAHs. Although effects on the immune system were initially severe, they were not permanent.

Edwards, Katherine R.; Lepo, Joe Eugene; Lewis, Michael A. **Toxicity comparison of biosurfactants and synthetic surfactants used in oil spill remediation to two estuarine species.** *Marine Pollution Bulletin*. 2003; 46 (10):1309-1316. ISSN: 0025-326X.
Three biosurfactants and three synthetic surfactants were tested for toxicity on *Mysidopsis bahia* and *Menidia beryllina*. Results indicate that acute and chronic toxicities were compound-specific, with *M. bahia* being a more sensitive species to toxins in the surfactants.

Efroymson, Rebecca A.; Sample, Bradley E.; Peterson, Mark J. **Ecotoxicity test data for total petroleum hydrocarbons in soil: plants and soil-dwelling invertebrates.** *Human and Ecological Risk Assessment*. 2004; 10 (2):207-231. ISSN: 1080-7039.
After reviewing research of previous studies investigating the toxicity of total petroleum hydrocarbons to plants and soil invertebrates, the authors concluded that existing data are not sufficient for establishing benchmarks for ecotoxicology screening of soils.

Ekpubeni, F. A.; Ekundayo, E. O. **Effects of exposure of crocodiles to sublethal concentrations of petroleum waste drilling fluid in the Niger Delta Basin of Midwestern Nigeria.** *Environmental Monitoring and Assessment*. 2002; 76 (3):291-298. ISSN: 0167-6369.
Two species of crocodile were exposed to controlled concentrations of waste drilling fluid for varied exposure periods, in order to determine the influence of toxicity on mortality rates.

El Nemr, Ahmed; El-Sikaily, Amany; Khaled, Azza; Said, Tarek O.; Abd-Alla, Aly M. A. **Determination of hydrocarbons in mussels from the Egyptian Red Sea Coast.** *Environmental Monitoring and Assessment*. 2004; 96 (1-3):251-261. ISSN: 0167-6369.
Sampling stations were set up along coastal areas of the Egyptian Red Sea to collect mussels and analyze total hydrocarbon concentrations. Findings were compared to published data conducted in a surveillance and monitoring study along coastal areas from various regions.

El-Alawi, Yousef S.; Huang, Xiao-Dong; Dixon, D. George; Greenberg, Bruce M. **Quantitative structure-activity relationship for the photoinduced toxicity of polycyclic aromatic hydrocarbons to the luminescent bacteria *Vibrio fischeri.*** *Environmental Toxicology and Chemistry*. 2002; 21 (10):2225-2232. ISSN: 0730-7268.
A QSAR model used for predicting photoindiced toxicity of PAHs to plant species was found to be useful in determining toxicity to a bacterial species. The QSAR model can be applied to other organisms because it focuses on the mechanisms that create photoinduced toxicity in PAHs.

El-Tarabily, Khaled A. **Total microbial activity and microbial composition of a mangrove sediment are reduced by oil pollution at a site in the Arabian Gulf.** *Canadian Journal of Microbiology* . 2002; 48 (2):176-182. ISSN: 0008-4166.
Research indicates that the presence of light Arabian crude oil in the sediment of a mangrove ecosystem alters microbial activity. A significant reduction in microbial activity was noted when non-polluted sediment was contaminated.

Erasmus, Chris. **The incredible rescue of the African penguin.** *East African (Nairobi)*. Nation Newspapers, Ltd.; September 7, 2000; ISSN: 1024-1418.
On June 23, 2000, the bulk ore carrier *The Treasure* went down in shallow water just a few miles off the South African coast, within sight of Cape Town and engulfing the major penguin colonies of Dassen Island and the nearby Robben Island. This article reports on the eight-weeks of response by volunteers that literally saved an entire endangered species of water bird from a man-made environmental disaster. Conservationists say this remarkable achievement has set the standard for the care of water birds exposed to oil spills.

Eriksson, Mikael; Dalhammer, Gunnel; Mohn, William W. **Bacterial growth and biofilm production on pyrene.** *FEMS Microbial Ecology*. 2002; 40 (1):21-27. ISSN: 0168-6496.
After exposing Arctic soil with enrichment cultures, investigators observed the growth of microbial biofilms on pyrene and phenanthrene.

Esler, Daniel et al. **Correlates of harlequin duck densities during winter in Prince William Sound, Alaska.** *Condor*. 2000; 102 (4):920-926. ISSN: 0010-5422.
Population surveys suggest that colonies wintering in oiled areas have lower numbers. This is due either to lack of recovery after the spill or continued exposure to residual oil.

Esler, Daniel et al. **Harlequin duck population recovery following the '*Exxon Valdez*' oil spill: progress, process and constraints.** *Marine Ecology - Progress Series*. 2002; 241;271-286. ISSN: 0171-8630.
Data collected for this study contradicts popular assumptions that the effects of oil spills on bird populations are short lived. Researchers found elevated levels of CYP1A induction, higher mortality of female ducks in winter, and overall declines in population levels several years after the *Exxon Valdez* spill.

Esler, Daniel; Bowman, Timothy D.; O'Clair, Charles E.; Dean, Thomas A.; McDonald, Lyman L. **Densities of Barrow's goldeneyes during winter in Prince William Sound, Alaska in relation to habitat, food and history of oil contamination.** *Waterbirds*. 2000; 23 (3):423-429. ISSN: 0738-6028.
Researchers found healthy population densities of goldeneyes in oiled and non-oiled study areas, suggesting that population levels had recovered from initial impacts of the *Exxon Valdez* oil spill. Also noted was that population densities were somewhat different in oiled and non-oiled areas, although the reasons for this were unknown.

Esler, Daniel; Schmutz, Joel A. ; Jarvis, Robert L. ; Mulcahy, Daniel M. **Winter survival of adult female harlequin ducks in relation to history of contamination by the *Exxon Valdez* oil spill.** *Journal of Wildlife Management*. 2000; 64 (3):839-847. ISSN: 0022-541X.
Radiotelemetry was employed to monitor survival rates in oiled and non-oiled areas of Prince William Sound between 1995 and 1998. Wintering harlequin duck populations were shown to decline in oiled areas, possibly due to exposure to residual oil.

Evans, F. F. et al. **Influence of petroleum contamination and biostimulation treatment on the diversity of Pseudomonas spp. in soil microcosms as evaluated by 16S rRNA based-PCR and DGGE.** *Letters in Applied Microbiology*. 2004; 38 (2):93-98. ISSN: 0266-8254.
Analysis of DNA by denatured gradient gel electrophoresis showed that microbial community diversity was not greatly impacted by exposure to oil-contaminated or biostimulated soils.

Faber, B. W.; Schonewille, A. B. J. A.; van Gorcom, R. F. M.; Duine, J. A. **Constitutive and inducible hydroxylase activities involved in the degradation of naphthalene by *Cunninghamella elegans*.** *Applied Microbiology and Biotechnology*. 2001; 55 (4):486-491. ISSN: 0175-7598.
Cunninghamella elegans, a non-ligninolytic fungus, was used in the degradation of naphthalene by enzymatic activity. The fungus was able to produce different levels of naphthalene hydroxylase and naphthol hydroxylase at various stages of mycelial growth.

Fan, Cheng-Wei; Reinfelder, John R. **Phenanthrene accumulation kinetics in marine diatoms.** *Environmental Science & Technology*. 2003; 37 (15):3405-3412. ISSN: 0013-936X.
Researchers exposed two species of marine diatoms to phenanthrene and compared adsorption and intracellular accumulation rates. Phenanthrene accumulation was found to relate to the size dependence of cell walls in a given phytoplankton species.

Faraco, Luiz Francisco Ditzel; Lana, Paulo da Cunha. **Response of polychaetes to oil spills in natural and defaunated subtropical mangrove sediments from Paranaguá bay (SE Brazil).** *Hydrobiologia*. 2003; 496;321-328. ISSN: 0018-8158.
Polychaete recolonization rates were compared in mangrove sediments defaunated either by diesel oil or by sediment drying. Polychaetes quickly recolonized oiled areas in contrast to the dried areas. It is believed that modification of the sediments due to drying was the primary reason for slower population growth.

Fechhelm, Robert G.; Gallaway, Benny J.; Hubbard, G. Fain; MacLean, Steve; Martin, Larry R. **Opportunistic sampling at a deep-water synthetic drilling fluid discharge site in the Gulf of Mexico.** *Gulf of Mexico Science*. 2001; 19 (2):97-106. ISSN: 1087-688X.
Studies were conducted on the prevalence of synthetic-based drilling fluid (Petrofree LE) around an oil platform in waters greater than 500 meters. Sampling discovered extremely high densities of polychaetes and gastropods associated with areas where high concentrations of Petrofree LE rested on the ocean floor.

Fernley, P. W.; Moore, M. N.; Lowe, D. M.; Donkin, P.; Evans, S. **Impact of the *Sea Empress* oil spill on lysosomal stability in mussel blood cells.** *Marine Environmental Research*. 2000; 50 (1-5):451-455. ISSN: 0141-1136.
The neutral red retention (NRR) test was used to determine harmful effects of PAH levels in mussels 4 months after the initial spill. Researchers note that the NRR test is an inexpensive and quick way to determine toxicological effects on animal life in coastal zones of developing countries.

Fillmann, Gilberto et al. **Urinary PAH metabolites as biomarkers of exposure in aquatic environments.** *Environmental Science & Technology*. 2004; 38 (9):2649-2656. ISSN: 0013-936X.
Crab urine can be analyzed by immunoassay and fluorescence to assess the levels of contamination as expressed by PAH metabolites. This method is fast and does not require destroying the subject to determine the effects of environmental exposure to contaminants.

Fillmann, Gilberto; Watson, G. M.; Francioni, E.; Readman, J. W.; Depledge, M. H. **A non-destructive assessment of the exposure of crabs to PAH using ELISA analyses of their urine and haemolymph.** *Marine Environmental Research*. 2002; 54 (3-5):823-828. ISSN: 0141-1136.
Shore crabs (*Carcinus maenas*) were used to determine if urine and haemolymph samples could be used to assess contaminant exposure. Urine was found to be a better fluid indicator of contamination than haemolymph.

Fleet, D. M.; Reineking, B. **Have efforts to clean up the marine environment been successful? German beached bird surveys provide an index for oil pollution levels in the southern North Sea.** *In* Rodriguez, G. R.; Brebbia, C. A. (Eds.) *Oil and Hydrocarbon Spills, Modelling, Analysis and Control II*. Billerica, Ma.: Computational Mechanics Inc.; 2000; p. 117-126. ISBN: 1-85312-828-7.
Authors found a correlation between the numbers of oiled birds found in beached bird surveys and oil incidents. Data suggests that a reduction of oil pollution in the German North Sea has occurred in the last decade.

Forbes, Valery E.; Andreassen, Mai S. H.; Christensen, Lene. **Metabolism of the polycyclic aromatic hydrocarbon fluoranthene by the polychaeate *Capitella capitata* species I.** *Environmental Toxicology and Chemistry*. 2001; 20 (5):1012-1021. ISSN: 0730-7268.
Capitella sp. was found to metabolize fluoranthene, and after 24 hours in clean sediment, no trace of fluoranthene was found in worm tissues. Due to the existence of fluoranthene-derived metabolites in the worm tissue, *Capitella*, not bacteria, was thought to be responsible for the biotransformation of fluoranthene.

Franson, J. C.; Hollmén, T. E.; Flint, P. L.; Grand, J. B.; Lanctot, R. B. **Contaminants in molting long-tailed ducks and nesting common eiders in the Beaufort Sea.** *Marine Pollution Bulletin*. 2004; 48 (5-6):504-513. ISSN: 0025-326X.
Blood samples from long-tailed ducks and eggs from common eiders were collected from birds in the vicinity of Purdue Bay, Alaska, and analyzed for concentrations of contaminants. Researchers found residues of 1- and 2-methylnaphthalene and naphthalene in 100% of the eggs.

Fukyuama, A. K.; Shigenaka, G.; Hoff, R. Z. **Effects of residual *Exxon Valdez* oil on intertidal *Protothaca staminea*: mortality, growth, and bioaccumulation of hydrocarbons in transplanted clams.** *Marine Pollution Bulletin*. 2000; 40 (11):1042-1050. ISSN: 0025-326X.
Tests show that even 5-6 years after the *Exxon Valdez* spill, survival and growth rates of the intertidal clam were affected by the presence of residual oil. According to the authors, recovery of the population may take many more years.

Gagnon, Marthe Monique; Holdway, D. A. **EROD activity, serum SDH and PAH biliary metabolites in sand flathead (*Platycephalus bassensis*) collected in Port Phillip Bay, Australia.** *Marine Pollution Bulletin*. 2002; 44 (3):230-237. ISSN: 0025-326X.
EROD and serum SDH activities were monitored in male and female southern sand flathead collected from different areas of Port Phillip Bay. Effects from exposure to B(a)P were more concentrated near industrialized and populated areas.

Garshelis, David L.; Johnson, Charles B. **Sea otter population dynamics and the *Exxon Valdez* oil spill: disentangling the confounding effects.** *Journal of Applied Ecology*. 2001; 38;19-35. ISSN: 0021-8901.
Researchers dispute the reports of significant decline in sea otter numbers following the *Exxon Valdez* spill. They argue that complex factors, such as lingering effects of previous catastrophic events and other environmental incidents, make it difficult to assess the role of the spill on long-term population fluctuations.

Geffard, Olivier; Budzinski, Hélèn; His, Eduard. **The effects of elutriates from PAH and heavy metal polluted sediments on *Crassostrea gigas* (Thunberg) embryogenesis, larval growth and bio-accumulation by the larvae of pollutants from sedimentary origin.** *Ecotoxicology*. 2002; 11 (6):403-416. ISSN: 0963-9292.
The effects of resuspended polluted sediments combined with PAH-contamination of algae on growth rates and bioaccumulation in oyster larvae were found to be significant. Testing oyster larval growth in contaminated areas can be a useful method of judging the impacts of pollution on biota in marine environments.

Geffard, Olivier; Geffard, A.; His, Eduard; Budzinski, Hélèn. **Assessment of the bioavailability and toxicity of sediment-associated polycyclic aromatic hydrocarbons and heavy metals applied to *Crassostrea gigas* embryos and larvae.** *Marine Pollution Bulletin*. 2003; 46 (4):481-490. ISSN: 0025-326X.
Oyster embryos were exposed to contaminants, including PAHs, in spiked sediments to assess toxicity rates, concentrations of the pollutants, and developmental abnormalities in the organisms.

Gelin, Agnès; Graves, Vincent; Edgar, Graham J. **Assessment of *Jessica* oil spill impacts on intertidal invertebrate communities.** *Marine Pollution Bulletin*. 2003; 46 (11):1377-1384. ISSN: 0025-326X.
After assessing data from three tidal levels at oiled sites, investigators found no impacts on high-intertidal invertebrate community structure following the *Jessica* spill near the Galápagos Islands.

George-Ares, A.; Clark, J. R. **Aquatic toxicology of two corexit dispersants.** *Chemosphere*. 2000; 40 (8):897-906. ISSN: 0045-6535.

Gesteira, J. L. G.; Dauvin, J. C.; Fraga, M. S. **Taxonomic level for assessing oil spill effects on soft-bottom sublittoral benthic communities.** *Marine Pollution Bulletin*. 2003; 46 (5):562-572. ISSN: 0025-326X.
Authors compared species-, genus- and family-level data to find a suitable taxonomic order for assessing post-spill population trends for benthic assemblages. They concluded that family-level data was adequate for making post-spill assessments.

Gibbs, M.; Hampton, S.; Morgan, L.; Arendt, J. **Adaptation of the circadian rhythm of 6-sulphatoxymelatonin to a shift schedule of seven nights followed by seven days in offshore oil installation workers.** *Neuroscience Letters*. 2002; 325 (2):91-94. ISSN: 0304-3940.
A melatonin metabolite found in urine was measured in offshore workers to understand the adaptability of workers to night versus day work shifts.

Giese, M.; Goldsworthy, S. D.; Gales, R.; Brothers, N.; Hamill, J. **Effects of the *Iron Baron* oil spill on little penguins (*Eudyptula minor*). III. Breeding success of rehabilitated oiled birds.** *Wildlife Research*. 2000; 27 (6):583-591. ISSN: 1035-3712.
A comparison study was conducted on rehabilitated oiled little penguins and non-oiled birds, in order to determine the long-term effects of oiling on the breeding success of rehabilitated penguins. The study was conducted for two consecutive breeding seasons following the *Iron Baron* oil spill. Results indicate a decrease in the quality of young produced, and a reduction in the number of chicks raised by rehabilitated penguins, compared to non-oiled birds, during this time.

Giessing, Anders M. B.; Mayer, Lawrence M.; Forbes, Thomas L. **1-hydroxypyrene glucuronide as the major aqueous pyrene metabolite in tissue and gut fluid from the marine deposit-feeding polychaete *Nereis diversicolor*.** *Environmental Toxicology and Chemistry*. 2003; 22 (5):1107-1114. ISSN: 0730-7268.
Phase I and phase II metabolites were identified in a species of polychaete after exposing the organism to pyrene. It is believed that 1-hydroxypyrene glucuronide, the only phase I metabolite of pyrene in this species, is a useful biomarker for PAH exposure.

Giessing, Anders M. B.; Mayer, Lawrence M.; Forbes, Thomas L. **Synchronous fluorescence spectrometry of 1-hydroxypyrene: a rapid screening method for identification of PAH exposure in tissue from marine polychaetes.** *Marine Environmental Research*. 2003; 56 (5):599-615. ISSN: 0141-1136.
After exposing four species of polychaete to pyrene-spiked sediments, researchers were able to use a simple and fast assay for qualitative and quantitative analysis of PAH-derived metabolites from those organisms.

BIOLOGY

Aas, Endre et al. **PAH metabolites in bile, cytochrome P4501A and DNA adducts as environmental risk parameters for chronic oil exposure: a laboratory experiment with Atlantic cod.** *Aquatic Toxicology*. 2000; 51 (2):241-258. ISSN: 0166-445X
In a month-long experiment, 3 groups of cod were exposed to different levels of mechanically dispersed crude oil in a continuous flow system, and then tested against a control group.

Abdel-Rahman, Mohammed S.; Skowronski, Gloria A.; Turkall, Rita M. **Assessment of the dermal bioavailability of soil-aged benzo(a)pyrene.** *Human and Ecological Risk Assessment*. 2002; 8 (2):429-441. ISSN: 1080-7039.
As B(a)P ages in soil, it becomes less able to bind to skin. As a result, health risks due to B(a)P exposure are probably reduced over time, suggesting that less soil cleanup is needed in order to return areas to levels safe for human exposure.

Abuodha, P. A. W.; Kairo, J. G. **Human-induced stresses on mangrove swamps along the Kenyan coast.** *Hydrobiologia*. 2001; 458;255-265. ISSN: 0018-8158.
Long-term effects of oil spills have played a role in the weakening and disappearance of Kenya's mangrove forests. Replanting mangroves, avoidance of a single use management strategy and effective pollution monitoring are recommended for the rehabilitation of coastal mangrove ecosystems.

Adkinson, Milo D.; Quinn, Terrance J., II; Small, Robert J. **Evaluation of the Alaska harbor seal (*Phoca vitulina*) population survey: a simulation study.** *Marine Mammal Science*. 2003; 19 (4):764-790. ISSN: 0824-0469.
An operating model that could account for factors such as number of years, numbers and timing of existing data from aerial surveys, number of haul-out sites in a given area, and other variables, was created to assess the accuracy of results from previous data collected on seal populations.

Ahrens, Michael J.; Nieuwenhuis, Ronald; Hickey, Christopher W. **Sensitivity of juvenile *Macomona liliana* (Bivalvia) to UV-photoactivated fluoranthene toxicity.** *Environmental Toxicology*. 2002; 17 (6):567-577. ISSN: 1520-4081.
Results of investigations suggest that even a short period of UV exposure significantly increases the toxicity of fluoranthene in juvenile bivalves.

Ahrens, Michael. J. et al. **The effect of body size on digestive chemistry and absorption efficiencies of food and sediment-bound organic contaminants in *Nereis succinea* (Polychaeta).** *Journal of Experimental Marine Biology and Ecology*. 2001; 263 (2):185-209. ISSN: 0022-0981.
The authors tested the hypothesis that body size is a crucial determinant of absorption efficiencies by comparing uptake of food carbon and sediment-bound hydrophobic organic contaminants between large and small *N. succinea*.

Akkanen, Jarkko; Kukkonen, Jussi V. K. **Biotransformation and bioconcentration of pyrene in *Daphnia magna*.** *Aquatic Toxicology*. 2003; 64 (1):53-61. ISSN: 0166-445X.
Researchers investigated the bioconcentration and biotransformation of hydrocarbons in water fleas by exposing them to [^{14}C]pyrene in the presence and absence of a CYP540 inhibitor. Results indicate that CYP monooxygenses play an essential role in the transformation of PAHs in this species.

Alagappan, Gunaseelan; Cowan, Robert M. **Effect of temperature and dissolved oxygen on the growth kinetics of *Pseudomonas putida* F1 growing on benzene and toluene.** *Chemosphere*. 2004; 54 (8):1255-1265. ISSN: 0045-6535.
Pseudomonas putida F1, a toluene degrading microbial strain, was used as to assess the effects of temperature and dissolved oxygen concentrations on substrate degradation and growth rates of PAH-degrading organisms.

Alexander, R. R.; Tang, J. X.; Alexander, M. **Genotoxicity is unrelated to total concentration of priority carcinogenic polycyclic aromatic hydrocarbons in soils undergoing biological treatment.** *Journal of Environmental Quality*. 2002; 31 (1):150-154. ISSN: 0047-2425.

Al-Hassan, J. M.; Afzal, M. ; Rao, C. V. N.; Fayad, S. **Time-related increase of hydrocarbons in barnacles in the north-western waters of the Arabian Gulf.** *Bulletin of Environmental Contamination and Toxicology*. 2000; 65 (5):646-653. ISSN: 0007-4861.
Barnacles collected at various locations from 1996 to 1999 indicate an increase in pollution from petroleum hydrocarbons in Arabian Gulf coastal and offshore sediments.

BIOLOGY

Giesy, J. P.; Hilscherova, K.; Jones, P. D.; Kannan, K.; Machala, M. **Cell bioassays for detection of aryl hydrocarbon (AhR) and estrogen receptor (ER) mediated activity in environmental samples.** *Marine Pollution Bulletin*. 2002; 45 (1-12):3-16. ISSN: 0025-326X.
Authors appraise two cell bioassay techniques for determining the effects of pollutants, including PAHs, in environmental samples.

Gifford, S.; Dunstan, R. H.; Connor, W. O.; Roberts, T.; Toia, R. **Pearl aquaculture - profitable environmental remediation?** *Science of the Total Environment*. 2004; 319 (1-3):27-37. ISSN: 0048-9697.
Researches propose cultivation and deployment of mollusks as biomonitors in areas that are highly contaminated in hopes of rapid bioaccumulation of marine pollution.

Gilbert, David W. *A* **Population Density Model for the Long-Billed Curlew (*Numenius americanus*) on Humboldt Bay While Affected by an Oil Spill.** Thesis (M.S.): Humboldt State University; 1999; 82 leaves.

Gilbert, Franck et al. **Alteration and release of aliphatic compounds by the polychaete *Nereis virens* (Sars) experimentally fed with hydrocarbons.** *Journal of Experimental Marine Biology and Ecology*. 2001; 256 (2):199-213. ISSN: 0022-0981.
Marine worms were fed a diet of algae and hydrocarbons over a 15-day period. Feces of the worms were examined, and the amount and types of hydrocarbons were analyzed for evidence of biodegradation.

Gilroy, Duncan J. **Derivation of shellfish harvest reopening criteria following the *New Carissa* oil spill in Coos Bay, Oregon.** *Journal of Toxicology and Environmental Health, Part A.*. 2000; 60;317-329. ISSN: 1528-7394.
In February 1999, the *M/V New Carissa* ran aground 2 miles north of Coos Bay, Oregon, releasing an estimated 25,000 to 70,000 gallons of oil. The spill forced state health agencies to evaluate the potential health risks from consumption of oil-contaminated shellfish. The article describes the response of the state health agency following the oil spill.

Glemarec, M.; Grall, J. **Ecological and zoological groupings within marine invertebrates in relation to coastal perturbations.** *Bulletin de La Societe Zoologique de France*. 2000; 125 (1):37-48. ISSN: 0037-962X.
Authors look at different classes of organisms to determine how different families or phyla react to pollutants in a marine environment.

Glionna, J. M. **Mysterious oil spill killing hundreds of California seabirds; environment: while volunteers work to save the waterfowl, state and federal officials search the ocean for the source of the deadly crude.** *Los Angeles Times*. Los Angeles, Ca.: Times Mirror Company; December 25, 2001; B 1.
Oiled birds began washing ashore from San Francisco to Point Reyes National Seashore and the Farallon Islands 22 miles offshore on November 24, 2001. On December 8, 2001, the Coast Guard spotted a five-mile-long sheen of oil about 20 miles west of the Golden Gate Bridge. State and federal officials began to gather information in an effort to determine the source of the oil and protect birds from the oil.

Golden, N. H.; Rattner, B. A. **Ranking terrestrial vertebrate species for utility in biomonitoring and vulnerability to environmental contaminants.** *In* Ware, G. W. (Ed.) *Reviews of Environmental Contamination and Toxicology, 176*. New York: Springer-Verlag; 2003; p. 67-136. ISBN: 0-387-95517-8.

Goldsworthy, S. D.; Giese, M.; Gales, R. P.; Brothers, N.; Hamill, J. **Effects of the *Iron Baron* oil spill on little penguins (*Eudyptula minor*). II. Post-release survival of rehabilitated oiled birds.** *Wildlife Research*. 2000; 27 (6):573-582. ISSN: 1035-3712.
This study was part of a series of three papers that investigated the effects of the *Iron Baron* oil spill on little penguins. Long-term survival rates of rehabilitated oiled little penguins were assessed using regular trapping.

Goldswothy, S. D.; Gales, R. P.; Giese, M.; Brothers, N. **Effects of the *Iron Baron* oil spill on little penguins (*Eudyptula minor*). I. Estimates of mortality.** *Wildlife Research*. 2000; 27;559-571. ISSN: 1035-3712.
On July 10, 1995, the bulk one carrier *Iron Baron* ran aground on Hebe Reef in northern Tasmania. A relatively small amount of oil was spilled by the carrier. However, the impact of the oiling on penguin populations was extensive.

Golet, Gregory H. et al. **Long-term direct and indirect effects of the '*Exxon Valdez*' oil spill on pigeon guillemots in Prince William Sound, Alaska.** *Marine Ecology - Progress Series*. 2002; 241; 287-304. ISSN: 0171-8630.
Pigeon guillemot populations continue to be affected by the *Exxon Valdez* spill, with lower chick weights noticed in populations found in oiled areas. Researchers also found heightened hepatic activity normally associated with oil exposure and lower numbers of forage fish in areas where lower chick weights were detected.

Golightly, Richard T.; Newman, Scott H.; Craig, Emmilie N.; Carter, Harry R.; Mazet, Jonna A. K. **Survival and behavior of western gulls following exposure to oil and rehabilitation.** *Wildlife Society Bulletin*. 2002; 30 (2):539-546. ISSN: 0091-7648.
Post-release analysis of gulls that were rehabilitated following exposure to oil showed no effect of rehabilitation on survival rates of the birds.

Gómez-Mendikute, Amagoia; Etxeberria, Ainhoa; Olabarrieta, Igor; Cajaraville, Miren P. **Oxygen radicals production and actin filament disruption in bivalve haemocytes treated with benzo(a)pyrene.** *Marine Environmental Research*. 2002; 54 (3-5):431-436. ISSN: 0141-1136.
B(a)P exposure increased the presence of reactive oxygen species, which, in turn, caused damage to cytoskeletal proteins and proteins involved in calcium homeostatis in the mussel *Mytilus galloprovincialis*.

Gourlay, Catherine; Tusseau-Vuillemin, Marie-Hélène; Garric, Jeanne; Mouchel, Jean-Marie. **Effect of dissolved organic matter of various origins and biodegradabilities on the bioaccumulation of polycyclic aromatic hydrocarbons in *Daphnia magna*.** *Environmental Toxicology and Chemistry*. 2003; 22 (6):1288-1294. ISSN: 0730-7268.
The presence of dissolved organic matter resulted in reduced bioaccumulation rates of PAHs in water fleas.

Gowland, B. T. G.; McIntosh, A. D; Davies, I. M.; Moffat, C. F.; Webster, L. **Implications from a field study regarding the relationship between polycyclic aromatic hydrocarbons and glutathione *S*-transferase activity in mussels.** *Marine Environmental Research*. 2002; 54 (3/5):231-236. ISSN: 0141-1136.
Results of research on the mussel *Mytilus edulis* suggests that 5- to 6-ring PAHs are more influential than 2- to 4-ring PAHs in inducing glutathione *S*-transferase activity in bivalves.

Gravato, C.; Santos, Maria A. **EROD induction in sea bass (*Dicentrarchus labrax* L.) and crab (*Carcinus maenas* L.).** *Fresenius Environmental Bulletin*. 2002; 11 (9A Special Issue):605-608. ISSN: 1018-4619.

Gravato, C.; Santos, Maria A. **Genotoxicity biomarkers' association with B(A)P biotransformation in *Dicentrarchus labrax* L.** *Ecotoxicology and Environmental Safety*. 2003; 55 (3):352-358. ISSN: 0147-6513.
After exposing sea bass to B(a)P over a period of 96 hours, investigators looked for specific genotoxic reactions at different phases of biotransformation. EROD activity, CYP450 content, and liver cytosolic B(a)P-type metabolites increased significantly in phase I, and in phase II, heightened levels of erythrocytic micronuclei and erythrocytic nuclear abnormalities were noted.

Gravato, C.; Santos, Maria A. **Juvenile sea bass liver P450, EROD induction, and erythrocytic genotoxic responses to PAH and PAH-like compounds.** *Ecotoxicology and Environmental Safety*. 2002; 51 (2):115-127. ISSN: 0147-6513.
Sea bass were exposed to β-naphthaflavone, naphthalene, and benzo(a)pyrene and EROD induction activity was monitored over time. Results indicate that of the compounds, B(a)P was the most genotoxic, followed by naphthalene and then β-naphthaflavone.

Gravato, C.; Santos, Maria A. **Liver phase I and phase II enzymatic induction and genotoxic responses of â-naphthoflavone water-exposed sea bass.** *Ecotoxicology and Environmental Safety*. 2002; 52 (1):62-68. ISSN: 0147-6513.

Gray, Joshua P. et al. **Evidence of aryl hydrocarbon receptor ligands in Presque Isle Bay of Lake Erie.** *Aquatic Toxicology*. 2003; 64 (3):343-358. ISSN: 0166-445X.
Researchers found PAHs, as well as other compounds that act through the aryl hydrocarbon receptor, in sediments from Presque Isle Bay. However, brown bullheads collected from this area were neither exposed to these compounds nor responsive to them in biomarker experiments.

Greene, E. A.; Kay, J. G.; Stehmeier, L. G.; Voordouw, G. **Microbial community composition at an ethane pyrolysis plant site at different hydrocarbon inputs.** *FEMS Microbiology Ecology*. 2002; 40 (3):233-241. ISSN: 0168-6496.

Gresham, Matt. **Researcher's coral work influences fate of platforms.** *The Houma Courier*. Houma, LA.: Houma Daily Courier; Monday, April 15, 2002; A1 & A11
This article described the activities of Dr. Paul Sammarco of LUMCON, with respect to his M.M.S.-funded research on coral reefs in the Garden Banks, offshore Texas.

Guidetti, P.; Modena, M.; LaMesa, G.; Vacchi, M. **Composition, abundance and stratification of macrobenthos in the marine area impacted by tar aggregates derived from the *Haven* oil spill (Ligurian Sea, Italy)**. *Marine Pollution Bulletin*. 2000; 40 (12):1161-1166. ISSN: 0025-326X.
The distribution of tar aggregates in sediment did not significantly alter the abundances of the whole benthic assemblages or the main taxonomic groups when contaminated and control sites were compared.

Haitzer, Markus; Akkanen, Jarkko; Steinberg, Christian; Kukkonen, Jussi V. K. **No enhancement in bioconcentration of organic contaminants by low levels of DOM.** *Chemosphere*. 2001; 44 (2):165-171. ISSN: 0045-6535.
Results of a systematic study indicate that bioconcentration factor enhancements, as a result of the presence of dissolved organic matter are likely the result of random, experimental variations instead of a systematic enhancement of bioconcentration.

Hamdoun, Amro M.; Griffin, Fred J.; Cherr, Gary N. **Tolerance to biodegraded crude oil in marine invertebrate embryos and larvae is associated with expression of a multixenobiotic resistance transporter.** *Aquatic Toxicology*. 2002; 61 (1-2):127-140. ISSN: 0166-445X.
Multixenobiotic resistance (MXR) was monitored in embryos and larvae to determine its usefulness as an indicator of susceptibility to toxins in degraded hydrocarbons. MXR expression levels are evidence that toxic by-products are created in the biodegradation process.

Hamoutene, D.; Payne, J. F.; Rahimtula, A.; Lee, K. **Effect of water soluble fractions of diesel and an oil spill dispersant (Corexit 9527) on immune responses in mussels.** *Bulletin of Environmental Contamination and Toxicology*. 2004; 72 (6):1260-1267. ISSN: 0007-4861.
Fluorescence measurements used to monitor cellular immune responses in mussels showed either a sensitivity of hemocytes to diesel water soluble fractions or a physical effect of fractions on cells. Immune responses to dispersant were not enhanced under concentrations considered to be operational doses.

Heintz, R. A. et al. **Delayed effects on growth and marine survival of pink salmon *Oncorhynchus gorbuscha* after exposure to crude oil during embryonic development.** *Marine Ecology - Progress Series*. 2000; 208; 205-216. ISSN: 0171-8630.
This study reports on delayed effects on the growth and marine survival of pink salmon *Oncorhynchus gorbuscha*, which were exposed to oil as embryos under conditions similar to those observed after the *Exxon Valdez* oil spill.

Hekmat, D.; Feuchtinger, A.; Stephan, M.; Vortmeyer, D. **Biofilm population dynamics in a trickle-bed bioreactor used for the biodegradation of aromatic hydrocarbons from waste gas under transient conditions.** *Biodegradation*. 2004; 15 (2):133-144. ISSN: 0923-9820.
A multispecies biofilm population was examined during exposure to a mixture of volatile organic compounds of varying concentrations, as well as during a starvation phase. Population shifts were observed in reaction to shifting concentrations of the PAHs, but a direct correlation between biodegradation rates and population numbers of pollutant-degrading organisms could not be established.

Hellou, J. et al. **Distribution of PACs in surficial sediments and bioavailability to mussels, *Mytilus edulis* of Halifax Harbour.** *Marine Environmental Research*. 2002; 53 (4):357-379. ISSN: 0141-1136.
Blue mussels and sediment were collected in several areas of Halifax Harbor, and data on polycyclic aromatic compounds (PACs) was extracted from the two sample sources and compared. Fingerprinting the PACs revealed that the total amount of petroleum-derived hydrocarbons in the samples was the minority of the dataset.

Hellou, J.; Leonard, J.; Anstey, C. **Dietary exposure of finfish to aromatic contaminants and tissue distribution.** *Archives of Environmental Contamination and Toxicology*. 2002; 42 (4):470-476. ISSN: 0090-4341.
Investigators monitored the bioaccumulation and partitioning of polycyclic aromatic compounds in internal tissues of rainbow trout over a period of several weeks.

Hernandez, F. J. et al. **The across-shelf larval, postlarval, and juvenile fish assemblages collected at offshore oil and gas platforms west of the Mississippi river delta.** *In* Stanley, D.R.; Scarborough-Bull, A. (Eds.) *Fisheries, Reefs, and Offshore Development (Series: American Fisheries Society Symposium Series, v.36)*. Bethesda, Md: American Fisheries Society; 2003; p. 39-72. ISBN: 1-888569-54-9.

Hernandez, F. J.; Shaw, R. F. **Comparison of plankton net and light trap methodologies for sampling larval and juvenile fishes at offshore petroleum platforms and a coastal jetty off Louisiana.** *In* Stanley, D.R.; Scarborough-Bull, A. (Eds.) *Fisheries, Reefs, and Offshore Development (Series: American Fisheries Society Symposium Series, v.36)*. Bethesda, Md: American Fisheries Society; 2003; p. 15-38. ISBN: 1-888569-54-9.

Holman, Hoi-Ying N.; Goth-Goldstein, Regine; Aston, David; Yun, Mao; Kengsoontra, Jenny. **Evaluation of gastrointestinal solubilization of petroleum hydrocarbon residues in soil using an *in vitro* physiologically based model.** *Environmental Science & Technology*. 2002; 36 (6):1281-1286. ISSN: 0013-936X.
Using an experimental extraction protocol, investigators modeled human gastrointestinal (GI) absorption of total petroleum hydrocarbon (TPH) residues in weathered soils. TPH solubility was much higher in diesel-contaminated soil than soil contaminated by crude oil. Different rates of solubility were noted between the "gallbladder empty" phase of fasting and fat digestion.

Hoover-Miller, A.; Parker, K. R.; Burns, J. J. **A reassessment of the impact of the *Exxon Valdez* oil spill on harbor seals *(Phoca vitulina richardsi)* in Prince William Sound, Alaska.** *Marine Mammal Science*. 2001; 17 (1):111-135. ISSN: 0824-0469.
Authors dispute previously published research estimating the death of over 300 harbor seals as a result of the *Exxon Valdez* oil spill in 1989.

Horng, Ching-Yi; Taghon, Gary L. **Loss rates of polycyclic aromatic hydrocarbons from sediment and deposit-feeder fecal pellets.** *Environmental Toxicology and Chemistry*. 2001; 20 (7):1465-1473. ISSN: 0730-7268.
The deposit feeder *Capitella* was used to test desorption versus biodegradation rates in marine sediment. After 60 days, desorption of PAHs was found to be minimal, but biodegradation was more substantial.

Huggett, Robert J. et al. **Biomarkers in fish from Prince William Sound and the Gulf of Alaska.** *Environmental Science & Technology*. 2003; 37 (18):4043-4051. ISSN: 0013-936X.
Biomarkers indicating exposure to PAHs were measured in nearshore and offshore species of fish between the years 1999 and 2000 in oiled and non-oiled areas. Researchers found no substantial differences between samples from Prince William Sound and outside the spill area.

Hussein, Hussein S.; Terry, Norman. **Phytomonitoring the unique colonization of oil-contaminated saline environment by *Limoniastrum monopetalum* (L.) Boiss in Egypt.** *Environment International*. 2002; 28 (1-2):127-135. ISSN: 0160-4120.
Researchers studied the metabolites of a desert plant to understand biochemical changes that allow a particular species to thrive in oil-contaminated soil conditions.

Hutchinson, Thomas H.; Field, Michael D. R.; Manning, Margaret J. **Evaluation of non-specific immune functions in dab, *Limanda limanda* L., following short-term exposure to sediments contaminated with polyaromatic hydrocarbons and/or polychlorinated biphenyls.** *Marine Environmental Research*. 2003; 55 (3):193-202. ISSN: 0141-1136.
Short-term exposure to contaminants, including PAHs, did not alter immune functions in dab in any significant way. However, hydrogen peroxide production was reduced in the fish, probably due to PAH exposure.

Hyöyläinen, T.; Karels, A.; Oikari, A. **Assessment of bioavailability and effects of chemicals due to remediation actions with caging mussels (*Anodonta anatina*) at a creosote-contaminated lake sediment site.** *Water Research*. 2002; 36 (18):4497-4504. ISSN: 0043-1354.
Duck mussel tissue was analyzed to better understand long-term contamination risks of creosote-polluted sediments. Biota-sediment accumulation factors were determined for a number of PAHs, and contamination rates were found to vary according to sample site location outside of an area that had undergone remediation in 1998.

Ilarionov, S. A.; Nazarov, A. V.; Kalachnikova, I. G. **The role of micromycetes in the phytotoxicity of crude oil-polluted soils.** *Russian Journal of Ecology*. 2003; 34 (5):303-308. ISSN: 1067-4136.
Analysis of soil yielded abundant amounts of nonsymbiotic saprotrophic micromycetes in the rhizosphere of plants growing in crude oil-contaminated soils. The microorganisms were found to be producing a number of mycotoxins, which had an adverse effect on the plants.

Ingebrigsten, K.; Christainsen, J. S.; Lindhe, Ö. Brandt. **Disposition and cellular binding of 3 H-benzo[a]pyrene at subzero temperatures: studies in an aglomerular arctic teleost fish - the polar cod (*Boreogadus saida*).** *Polar Biology*. 2000; 23 (7):503-509. ISSN: 0722-4060.
Experiments show that polar cod are exposed to higher levels of B[a]P through absorption via gills (at subzero temperatures) than is ingested orally.

Ingersoll, Christopher G. et al. **Uptake and depuration of nonionic organic contaminants from sediment by the oligochaete, *Lumbriculus variegatus*.** *Environmental Toxicology and Chemistry*. 2003; 22 (3):872-885. ISSN: 0730-7268.
In 56-day bioaccumulation experiments involving oligochaetes, concentrations obtained in laboratory studies were shown to correlate with field exposure levels for a number of contaminants, including PAHs. Depuration rates were accelerated when the organisms were held in clean sediment for a period of 7 days.

Irons, D. B.; Kendall, S. J. ; Erickson, W. P.; McDonald, L. L.; Lance, B. K. **Nine years after the *Exxon Valdez* oil spill: effects on marine bird populations in Prince William Sound, Alaska.** *Condor*. 2000; 102 (4):723-737. ISSN: 0010-5422.
Population densities of various resident birds were compared between 1984-1985 and 1989-1991, 1993, 1996, and 1998. Results showed that birds that dive for food suffered population declines, while surface-feeding birds did not. Researchers note that, nine years after the spill, population levels for some marine species haven't reached pre-spill levels.

Jacob, P. G.; Al-Matrouk, K.; Beg, K. R.; Al-Bahloul, T. Saeed. **Benzo-a-pyrene residues in liver and in bile of fish following oral exposure.** *Bulletin of Environmental Contamination and Toxicology*. 2002; 68 (3):436-443. ISSN: 0007-4861.
Fish were given varying concentrations of B(a)P over time, and residues in livers and bile were analyzed. Data showed a concentration-dependent elimination B(a)P in bile residue. Authors suggest that bile metabolites can be used as biomarkers to determine exposure concentrations in fish during field monitoring investigations.

Janikowska, G.; Wardas, W. **Bioconcentration of benzo(a)pyrene in Chlorella BB cells.** *Polish Journal of Environmental Studies*. 2002; 11 (4):345-348. ISSN: 1230-1485.

Jensen, John; Sverdrup, Line.E. **Joint toxicity of linear alkylbenzene sulfonates and pyrene on *Folsomia fimetaria*.** *Ecotoxicology and Environmental Safety*. 2002; 52 (1):75-81. ISSN: 0147-6513.

Jewett, Stephen C.; Dean, Thomas A.; Woodin, Bruce R.; Hoberg, Max K.; Stegeman, John J. **Jewett, Stephen C., Dean, Thomas A., Woodin, Bruce R., Hoberg, Max K., Stegeman, John J. (2002). Exposure to hydrocarbons 10 years after the *Exxon Valdez* oil spill: evidence from cytochrome P4501A expression and biliary FACs in nearshore demersal fishes.** Marine Environmental Research 54, 21-48. Authors' response. *Marine Environmental Research*. 2003; 55 (5):463-468. ISSN: 0141-1136.
Authors of the above-cited paper respond with a written rebuttal to the editor, in a published paper in Marine Environmental Research, volume 55(2003). The editorial addresses the issues of concerns regarding the manner in which they conducted and presented their logistical findings and conclusions.

Jewitt, Stephen C.; Dean, Thomas A.; Woodin, Bruce R.; Hoberg, Max K.; Stegeman, John J. **Exposure to hydrocarbons 10 years after the *Exxon Valdez* oil spill: evidence from cytochrome P4501A expression and biliary FACs in nearshore dimersal fishes.** *Marine Environmental Research*. 2002; 54 (1):21-48. ISSN: 0141-1136.
Research on masked greenling (*Hexagrammos octogrammus*) and crescent gunnel (*Pholis laeta*) revealed evidence that residual levels of hydrocarbons are still affecting neashore fish species within the area of the *Exxon Valdez* oil spill.

Jimenez, C. **Coral reefs and environments of Culebra Bay, Pacific coast of Costa Rica: biology, economic and recreational considerations, management hydrocarbons in the water bodies of the Baltic Sea.** *Revista de Biologia Tropical*. 2001; 49 (2):215-231. ISSN: 0034-7744.

Jiménez, M.; Aranda, F. J.; Teruel, J. A.; Ortiz, A. **The chemical toxic benzo[a]pyrene perturbs the physical organization of phosphatidycholine membranes.** *Environmental Toxicology & Chemistry*. 2002; 21 (4):787-793. ISSN: 0730-7268.
This paper investigates the manner that benzo(a)pyrene acts as a noncarcinogenic, cytotoxic agent at the level of the cellular membrane.

Joner, Erik. J.; Corgié, S. C.; Amellal, N.; Leyval, Corinne. **Nutritional constraints to degradation of polycyclic aromatic hydrocarbons in a simulated rhizosphere.** *Soil Biology & Biochemistry*. 2002; 34 (6):859-864. ISSN: 0038-0717.
This study monitored the effects of nutrient amendments on the degradation rates of 3-, 4-, 5-, and 6-ring hydrocarbons, in order to understand the function of C, N and P limitations on the dissipation of PAHs. For these experiments, artificial root exudates, N, and P were used either separately, or in double or triple combinations on soils spiked with ring-specific hydrocarbons.

Jonsson, Grete; Bechmann, Renee K.; Bamber, Shaw D.; Baussant, Thierry. **Bioconcentration, biotransformation, and elimination of polycyclic aromatic hydrocarbons in sheepshead minnows (*Cyprinodon variegatus*) exposed to contaminated seawater.** *Environmental Toxicology and Chemistry*. 2004; 23 (6):1538-1548. ISSN: 0730-7268.
The existence and type of alkyl groups affected PAH kinetics in fish. Further, it was noted that alkylated isomers of specific PAHs influenced bioconcentration factors.

Jorgensen, Even H.; Wolkers, Johannes. **Effect of temperature on the P4501A response in winter- and summer-acclimated Arctic char (*Salvelinus alpinus*) after oral benzo[a]pyrene exposure.** *Canadian Journal of Fisheries and Aquatic Sciences*. 1999; 56 (8):1370-1375. ISSN: 0706-652X.
Arctic char were orally exposed to (BaP), and induction response was measured for both winter- and summer-acclimated fish by analysis of CYP1A enzymes. Researchers note that the induction response for winter-acclimated char was seven times lower than response in summer-acclimated char. The use of P450 enzyme as a biomarker for PAH contamination in char is discussed.

Jung, D. K. J.; Klaus, T.; Fent, K. **Cytochrome P450 induction by nitrated polycyclic aromatic hydrocarbons, azaarenes, and binary mixtures in fish hepatoma cell line PLHC-1.** *Environmental Toxicology and Chemistry*. 2001; 20 (1):149-159. ISSN: 0730-7268.
CYP1A induction potential of NPAHs and azaarenes was found to be similar to induction from related PAHs.

Kaplan, Christopher W.; Kitts, Christopher L. **Bacterial succession in a petroleum land treatment unit.** *Applied and Environmental Microbiology*. 2004; 70 (3):1777-1786. ISSN: 0099-2240.
Observation of microbial population dynamics during the degradation of PAHs in a land treatment site showed species *Flavobacterium* and *Pseudomonas* increasing during the biodegradation process and then decreasing as the rate of degradation slowed.

Kasai, Yuki et al. **Predominant growth of *Alcanivorax* strains in oil-contaminated and nutrient-supplemented sea water.** *Environmental Microbiology*. 2002; 4 (3):141-147. ISSN: 1462-2912.
In experiments replicating three separate physical conditions, *Alcanivorax* sp. became the dominant bacterial population when phosphorus and nitrogen were added to oil-contaminated seawater.

Kasai, Yuki; Kishira, Hideo; Syutsubo, Kazuaki; Harayama, Shigeaki. **Molecular detection of marine bacterial populations on beaches contaminated by the *Nakhodka* tanker oil-spill accident.** *Environmental Microbiology*. 2001; 3 (4):246-255. ISSN: 1462-2912.
DNA analysis of microbes in seawater and oil residue resulted in the discovery of 2 separate bacterial communities up to 29 months after the *Nakhodka* accident. The bacteria found in seawater were classified as mostly cyanobacteria, while the microbes in oil consisted of hydrocarbon degraders.

Katayama, Yoko et al. **Effects of spilled oil on microbial communities in a tidal flat.** *Marine Pollution Bulletin*. 2003; 47 (1-6):85-90. ISSN: 0025-326X.
Using 16S rDNA analysis, researchers followed changes in bacterial community structure after exposing an area to fuel oil C. A brief discussion followed about the possibility of using oil-susceptible bacteria as an indicator of bioremediation.

Kathiresan, K.; Bingham, B. L. **Biology of mangroves and mangrove ecosystems.** *In* Southward, A. J.; Tyler, P. A.; Young, C. M.; Fuiman, L. A. (Eds.) *Advances in Marine Biology, v.40*. London: Academic Press, Ltd.; 2001; p. 81-251. ISBN: 0-12-026140-5.

Kaufmann, Karin; Christophersen, Mette; Buttler, Alexandre; Harms, Hauke; Höhener, Patrick. **Microbial community response to petroleum hydrocarbon contamination in the unsaturated zone at the experimental field site Vaerlose, Denmark.** *FEMS Microbiology Ecology*. 2004; 48 (3):387-399. ISSN: 0168-6496.
After monitoring CO_2 levels and various microbial parameters in contaminated soils with low nutrient levels, researchers found that microbial community dynamics were dominated by natural heterogeneity.

Khan, Ashraf A. et al. **Molecular cloning, nucleotide sequence, and expression of genes encoding a polcyclic aromatic ring dioxygenase from *Mycobacterium* sp strain PYR-1.** *Applied and Environmental Microbiology*. 2001; 67 (8):3577-3585. ISSN: 0099-2240.
Researchers isolated *Mycobacterium* sp. strain PYR-1 to determine the biochemical, molecular, and genetic bases for the metabolism of PAHs. Researchers also characterized the genes encoding an aromatic dioxygenase, in order to determine PAH catabolism in bacteria.

Khan, R. A. **Comparison of tissue lesions in four species of benthic fish sampled in 1972-1973 and 1997-1998 on the Grand Banks off Newfoundland.** *Bulletin of Environmental Contamination and Toxicology*. 2000; 65 (1):78-83. ISSN: 0007-4861.
By comparing samples of fish taken over two decades apart, the author shows that in more recent samples of fish, the prevalence of lesions is significantly higher. The higher amounts of lesions suggest chronic exposure to xenobiotics, with PAH exposure the most likely culprit.

Kim, In Seon; Foght, Julia M.; Gray, Murray R. **Selective transport and accumulation of alkanes by *Rhodococcus erythropolis* S+14He.** *Biotechnology and Bioengineering*. 2002; 80 (6):650-659. ISSN: 006-3592.
A strain of *R. erythropolis* was able to select *n*-hexadecane from a pool of other structurally similar alkanes and transport them through membranes.

Kirby, Mark F.; Neall, Paula; Taylor, Tina. **EROD activity measured in flatfish from the area of the *Sea Empress* oil spill.** *Chemosphere*. 1999; 38 (12):2929-2949. ISSN: 0045-6535.
Two species of flatfish, plaice and dab, were collected in 5 locations within the area of the spill site. Heightened EROD activities were noted in fish caught closest to the spill, though no correlation could be established between the amounts of activity and exposure to contaminants. Sexual maturity had the greatest impact on EROD activity in dab; in plaice, this could not be established because the fish that were collected were sexually immature. Researchers feel that EROD monitoring should be done with sexually inactive fish.

Klerks, Paul L.; Nyman, John A.; Bhattacharyya, S. **Relationship between hydrocarbon measurements and toxicity to a chironomid, fish larva and daphnid for oils and oil spill chemical treatments in laboratory freshwater marsh microcosms.** *Environmental Pollution*. 2004; 129 (3):345-353. ISSN: 0269-7491.
Researchers used regression measurements of target aromatic hydrocarbons to attempt to predict toxicity in freshwater organisms. Although some hydrocarbons accurately fit into results considered statistically significant, researchers felt that this method is no substitute for actual toxicity determinations.

Klimkowicz-Pawlas, A.; Maliszewska-Kordybach, B. **Effect of anthracene and pyrene on dehydrogenases activity in soils exposed and unexposed to PAHs.** *Water, Air, & Soil Pollution*. 2003; 145 (1):169-186. ISSN: 0049-6979.
Dehydrogenase activity was measured after 7 and 31 days in soils spiked with various concentrations of PAHs in already contaminated industrial soils and previously uncontaminated rural soils. Results show different PAH tolerance levels in microorganisms between the two soil samples, most notably seen when data was compared over time.

Klosterhaus, Susan L.; Ferguson, P. Lee; Chandler, G. Thomas. **Polycyclic aromatic hydrocarbon bioaccumulation by meiobenthic copepods inhabiting a superfund site: techniques for micromass body burden and total lipid analysis.** *Environmental Toxicology and Chemistry*. 2002; 21 (11):2331-2337. ISSN: 0730-7268.
Biota-sediment accumulation factors (BSAFs) of PAHs were established by the analysis of contaminants and lipids in tissues of copepods. Disparities in lipid content, specific PAH molecular structures, as well as sex and reproductive condition of the organism, may have an impact on BSAF values.

Komiyama, Kazuo et al. **Non-specific cellular function of *Eisenia fetida* regulated by polycyclic aromatic hydrocarbons.** *Pedobiologia*. 2003; 47 (5-6):717-723. ISSN: 0031-4056.
Cellular analysis of earthworms exposed to sublethal amounts of dimethylbenzanthracene show that cell functions were down regulated depending on exposure length or concentration to the PAH. Also, cytochrome P450 expression increased as a result to exposure to the contaminant.

Lance, B. K.; Irons, D. B.; Kendall, S. J.; McDonald, L. L. **An evaluation of marine bird population trends following the *Exxon Valdez* oil spill, Prince William Sound, Alaska.** *Marine Pollution Bulletin*. 2001; 42 (4):298-309. ISSN: 0025-326X.
This article reports on nine years of post-spill marine bird population changes in the oiled areas of Prince William Sound. Lingering spill effects provide evidence of slow recovery, lack of recovery, and divergent population trends in many taxa that utilize shoreline and nearshore habitats.

Lanctot, Richard; Goatcher, Buddy; Scribner, Kim. **Harlequin duck recovery from the *Exxon Valdez* oil spill: a population and genetics perspective.** *Auk*. 1999; 116 (3):781-791. ISSN: 0004-8038.
Concerns about population recovery of this species of duck led researchers to investigate whether there were genetic differences between birds in different wintering areas. Research also revealed that population recovery by emigration is a long-term process.

Landrum, Peter F.; Lotufo, Guilherme R.; Gossiaux, Duane C.; Gedeon, Michelle L.; Lee, Jong-Hyeon. **Bioaccumulation and critical body residue of PAHs in the amphipod, *Diporeia* spp.: additional evidence to support toxicity additivity for PAH mixtures.** *Chemosphere*. 2003; 51 (6):481-489. ISSN: 0045-6535.
Results of toxicity experiments support the claim that PAHs act at the same molar concentration when present as individual hydrocarbon types or as part of a mixture of compounds.

Landrum, Peter. F.; Gedeon, Michelle. L.; Burton, G. A.; Greenberg, M. S.; Rowland, C. D. **Biological responses of *Lumbriculus variegatus* exposed to fluoranthene-spiked sediment.** *Archives of Environmental Contamination and Toxicology*. 2002; 42 (3):292-302. ISSN: 0090-4341.
The California blackworm was used in experiments to examine the effects of fluoranthene on behavior, reproduction, and toxikinetics. Bioaccumulation rates reflected uptake of the PAH, but toxikinetics were not closely tied to ingestion. In addition, the presence of fluoranthene stimulated reproduction rates in the oligochaete.

Langworthy, D. E.; Stapleton, R. D.; Sayler, G. S.; Findlay, R. H. **Lipid analysis of the response of a sedimentary microbial community to polycyclic aromatic hydrocarbons.** *Microbial Ecology*. 2002; 43 (2):189-198. ISSN: 0095-3628.
A number of methods were used to determine the response of a microbial community in PAH-contaminated soils. Researchers analyzed ongoing changes in microbial biomass and community structure by using perturbation theory and the subsidy-stress gradient.

Large, A. T. et al. **Different levels of mussel (*Mytilus edulis*) DNA strand breaks following chronic field and acute laboratory exposure to polycyclic aromatic hydrocarbons.** *Marine Environmental Research*. 2002; 54 (3-5):493-498. ISSN: 0141-1136.
Mussels taken from PAH-contaminated sites were exposed to high doses of B(a)P in laboratory experiments to determine changes in the amount of DNA strand breaks. Researchers found no ongoing DNA damage, suggesting an adaptive response.

Law, Robin J. **Toxic equivalency factors for PAH and their applicability in shellfish pollution monitoring studies.** *Journal of Environmental Monitoring*. 2002; 4 (3): 383-388. ISSN: 1464-0325.
Authors investigate the use of toxic equivalency factors, comprising datasets gathered from previous oil spills, to use as an additional parameter when monitoring fishery resources after an oil spill has occurred.

Le Floch, Stéphane. et al. **Effects of oil and bioremediation on mussel (*Mytilus edulis* L.) growth in mudflats.** *Environmental Technology*. 2003; 24 (10):1211-1219. ISSN: 0959-3330.
Mussel growth was monitored during bioremediation of spiked mudflats. Growth rates were found to be inhibited the most in bioremediation plots that were tilled. Tilling subdued filter feeding activity in the mussels by causing an increase in suspended solids, thus affecting growth rates.

Lee, Hyun Joo; Villaume, Julien; Cullen, David C.; Kim, Byoung Chan; Gu, Man Bock. **Monitoring and classification of PAH toxicity using an immobilized bioluminescent bacteria.** *Biosensors & Bioelectronics*. 2003; 18 (5-6):571-577. ISSN: 0956-5663.
Researchers monitored bioluminescence levels in bacteria to establish cellular toxicity from PAHs. Catacondensed polycyclic aromatic hydrocarbons (CCPAHs) were found to cause cellular toxicity, signifying the bacteria's importance as a biosensor for the existence of CCPAH contamination.

Lei, An-ping; Wong, Yuk-shan; Tam, Nora Fung-yee. **Pyrene-induced changes of glutathione-*S*-transferase activities in different microalgal species.** *Chemosphere*. 2003; 50 (3):293-301. ISSN: 0045-6535.
Four microalgal species underwent experiments to better understand the role of hydrocarbon contamination on glutathione-*S*-transferase (GST) activities. It is believed that GST activities may be influenced by the resistance of a species of microalgae to pyrene, as well as ability to metabolize the compound.

Lin, Meng-Chiao et al. **Increased risk of preterm delivery in areas with air pollution from a petroleum refinery plant in Taiwan.** *Journal of Toxicology and Environmental Health - Part A*. 2001; 64 (8):637-644. ISSN: 1528-7394.
This study examines the possible impact of air pollution on pregnant women living near petroleum refinery plants in Taiwan.

Lin, Qianxin; Mendelssohn, Irving A.; Suidan, Makram T.; Lee, Kenneth; Venosa, Albert D. **The dose-response relationship between No. 2 fuel oil and the growth of the salt marsh grass, *Spartina alterniflora*.** *Marine Pollution Bulletin*. 2002; 44 (9):897-902. ISSN: 0025-326X.
Low and moderate concentrations of No. 2 fuel oil did not hamper the ability of *S. alterniflora* in growth or phytoremediation abilities. However, dosages at and above 228 mg g^{-1} had a negative effect on total biomass production.

Livingstone, David. R. et al. **Development of biomarkers to detect the effects of organic pollution on aquatic invertebrates: recent molecular, genotoxic, cellular and immunological studies on the common mussel (*Mytilus edulis L.*) and other mytilids.** *International Journal of Environment and Pollution*. 2000; 13 (1-6):56-91. ISSN: 0957-4352.
This article describes several established and developmental biomarkers that can be used to guage organic pollution and its effects among mussels and other mollusks.

Loibner, Andreas P.; Szolar, Oliver H. J.; Braun, Rudolf; Hirmann, Doris. **Toxicity testing of 16 priority polycyclic aromatic hydrocarbons using Lumistox®.** *Environmental Toxicology and Chemistry*. 2004; 23 (3):557-564. ISSN: 0730-7268.
A luminescent bacteria test was used to determine the extent that exposure of PAHs have on bioluminescence limitation in *Vibrio fischeri*. Results suggest that PAHs are not a major cause of acute toxicity in the bacteria.

Long, Sara M.; Ryder, Kelly J.; Holdway, Douglas A. **The use of respiratory enzymes as biomarkers of petroleum hydrocarbon exposure in *Mytilus edulis* planulatus.** *Ecotoxicology and Environmental Safety*. 2003; 55 (3):261-270. ISSN: 0147-6513.
The common mussel was exposed to three different concentrations of the water-accommodated fraction of Bass Strait crude oil over periods of 12, 24, and 96 hours. Researchers found no significant change in levels of gill citrate synthase or lactate dehydrogenase, leading them to conclude that these respiratory enzymes are not sensitive biomarkers of PAH exposure in the mussel.

Long, Sara. M.; Holdway, Douglas. A. **Acute toxicity of crude and dispersed oil to *Octopus pallidus* (Hoyle, 1885) hatchlings.** *Water Research*. 2002; 36 (11):2769-2776. ISSN: 0043-1354.
The addition of a chemical dispersant to a water-accommodated fraction (WAF) of Bass Strait crude oil did not increase the toxicity of the WAF to hatchlings of a species of octopus.

Loranger, S.; Pouliot, Y.; Sauve, S.; Dussault, L.; Courchesne, Y. **Environmental fate and human exposure modeling of the residual TPH contamination in a bioremediated petroleum storage site.** *Environmental Analysis of Contaminated Sites (Series: Ecolgical and Environmental Toxicology Series)*. 2002;p. 411-431. ISBN: 0-471-98669-0.

Lotufo, Giulherme R.; Landrum, Peter F. **The influence of sediment and feeding on the elimination of polycyclic aromatic hydrocarbons in the freshwater amphipod, *Diporeia* spp.** *Aquatic Toxicology*. 2002; 58 (3-4):137-150. ISSN: 0166-445X.
In the presence of a substrate, *Diporeia* spp. eliminates most PAH-related contaminants by passive diffusion, not by fecal elimination, as previously thought. Researchers also report that the peritrophic membrane is not prominent in the process of elimination.

Lu, Xiaoxia; Reible, Danny D.; Fleeger, John W. **Bioavailability and assimilation of sediment-associated benzo[a]pyrene by *Ilyodrilus templetoni* (Oligochaeta).** *Environmental Toxicology and Chemistry*. 2004; 23 (1):57-64. ISSN: 0730-7268.
An oligochaete was exposed to sediments spiked with B(a)P to assess bioavailability and to better understand factors affecting bioavailability of hydrocarbon contaminants in bulk deposit-feeding organisms. Researchers found identical normalized accumulations of the contaminant at low and high concentrations, reinforcing the belief that pore-water concentration controls uptake of contaminants in this class of organism.

Lu, Xioxia; Reible, Danny D.; Fleeger, John W.; Chai, Yunzhou. **Bioavailability of desorption-resistant phenanthrene to the oligochaete *Ilyodrilus templetoni*.** *Environmental Toxicology and Chemistry*. 2003; 22 (1):153-160. ISSN: 0730-7268.
Desorption-resistant pollutants were found to reduce bioavailability to a species of freshwater oligochaete, largely due to lower effective water concentration. Uptake of pollutants was determined to occur in a two-stage process, controlled by partitioning from pore waters or digestive fluids.

Lucarelli, F. et al. **DNA biosensor investigations in fish bile for use as a biomonitoring tool.** *Analytical Letters*. 2003; 36 (9):1887-1901. ISSN: 0003-2719.
An electrochemical DNA biosensor was used to distinguish PAH-exposed fish bile samples from control samples. This novel method of recognizing and quantifying PAH exposure in organisms is sensitive, fast, and portable.

Lyons, B. P.; Pascoe, C. K.; McFadzen, I. R. B. **Phototoxicity of pyrene and benzo[a]pyrene to embryo-larval stages of the Pacific oyster *Crassostrea gigas*.** *Marine Environmental Research*. 2002; 54 (3-5):627-632. ISSN: 0141-1136.
Researchers discovered that natural levels of UV radiation caused significant increases in toxicity in the presence of very small amounts of PAHs. The phototoxic effects of pyrene and B(a)P inhibited development in oyster embryos and larvae.

MacAvoy, Stephen E.; Macko, Stephen A.; Carney, Robert S. **Links between chemosynthetic production and mobile predators on the Louisiana continental slope: stable carbon isotopes of specific fatty acids.** *Chemical Geology*. 2003; 201 (3-4):229-237. ISSN: 0009-2541.
Fatty acids and stable carbon isotopes were analyzed in organisms such as the giant isopod, starfish, hagfish and spider crab to determine the percentages of their diet originating from photosynthetic or chemosynthetic production.

Maccarone, A. D.; Brzorad, J. N. **Wading bird foraging: response and recovery from an oil spill.** *Waterbirds*. 2000; 23 (2):246-257. ISSN: 0738-6028.
This paper examines the longterm effects of the Arthur Kill oil spill on wading bird foraging ecology. In 1997, researchers repeated several earlier studies to determine whether wading birds had returned to foraging sites that were abandoned after the oil spill. Findings suggest that neither foraging habitat selection nor feeding success had returned to pre-spill patterns.

MacDonald, Ian R. et al. **Asphalt volcanism and chemosynthetic life in the Campeche Knolls, Gulf of Mexico.** *Science*. 2004; 304 (5673):999-1002. ISSN: 0036-8075.
An area on the seafloor covered in solidified asphalt hosts colonies of chemosynthetic tubeworms and bivalves. Also found in the area are oil seeps, gas hydrate deposits, and authigenic carbonate.

MacDonald, Ian R.; Sager, William W.; Peccini, Michael B. **Gas hydrate and chemosynthetic biota in mounded bathymetry at mid-slope hydrocarbon seeps: Northern Gulf of Mexico.** *Marine Geology*. 2003; 198 (1-2):133-158. ISSN: 0025-3227.
Surveys of four hydrocarbon seeps between 550 and 1900 meters revealed the existence of bacterial mats, tube worms, polychaetes and seep mussels in shallower areas, but only bacterial mats and mussels were found during preliminary surveys of deepwater locations.

Macinnis-Ng, Catriona; Ralph, Peter J. ***In situ* impact of petrochemicals on the photosynthesis of the seagrass *Zostera capricorni*.** *Marine Pollution Bulletin*. 2003; 46 (11):1395-1407. ISSN: 0025-326X.
Researchers used photosynthetic activity and a dispersant to assess the impact of petrochemicals on the samples of seagrass exposed to aged crude oil in the laboratory. Recovery of the seagrass in the laboratory was limited with the dispersant, and stress on the seagrass increased during exposure time.

Mahmoudi, E.; Beyrem, H.; Aissa, P. **Response of free-living nematodes to the quality of waters and sediments at Ghar El Melh lagoon (Tunisia) during summer 1999.** *Cahiers de Biologie Marine*. 2002; 43 (1):83-93. ISSN: 0007-9723.

Maria, Vera L.; Correia, António C.; Santos, Maria A. ***Anguilla anguilla* L. biochemical and genotoxic responses to benzo[a]pyrene.** *Ecotoxicology and Environmental Safety*. 2002; 53 (1):86-92. ISSN: 0147-6513.
Adult eels were investigated to further understand the influence of B(a)P exposure on Phase 1 enzyme activity and types of genotoxic biomarkers found in liver samples. Biotransformation of B(a)P in eel livers was recognized by the presence of EROD activity, a reduction of blood and liver DNA integrity, and an increase in erythrocytic nuclear abnormalities (ENA) activity, over a period up to 216 hours after initial exposure.

Maria, Vera L.; Correia, António C.; Santos, Maria A. ***Anguilla anguilla* L. blood and liver DNA strand breaks after β-naphthoflavone exposure.** *Fresenius Environmental Bulletin*. 2004; 13 (2):93-97. ISSN: 1018-4619.
DNA extracted from the blood and liver eels were analyzed after different exposure levels of β-naphthoflavone (BNF). Analysis showed that blood DNA integrity decrease was time and dose dependent, and that liver DNA was more sensitive to BNF exposure as compared to blood DNA.

Maria, Vera L.; Correia, António C.; Santos, Maria A. **Benzo[a]pyrene and β -naphthoflavone mutagenic activation by European eel (*Anguilla anguilla* L.) S9 liver fraction.** *Ecotoxicology and Environmental Safety*. 2002; 53 (1):81-85. ISSN: 0147-6513.
In order to determine whether EROD induction is necessary for conversion of B(a)P promutagens into mutagenic compounds, European eels were exposed to both high and low concentrations of B(a)P and β-naphthoflavone (BNF). Analysis of S9 liver fraction demonstrates that eel S9 liver fraction can convert high concentrations of B(a)P into mutagenic compounds with or without previous liver BNF transformation induction.

Maria, Vera L.; Gravato, C.; Correia, António C.; Santos, Maria A. **Biotransformation and genotoxicity responses to PAHs in two teleost species.** *Fresenius Environmental Bulletin*. 2002; 11 (9A (Special Issue)):609-615. ISSN: 1018-4619.

Marigómez, Ionan; Baybay-Villacorta, Lurraine. **Pollutant-specific and general lysosomal responses in digestive cells of mussels exposed to model organic chemicals.** *Aquatic Toxicology*. 2003; 64 (3):235-257. ISSN: 0166-445X.
Lysosomal enlargement was observed in mussels after exposure to a number of organic compounds, including B(a)P. Authors note that although lysosomal response is complex and open to interpretation, it has potential for being an extremely useful biomarker for pollution monitoring.

Mariño-Balsa, J. C. et al. **Assessment of the toxicity of sediment and seawater polluted by the *Prestige* fuel spill using bioassays with clams (*Venerupis pullastra*, *Tappes decussatus* and *Venerupis rhomboideus*) and the microalga *Skeletonema costatum*.** *Ciencias Marinas*. 2003; 29 (1):115-122. ISSN: 0185-3880.
Following the *Prestige* oil spill, bioassays and early pollution monitoring were undertaken on the shores of the Galician coast to evaluate the toxicity of sediments and the impact on juvenile burrowing animals.

Marsili, Letizia et al. **Polycyclic aromatic hydrocarbons (PAHs) in subcutaneous biopsies of Mediterranean cetaceans.** *Chemosphere*. 2001; 44 (2):147-154. ISSN: 0045-6535.
Blubber samples were collected from live specimens of fin whales (*Balaenoptera physalus*) and striped dolphins (*Stenella coeruleoalba*) by means of biopsies. The samples were then used to compare PAH values between the two species, and to determine chemical stress in the cetaceans.

Marty, Gary D.; Hoffman, Andy; Okihiro, Kelly Hepler; Hanes, David. **Retrospective analysis: bile hydrocarbons and histopathology of demersal rockfish in Prince William Sound, Alaska, after the *Exxon Valdez* oil spill.** *Marine Environmental Research*. 2003; 56 (5):569-584. ISSN: 0141-1136.
According to the authors, microscopic differences in samples of fish collected in 1989 compared with samples collected between 1990 and 1991 were due to age and species differences rather than previous exposure to oil.

Marvin, Chris; Allan, Laurie; Bryant, Douglas. **Use of the zebra mussel (*Dreissena polymorpha*) as a bioindicator for aromatic hydrocarbons in Hamilton Harbor.** *Water Quality Research Journal of Canada*. 2000; 35 (1):59-72. ISSN: 1201-3080.

Matscheko, Nadja; Lundstedt, Staffan; Svensson, Linda; Harju, Mikael; Tysklind, Mats. **Accumulation and elimination of 16 polycyclic aromatic compounds in the earthworm (*Eisenia fetida*).** *Environmental Toxicology and Chemistry*. 2002; 21 (8):1724-1729. ISSN: 0730-7268.
Uptake curves and elimination constants were plotted for polycyclic aromatic compounds in earthworms. Results of experiments have shed light on the relationship between the PACs, octanol-water partitioning and polarizability that will be useful in predicting future interactions.

Matthiessen, P.; Law, R. J. **Contaminants and their effects on estuarine and coastal organisms in the United Kingdom in the late twentieth century.** *Environmental Pollution*. 2002; 120 (3):739-757. ISSN: 0269-7491.

Mazet, J. K.; Gardner, I. A.; Jessup, D. A.; Lowenstien, L. J.; Boyce, W. M. **Evaluation of changes in hematologic and clinical biochemical values after exposure to petroleum products in mink (*Mustela vison*) as a model for assessment of sea otters (*Enhydra lutris*).** *American Journal of Veterinary Research*. 2000; 61 (10):1197-1203. ISSN: 0002-9645.
Results of research on mink show that they, like sea otters, exhibit increased alanine transaminase and alkaline phosphatase activities, in addition to decreased total protein concentration after exposure to to a slick of Alaskan North Slope crude oil.

McCarthy, J. F.; Burrus, L. W.; Tolbert, V. R. **Bioaccumulation of benzo(a)pyrene from sediment by flathead minnows: effects of organic content, resuspension and metabolism.** *Archives of Environmental Contamination and Toxicology*. 2003; 45 (3):364-370. ISSN: 0090-4341.

Merten, Amy Ann. **Bioavailability of Different Forms of Polycyclic Aromatic Hydrocarbons to the Estuarine Amphipod *Leptocheirus plumulosus*.** Thesis (M.S.): University of Maryland, College Park; 1999; 151 leaves.

Meyer, Joel N.; Di Giuliuo, Richard T. **Heritable adaptation and fitness costs in killifish (*Fundulus beteroclitus*) inhabiting a polluted estuary.** *Ecological Applications*. 2003; 13 (2):490-503. ISSN: 1051-0761.
Laboratory-raised offspring of fish collected from polluted waters were more resistant to contaminated river sediments than offspring from reference sites. However, investigators believe that the toxicity-resistance in fish came at the cost of reduced fitness in other ways.

Michel, Xavier et al. **Cytochrome P450 dependent activities in mussel and fish from coastal marine environment: field studies on the French coast of the Mediterranean Sea.** *Polycyclic Aromatic Compounds*. 2001; 18 (3):307-324. ISSN: 1040-6638.
Investigators sampled the digestive glands of mussels (*Mytilus galloprovincialis*) and livers of the sea comber (*Serranus cabrilla*) for evidence of EROD activity due to exposure to B(a)P. A large discrepancy was discovered in CYP related activities, with higher levels found in the fish, rather than mussels.

Middaugh, D. P.; Chapman, P. J.; Shelton, M. E.; McKenney, C. L.; Courtney, L. A. **Effects of fractions from biodegraded Alaska north slope crude oil on embryonic inland silversides, *Menidia beryllina*.** *Archives of Environmental Contamination and Toxicology*. 2002; 42 (2):236-243. ISSN: 0090-4341.
Crude oil was biodegraded by microbial processes, and embryonic fish were exposed to various water-soluble fractions (WSFs) for a period of days. Results showed that WSF exposure led to developmental malformations and toxicity in the embryos.

Mignucci-Giannoni, A. A. **Assessment and rehabilitation of wildlife affected by an oil spill in Puerto Rico.** *Environmental Pollution*. 1999; 104 (2):323-333. ISSN: 0269-7491.
This article recounts the types and numbers of animals collected after the 1994 oil spill. Only 63% of the live species collected were successfully rehabilitated. Among the worst affected animals were shore crabs, birds and sea turtles.

Mills, DeEtta K.; Fitzgerald, Kristin; Litchfield, Carol D.; Gillevet, Patrick M. **A comparison of DNA profiling techniques for monitoring nutrient impact on microbial community composition during bioremediation of petroleum-contaminated soils.** *Journal of Microbiological Methods*. 2003; 54 (1):57-74. ISSN 0167-7012.
Two DNA profiling tools, amplicon length heterogeneity PCR (LH-PCR) and terminal restriction length polymorphism (TRFLP), were compared in analyses of microbial community reaction to nutrient amendments during bioremediation of PAHs. Authors found that LH-PCR was better at profiling the diversity of a microbial community and tracking changes in community responses to nutrient amendments.

Mitra, S.; Klerks, Paul L.; Bianchi, Thomas S.; Means, J.; Carman, K. R. **Effects of estuarine organic matter biogeochemistry on the bioaccumulation of PAHs by two epibenthic species.** *Estuaries*. 2000; 23 (6):864-876. ISSN: 0160-8347.
Two species, grass shrimp and common rangia, were tested in brackish swamp and coastal salt marsh ecosystems for PAH bio-sediment accumulation factors over a period of 14 days. Results from data collected at the brackish swamp differed with the data collected in the coastal salt marsh.

Monson, Daniel H.; Doak, Daniel F.; Bodkin, James L. **Long-term impacts of the *Exxon Valdez* oil spill on sea otters, assessed though age-dependent mortality patterns.** *Proceedings of the National Academy of Sciences*. 2000; 97 (12):6562-6567. ISSN: 0027-8424.
Investigations of the sea otter population in western Prince William Sound found elevated mortality rates 9 years after the *Exxon Valdez* oil spill. Younger otters were found to have lower mortality rates than those otters born before 1989. However, younger otters were still negatively affected by the presence of acute oil exposure and, possibly, exposure to oil residues.

Montagna, Paul A.; Jarvis, Stephen C.; Kennicutt, Mahlon C., II. **Distinguishing between contaminant and reef effects on meiofauna near offshore hydrocarbon platforms in the Gulf of Mexico.** *Canadian Journal of Fisheries and Aquatic Sciences*. 2022; 59 (10):1584-1592. ISSN: 0706-652X.
The influence of habitat seemed to have a greater effect on meiofaunal abundance and community structure than the effects of contamination from offshore oil and gas platforms.

Moore, P. G. **Mammals in intertidal and maritime ecosystems: interactions, impacts and implications.** *In* Gibson, R. N.; Barnes, Margaret; Atkinson, R. J. A. (Eds.) *Oceanography and Marine Biology: an Annual Review, v.40*. London: Taylor & Francis; 2002; p. 491-608. ISBN: 0-415-25462-0.

More birds coated in oil from spill. *San Diego Union-Tribune*. San Diego, Ca: San Diego Union-Tribune; March 25, 2002; A 4.
In November 2001, oil began to leak from a 468-ft. freighter that sank 17 miles southwest of the Golden Gate Bridge in 1953. Approximately 1,100 birds had died from the oil contamination, and approximately 800 birds were being rehabilitated.

Morita, Akemi; Kusaka, Yukinori; Deguchi, Yoji. **Acute health problems among the people engaged in the cleanup of the *Nakhodka* oil spill.** *Environmental Research*. 1999; 81 (3):185-94. ISSN: 0013-9351.
Investigations revealed that people helping with the cleanup experienced a number of heath related problems due to exposure to the oil, including low back and leg pain, headache, and various problems with eyes and throat.

Murphy, Kim. **Exxon oil spill's cleanup crews share years of illness; health: workers say chemical exposure left them debilitated. Firm insists toxicity was low.** *Los Angeles Times*. Los Angeles, Ca.: Times Mirror Company; November 5, 2001; A 1.
Lawsuits against Exxon are being brought forth by workers who aided in the clean-up of the *Valdez* oil spill. Strong solvents, in addition to fumes from the fresh crude oil, are being blamed for many internal illnesses.

Murphy, M. L.; Heintz, R. A.; Short, J. W.; Larsen, M. L.; Rice, S. D. **Recovery of pink salmon spawning areas after the *Exxon Valdez* oil spill.** *Transactions of the American Fisheries Society*. 2000; 128 (5):909-918. ISSN: 0002-8487
Sediment samples were collected and analyzed from stream deltas throughout Prince William Sound, Alaska, following the *Exxon Valdez* spill. The samples were used to assess recovery of salmon habitat after the spill. Up to 70% of wild pink salmon spawn in intertidal streams throughout the Prince William Sound.

Murphy, S. M.; Mabee, T. J. **Status of black oystercatchers in Prince William Sound, Alaska, nine years after the *Exxon Valdez* oil spill.** *Waterbirds*. 2000; 23 (2):204-213. ISSN: 0738-6028.
In 1998, researchers documented 79 Black Oystercatcher nesting pairs in the Prince William Sound study area. The study was implemented to evaluate the status of breeding Black Oystercatchers in Prince William Sound and to determine whether these birds have recovered from previously identified impacts of the oil spill. The objectives were to make comparisons among years and between oiled and unoiled sites in different aspects of the birds breeding effort, egg volumes, assess nesting success, and evaluate chick development and survival rates of chicks.

Nakata, Haruhiko; Sakai, Yasufumi; Miyawaki, Takashi; Takemura, Akira. **Bioaccumulation and toxic potencies of polychlorinated biphenyls and polycyclic aromatic hydrocarbons in tidal flat and coastal ecosystems of the Ariake Sea, Japan.** *Environmental Science & Technology*. 2003; 37 (16):3513-3521. ISSN: 0013-936X.
High PAH concentrations were found in lower trophic organisms, such as lugworms and crabs, which ingest sediment as they feed. Researchers stress that environmental risks associated with PAH accumulation in organisms should not be ignored.

Nayar, S.; Goh, B. P. L.; Chou, L. M. **The impact of petroleum hydrocarbons (diesel) on periphyton in an impacted tropical estuary based on *in situ* microcosms.** *Journal of Experimental Marine Biology and Ecology*. 2004; 302 (2):213-232. ISSN: 0022-0981.
Signs of acute toxicity, followed by a significant reduction in periphytic algal biomass, were noted after exposure to different concentrations of petroleum hydrocarbons.

Neff, Jerry M. **Bioaccumulation in Marine Organisms: Effect of Contaminants From Oil Well Produced Water.** Boston, Ma.: Elsevier; 2002; 452 pp. ISBN: 0-080-43716-8.

Nemergut, D. R.; Wunch, K. G.; Johnson, R. M.; Bennett, J. W. **Benzo[a]pyrene removal by *Marasmiellus troyanus* in soil microcosms.** *Journal of Industrial Microbiology & Biotechnology*. 2000; 25 (2):116-119. ISSN: 1367-5435.
Litter rot fungus was tested for remediation properties by being encapsulated in alginate and placed in contaminated soil samples for a six-week period.

Nicolas, Jean Marc. **Vitellogenesis in Winter Flounder (*Pleuronectes americanus*) Under Hydrocarbon Contaminated Conditions.** Thesis (Ph. D.): Dalhousie University (Canada); 1999; 163 leaves.

Nikitik, Christopher C. S.; Robinson, Andrew W. **Patterns in benthic populations in the Milford Haven waterway following the '*Sea Empress*' oil spill with special reference to amphipods.** *Marine Pollution Bulletin*. 2003; 46 (9):1125-1141. ISSN: 0025-326X.
Researchers use a polychaete/amphipod ratio as an indicator to assess the effects of oil contamination on resident organisms following the '*Sea Empress*' oil spill.

Nikolaus, Roxanne; Ammerman, James W.; MacDonald, Ian R. **Distinct pigmentation and trophic modes in *Beggiatoa* from hydrocarbon seeps in the Gulf of Mexico.** *Aquatic Microbial Ecology*. 2003; 32 (1):85-93. ISSN: 0948-3055.
Researchers examined pigmented and non-pigmented bacterial mats associated with hydrocarbon seeps to determine whether the colonies were located in areas due to specific geochemical environments. Results indicate that trophic modes (chemoautotrophic and heterotrophic) are supported by geochemical processes associated with hydrocarbon seeps.

Niyogi, S.; Biswas, S.; Sarker, S.; Datta, A. G. **Antioxidant enzymes in brackishwater oyster, *Saccostrea cucullata* as potential biomarkers of polyaromatic hydrocarbon pollution in Hooghly Estuary (India): seasonality and its consequences.** *Science of the Total Environment*. 2001; 281 (1-3):237-246. ISSN: 0048-9697.
Analysis of oysters suggested that samples from heavily polluted areas showed less seasonal fluctuations in antioxidant enzyme activity than oysters sampled in cleaner areas of the Hooghly estuary. Seasonal variations in enzyme activity should be understood when using certain species as biomarkers in a given environment.

Niyogi, S.; Biswas, S.; Sarker, S.; Datta, A. G. **Seasonal variation of antioxidant and biotransformation enzymes in barnacle, *Balanus balanoides*, and their relation with polyaromatic hydrocarbons.** *Marine Environmental Research*. 2001; 52 (1):13-26. ISSN: 0141-1136.
Tests on seasonal enzyme activity in a barnacle species in both polluted and non-polluted areas indicate that two antioxidant enzymes, SOD and catalase, are excellent biomarkers for evaluating the extent of pollution in marine ecosystems.

Norcross, B. L. et al. **A synthesis of the life history and ecology of juvenile Pacific herring in Prince William Sound, Alaska.** *Fisheries Oceanography*. 2001; 10 (Supp. 1):42-57. ISSN: 1054-6006.

Notar, M.; Leskovsek, H. **Polycyclic aromatic hydrocarbons in mussels from the Northern Adriatic Sea.** *Fresenius Environmental Bulletin*. 2000; 9 (7-8):427-434. ISSN: 1018-4619.

Nunes-Halldorson, Vânia da Silva; Steiner, Robert; Smith, Geoffrey B. **Residual toxicity after biodegradation: interactions among benzene, toluene, and chloroform.** *Ecotoxicology and Environmental Safety*. 2004; 57 (2):162-167. ISSN: 0147-6513.
Toxicity tests using freshwater invertebrates and microbes indicate that significant toxicity remained in samples following partial biodegradation of PAHs.

Nwankwo, D. I. **The algae of crude oil impacted mangrove soil in the Niger delta, Nigeria.** *Tropical Ecology*. 2000; 41 (2):243-245. ISSN: 0564-3295.
Sediment samples were analyzed over a two-year period following contamination by crude oil. Blue green algae were found to be more resilient and more successful in occupying freshly contaminated soil.

Ogboghodo, I. A.; Erebor, E. B.; Osemwota, I. O.; Isitekhale, H. H. **The effects of application of poultry manure to crude oil polluted soils on maize (*Zea mays*) growth and soil properties.** *Environmental Monitoring and Assessment*. 2004; 96 (1-3):153-161. ISSN: 0167-6369.
Under natural conditions, researchers use potted maize plants contaminated with different concentrations levels of crude oil and then amended with poultry manure to determine survival rate of seed germination, contamination to soils and to assess plant height.

Ogboghodo, I. A.; Iruaga, E. K.; Osemwota, I. O.; Chokor, J. U. **An assessment of the effects of crude oil pollution on soil properties, germination and growth of maize (*Zea mays*) using two crude types - Forcados light and Escravos light.** *Environmental Monitoring and Assessment*. 2004; 96 (1-3):143-152. ISSN: 0167-6369.
Using two crude oil types, authors set up experiments in controlled and natural environmental settings to investigate contamination on soil properties, germination and height of maize.

Ohwada, Kouichi et al. **Study of the effect of water-soluble fractions of heavy-oil on coastal marine organisms using enclosed ecosystems, mesocosms.** *Marine Pollution Bulletin*. 2003; 47 (1-6):78-84. ISSN: 0025-326X.
In mesocosm experiments, authors found that vertical flux of suspended particles and phytoplankton was mostly responsible for the soluble fraction of oil ending up in bottom sediments.

Oiled Antarctic penguins. *Marine Pollution Bulletin*. 2001; 42 (4):255. ISSN: 0025-326X.
A joint US and New Zealand team discovered petroleum residue in about a dozen small melt pools at a deserted research station at Cape Hallett, Antarctica. As the assessment of the melt pools was underway, the team discovered a number of Adelie penguin chicks, whose feathers were contaminated with oil. The chicks were removed, cleaned and transported to another location. The Cape Hallett station closed in 1973, after a fire destroyed the lab.

Oil-soaked birds spotted in area. *New Orleans Times-Picayune*. New Orleans, La.: Times-Picayune Publishing Company; November 30, 2000; A 06-07.
The *Westchester* tanker ran aground in the Mississippi River November 27, 2000. The oil spill was located about 25 miles downriver from two major wintering grounds for migratory waterfowl. Oil-soaked birds were spotted in the spill area. The environmental group Tri-State Bird Rescue and Research of Delaware was expected to arrive and set up a recovery plan for the oiled animals.

Omoregie, E. **Acute toxicity of water soluble fractions of crude oil to the Nile tilapia, *Oreochromis niloticus* (L.).** *Bulletin of Environmental Contamination and Toxicology*. 2002; 68 (5):623-629. ISSN: 0007-4861.
Bonny Light crude oil was tested on Nile tilapia, *Oreochromis niloticus*, to investigate the acute toxicity of the water soluble fractions of the oil and its impact on the fish.

Omoregie, E.; Ufodike, E. B. C.; Onwuliri, C. O. E. **Effect of petroleum effluent pollution on carbohydrate reserves of the Nile tilapia, *Oreochromis niloticus* (L.).** *Discovery and Innovation*. 2000; 12 (1-2):26-29. ISSN: 1015-079X.
Research on plasma glucose, liver and muscle glycogen of the Nile tilapia showed evidence of stress and impaired carbohydrate metabolism, as well as liver and muscle glycogen depletion.

Orbell, John D. et al. **Whole-bird models for the magnetic cleansing of oiled feathers.** *Marine Pollution Bulletin*. 2004; 48 (3-4):336-340. ISSN: 0025-326X.
In a laboratory study, various types of petroleum-based oils and an oil/seawater emulsion were applied to selected areas of Mallard Duck and Little Penguin carcasses to evaluate the effectiveness of an iron powder dry-cleansing agent.

Ormseth, O. A.; Ben-David, Merav. **Ingestion of crude oil: effects on digesta retention times and nutrient uptake in captive river otters.** *Journal of Comparative Physiology B.*. 2000; 170 (5-6):419-428. ISSN: 0174-1578.
River otters, when exposed to weathered crude oil as part of their diet, showed shorter rates of food retention in their system. Lower rates of absorption of lipids were discovered, which investigators speculated was due to reduced retention time of food. The impact of shorter food retention on digestive function would explain reduced body weights found in river otters following the *Exxon Valdez* oil spill.

Ortega-Calvo, J. J.; Marchenko, A. I.; Vorobyov, A. V.; Borovick, R. V. **Chemotaxis in polycyclic aromatic hydrocarbon-degrading bacteria isolated from coal-tar- and oil-polluted rhizospheres.** *FEMS Microbiology Ecology*. 2003; 44 (3):373-381. ISSN: 0168-6496.
A densitometric method of quantifying chemotactic response was used to determine the relevance of chemotaxis as a bioavailability-promoting feature of rhizosphere bacteria during biodegradation of PAHs.

Pacheco, Mário.; Santos, Maria Ana. **Naphthalene and β-naphthoflavone effects on *Anguilla anguilla* L. hepatic metabolism and erythrocytic nuclear abnormalities.** *Environment International*. 2002; 28 (4):285-293. ISSN: 0160-4120.
European eels were exposed to different concentrations of naphthalene and β - naphthoflavone to compare liver response as measured in EROD activity and erythrocytic nuclear abnormalities frequency. Based on the results of these experiments, the authors elect EROD activity as a useful short- to medium-term biomarker for exposure to PAHs.

Pacheco, Mário; Santos, Maria Ana. **Biotransformation, endocrine, and genetic responses of *Anguilla anguilla* L. to petroleum distillate products and environmentally contaminated waters.** *Ecotoxicology and Environmental Safety*. 2001; 49 (1):64-75. ISSN: 0147-6513.
European eels, exposed to diesel oil and gasoline water soluble fractions, showed a time-related increase in EROD activity and erythrocytic nuclear abnormalities. Eels exposed to tide harbor waters showed similar degrees of genotoxicity without corresponding EROD activity.

Pacheco, Mário; Santos, Maria Ana. **Biotransformation, genotoxic, and histopathological effects of environmental contaminants in European eel (*Anguilla anguilla* L.).** *Ecotoxicology and Environmental Safety*. 2002; 53 (3):331-347. ISSN: 0147-6513.
Researchers used a variety of environmental pollutants, including B(a)P, to monitor a suite of biomarkers in tracking the toxic response of contaminants in fish.

Palmqvist, Annemette; Selck, Henriette; Rasmussen, Lene Juel; Forbes, Valery E. **Biotransformation and genotoxicity of fluoranthene in the deposit-feeding polychaete *Capitella* sp I.** *Environmental Toxicology and Chemistry*. 2003; 22 (12):2977-2985. ISSN: 0730-7268.
After exposing a species of polychaete to fluoranthene, DNA was extracted and analyzed. Damaged DNA from fluoranthene exposure and/or uptake was associated with the production of aqueous metabolites of the hydrocarbon. Ongoing analysis found that the extent of damage was time-dependent, suggesting the existence of DNA repair mechanisms.

Park, W.; Jeon, C. O.; Cadillo, H.; DeRito, C.; Madsen, E. L. **Survival of naphthalene-degrading *Pseudomonas putida* NCIB 9816-4 in naphthalene-amended soils: toxicity of naphthalene and its metabolites.** *Applied Microbiology and Biotechnology*. 2004; 64 (3):429-435. ISSN: 0175-7598.
Naphthalene metabolites including catechol and related compounds or condensation products were found to be present in a PAH-degrading bacterium. Metabolites became toxic when accumulation levels reached a certain point while cells were in a stationary phase.

Paul, M.; Menon, N. R.; Philip, R. **Stress responses and vibriosis induced by petroleum hydrocarbons in the penaeid shrimp *Metapenaeus dobsoni* (Miers).** *In* Rodriguez, G. R.; Brebbia, C. A. (Eds.) *Oil and Hydrocarbon Spills, Modelling, Analysis and Control II*. Billerica, Ma.: Computational Mechanics Inc.; 2000; p. 107-115. ISBN: 1-85312-828-7.
Researchers established a link between subleathal exposure of crude oil to penaeid shrimp and stress that made them susceptible to vibriosis.

Pavillon, J. F.; Oudot, J.; Dlugon, A.; Roger, E.; Juhel, G. **Impact of the '*Erika*' oil spill on the *Tigriopus brevicornis* ecosystem at the Le Croisic headland (France): preliminary observations.** *Journal of the Marine Biological Association of the United Kingdom*. 2002; 82 (3):409-413. ISSN: 0025-3154.
Samples of oil contaminated water and sediments were collected during several field missions in the ecosystem at the Le Croisic headland following the '*Erika*' oil spill. These samples were then applied to a controlled laboratory experiment, where two organisms were exposed to contaminatss to determine the impact on the organisms.

Pearce, Fred. **In the thick of it.** *New Scientist*. 2001; 170 (2289):4. ISSN: 0262-4079.
A survey of seabird population recovery over eight years following the *Exxon Valdez* spill still show no evidence of recovery. Researchers believe that birds are still suffering because food in the intertidal zone and shallow waters near the shore are still contaminated with oil.

Peeters, E. T. H. M.; DeJager, T. J.; Beijer, J. A. J.; Koelmans, A. A. **Effects of benzo(a)pyrene and size of organic matter particles on bioaccumulation and growth of *Asellus aquaticus*.** *Archives of Environmental Contamination and Toxicology*. 2000; 39 (3):307-314. ISSN: 0090-4341.
Attempting to demonstrate the hypothesis that equilibrium partitioning theory (EPT) is responsible for biological effects of PAHs, authors tested bioaccumulation of the waterlouse *A. aquaticus*. Results showed that the size of organic matter particles ingested determined growth in the waterlouse.

Perkins, Edward J.; Lotufo, Guilherme R. **Playing in the mud-using gene expression to assess contaminant effects on sediment dwelling invertebrates.** *Ecotoxicology*. 2003; 12 (6):453-456. ISSN: 0963-9292.
The effect of phenanthrene on a putative retrotransposon resulted in increased expression, especially at levels causing significant mortality. Researchers believe that genetic markers can serve as measures of genotoxic potential.

Peters, L. D.; Telli-Karakoç, F.; Hewer, A.; Phillips, D. H. ***In vitro* mechanistic differences in benzo[a]pyrene-DNA adduct formation using fish liver and mussel digestive gland microsomal activating systems.** *Marine Environmental Research*. 2002; 54 (3-5):499-504. ISSN: 0141-1136.
Researchers conclude that disparities *in vitro* DNA adduct formation between fish and mussels is most likely due to different levels of CYP in each organism.

Peterson, Charles H.; Holland-Bartels, Leslie. **Chronic impacts of oil pollution in the sea: risks to vertebrate predators.** *Marine Ecology - Progress Series*. 2002; 241;235-236. ISSN: 0171-8630.
This paper introduces four reports that emerged from the Nearshore Vertebrate Predator project, which was initiated to investigate delays in population recovery of sentinel organisms in the coastal ecosystem affected by the *Exxon Valdez* oil spill.

Piccardo, M. T.; Coradeghini, R.; Valerio, F. **Polycyclic aromatic hydrocarbon pollution in native and caged mussels.** *Marine Pollution Bulletin*. 2001; 42 (10):951-956. ISSN: 0025-326X.
Four stations were set up along the Ligurian coast to conduct a biological monitoring study using native and caged mussels. Seasonal sampling showed that accumulation patterns varied according to the source of pollution to which the mussels were exposed. Samples of tissue from the mussels were used to classify PAH concentrations and composition at the coastal sites.

Pietrapiana, D.; Modena, M.; Guidetti, P.; Falugi, C.; Vacchi, M. **Evaluating the genotoxic damage and hepatic tissue alterations in demersal fish species: a case study in the Ligurian Sea (NW-Mediterranean).** *Marine Pollution Bulletin*. 2002; 44 (3):238-243. ISSN: 0025-326X.
Post-spill effects of oil from the *Haven* were investigated for possible genotoxic damage to three local fish species. Of the three species, *Lepidorhombus boscii* showed the greatest sensitivity to the pollutants. Authors suggest that micronucleus tests are a fast and effective method of detecting oil pollution.

Pilcher, Nicolas J. **Green turtle, *Chelonia mydas*, in the Saudi Arabian Gulf.** *Chelonian Conservation and Biology*. 2000; 3 (4):730-734. ISSN: 1071-8443.
In an attempt to assess the effects of the 1991 Gulf War oil spill on green turtles, over 800 were tagged in 3 areas of the Arabian Gulf, and monitored into the following year. Researches concluded that the oil spill had no acute effect on nesting turtles, their eggs or hatchlings.

Poggiale, Jean-Christophe; Dauvin, Jean-Claude. **Long-term dynamics of three benthic *Ampelisca* (Crustacea-Amphipoda) populations from the Bay of Morlaix (Western English Channel) related to their disappearance after the '*Amoco Cadiz*' oil spill.** *Marine Ecology - Progress Series*. 2001; 214;201-209. ISSN: 0171-8630.
A population dynamics model, which consists of pollution, sea temperature and competition, was used to explain how *Ampelisca* populations of Pierre Noire have recolonized following the severe effects of the *Amoco Cadiz* oil spill.

Pollino, Carmel A.; Holdway, Douglas A. **Reproductive potential of crimson-spotted rainbowfish (Melanotaenia fluviatilis) following short-term exposure to Bass Strait crude oil and dispersed crude oil.** *Environmental Toxicology*. 2002; 17 (2):138-145. ISSN: 1520-4081.
In this investigation, fish were exposed to different types of water-accommodated fractions of crude oil to determine the effects of short-term exposure on reproductive success. Results show that the crimson-spotted rainbowfish were able to endure short-term exposures without a pronounced effect on egg production, hatchability, or larval lengths.

Porte, C.; Biosca, X.; Solé, M.; Albaigés, J. ***Aegean* oil spill on the Galician Coast (NW Spain). III: the assessment of long-term sublethal effects on mussels.** *Biomarkers*. 2000; 5 (6):436-446. ISSN: 1354-750X.
Researchers found enzyme activity to be influenced by hydrocarbons in the water and sediment. Lipid peroxidation was found to increase throughout the year, even though a strong seasonal effect was also found, correlating with a total PAH body burden.

Quiñones-Rivera, Antonio; Alexander, Renee R.; Alexander, Martin. **Effect of nonaqueous-phase liquids on the availability of polycyclic aromatic hydrocarbons in soil for worm uptake and bacterial genotoxicity.** *Environmental Toxicology and Chemistry*. 2003; 22 (11):2599-2604. ISSN: 0730-7268.
Assays for genotoxicity and invertebrate assimilation confirmed that the presence of nonaqueous-phase liquids (NAPLs) in soil decreases the bioavailability of B(a)P. Soil type and viscosity of NAPLs were also found to influence the amount of B(a)P bioavailability.

Rademacher, K. R.; Render, J. H. **Fish assemblages around oil and gas platforms in the northeastern Gulf of Mexico: developing a survey design.** *In* Stanley, D. R.; Scarborough-Bull, A. (Eds.) *Fisheries, Reefs, and Offshore Development (Series: American Fisheries Society Symposium Series, v.36)*. Bethesda, Md: American Fisheries Society; 2003; p. 101-122. ISBN: 1-888569-54-9.

Rauch, Tommy J. **Equilibrial blenniid assemblages on offshore petroleum platforms.** *Environmental Biology of Fishes*. 2003; 68 (3):301-305. ISSN: 0378-1909.
The age of offshore platforms and the passage of Tropical Storm Danny did not appear to have any influence on blenniid community dynamics in the northern Gulf of Mexico.

Reid, D. J.; MacFarlane, G. R. **Potential biomarkers of crude oil exposure in the gastropod mollusc, *Austrocochlea porcata*: laboratory and manipulative field studies.** *Environmental Pollution*. 2003; 126 (2):147-155. ISSN: 0269-7491.
Researchers measured oxidative damage and glutathione antioxidant system levels to evaluate if these parameters were effective biomarkers of sublethal exposures to oil in a species of mollusk. Glutathione and glutathione peroxidase were thought to be better candidates for biomarker studies, but further analysis showed insufficient response sensitivity to the contaminants.

Reynaud, S.; Marionnet, D.; Taysse, L.; Duchiron, C.; Deschaux, P. **The effects of 3-methylcholanthrene on macrophage respiratory burst and biotransformation activities in the common carp (*Cyprinus carpio* L.).** *Fish & Shellfish Immunology*. 2002; 12 (1):17-34. ISSN: 1050-4648.
Authors describe the effects of a hydrocarbon on the physiological process that controls bacterial growth at the cellular level.

Reynolds, W. J.; Lancaster, J. E.; Pawson, M. G. **Patterns of spawning and recruitment of sea bass to Bristol Channel nurseries in relation to the 1996 '*Sea Empress*' oil spill.** *Journal of the Marine Biological Association of the United Kingdom*. 2003; 83 (5):1163-1170. ISSN: 0025-3154.
Analysis of sea bass recruitment to nursery areas along the south Wales coast suggests that effects of the '*Sea Empress*' spill and resulting cleanup efforts impacted post-larval survival more than the egg and larval stage of development.

Richardson, Bruce J. et al. **A comparison of polycyclic aromatic hydrocarbons and petroleum hydrocarbon uptake by mussels (*Perna viridis*) and semi-permeable membrane devices (SPMDs) in Hong Kong coastal waters.** *Environmental Pollution*. 2003; 122 (2):223-227. ISSN: 0269-7491.
In site tests, mussels consistently accumulated higher levels of PAHs and petroleum hydrocarbons than SPMDs. However, researchers found that mortality was a limiting factor in mussels, at least at one sampling site. Due to the different accumulation patterns between PAHs and petroleum hydrocarbons, SPMDs are not suitable replacements for sentinel organisms.

Roberts, J. M.; Anderson, R. M. **A new laboratory method for monitoring deep-water coral polyp behaviour.** *Hydrobiologia*. 2002; 471:143-148. ISSN: 0018-8158.
Authors describe a method of continuous monitoring of coral polyp behavior in a laboratory environment with the use of time-lapse video and infrared light. This technique can be used to understand the reaction of coral polyps to short-term environmental changes, such as sediment disturbance from deep-water drilling activities.

Robson, Diana Bizecki; Knight, J. Diane; Farrell, Richard E.; Germida, James J. **Natural revegetation of hydrocarbon-contaminated soil in semi-arid grasslands.** *Canadian Journal of Botany - Revue Canadienne de Botanique*. 2004; 82 (1):22-30. ISSN: 0008-4026.
Vegetation was sampled on contaminated plots where natural recovery was allowed to take place and compared with non-contaminated plots. Researchers found that species diversity was lower on contaminated plots, with self-pollinating species common but plants that use unassisted means or birds as primary dispersal of seed material lacking.

Roch, P. **Behaviour of defense peptides in environmentally stressed mussels.** *Revue de Medecine Veterinaire*. 2002; 153 (7):517-520. ISSN: 0035-1555.

Rodius, F.; Hammer, C.; Vasseur, P. **Use of RNA arbitrarily primed PCR to identify genomic alterations in the digestive gland of the freshwater bivalve *Unio tumidus* at a contaminated site.** *Environmental Toxicology*. 2002; 17 (6):538-546. ISSN: 1520-4081.
This paper describes an investigation of a technique used to identify the damaging effects of contaminants such as PAHs on DNA and the resulting variations in gene expression.

Rogers, Vincent V.; Wickstrom, Mark; Liber, Karsten; MacKinnon, Michael D. **Acute and subchronic mammalian toxicity of naphthenic acids from oil sands tailings.** *Toxicological Sciences*. 2002; 66 (2):347-355. ISSN: 1096-6080.

Roling, Jonathan A.; Bain, Lisa J.; Baldwin, William S. **Differential gene expression in mummichogs (*Fundulus heteroclitus*) following treatment with pyrene: comparison to a creosote contaminated site.** *Marine Environmental Research*. 2004; 57 (5):377-395. ISSN: 0141-1136.
An estuarine fish was chosen to investigate multiple biomarkers after exposure to pyrene. Following this, fish were exposed to creosote-contaminated areas and gene expression was compared between both experimental groups. Several differences in gene expression were found, possibly due to factors such as exposure time, dose, complex mixtures or tolerance.

Röling, Wilfred F. M.; de Brito, Ivana R. Couto; Swannell, Richard P. J.; Head, Ian M. **Response of archaeal communities in beach sediments to spilled oil and bioremediation.** *Applied and Environmental Microbiology*. 2004; 70 (5):2614-2620. ISSN: 0099-2240.
Oil contamination negatively impacted *Archaea* communities, leading researchers to conclude that this species may be a useful indicator of ecosystem recovery following oil pollution.

Romero, M. C.; Gatti, M. E.; Cordoba, S.; Cazau, M. C.; Arambarri, A. M. **Physiological and morphological characteristics of yeasts isolated from waste oil effluents.** *World Journal of Microbiology and Biotechnology*. 2000; 16 (7):683-686. ISSN: 0959-3993.

Rong, Chen; Weiyun, Zheng; Qun, Yu; Ang; Lihong, Peng. **Effect of oil pollution on gluthione and relative enzyme in oyster (*Saccostrea cuculiata*).** *Acta Oceanologica Sinica*. 2003; 22 (1):145-150. ISSN: 0253-505X.
In field tests, PAH exposure caused a change in glutathione content and induced the activity of selenium-dependent glutathione peroxidase and glutathione *S*-transferase in the digestive glands and gills of oysters.

Ross, Stephen T. **Blennies on Offshore Petroleum Platforms in the Gulf of Mexico: Factors Influencing Assemblage Structure.** Thesis (Ph. D.): University of Southern Mississippi; 2000; 101 leaves.

Rotterman, Lisa Mignon; Monnett, Charles. **Length-mass and total body length of adult female sea otters in Prince William Sound before and after the *Exxon Valdez* oil spill.** *Marine Mammal Science*. 2002; 18 (4):977-993. ISSN: 0824-0469.
A difference in body weights and lengths of some classes of otters pre- and post-spill suggests that there has been an ongoing negative effect related to the *Exxon Valdez* oil spill.

Rozas, Lawrence P.; Minello, Thomas J.; Henry, Charles B. **An assessment of potential oil spill damage to salt marsh habitats and fishery resources in Galveston Bay, Texas.** *Marine Pollution Bulletin*. 2000; 40 (12):1148-1160. ISSN: 0025-326X.
Results of this study suggest that background levels of weathered oil in marsh sediments do not affect population densities or habitat use by most organisms.

Ruddock, P. J.; Bird, D. J.; McCalley, D. V. **Bile metabolites of polycyclic aromatic hydrocarbons in three species of fish from the Severn Estuary.** *Ecotoxicology and Environmental Safety*. 2002; 51 (2):97-105. ISSN: 0147-6513.
Flounders and two species of eels were tested for the existence of PAH metabolites in bile. 1-hydroxy pyrene was identified as the key metabolite in the fish. Researches suggest that common eel *Conger conger* is a suitable monitor for the existence of PAHs in estuarine systems.

Ruddock, P. J.; Bird, D. J.; McEvoy, J.; Peters, L. D. **Bile metabolites of polycyclic aromatic hydrocarbons (PAHs) in European eels *Anguilla anguilla* from United Kingdom estuaries.** *Science of the Total Environment*. 2003; 301 (1-3):105-117. ISSN: 0048-9697.
Using HPLC and low fluorescent detection, researchers separated deconjugated metabolites of PAHs in European eels. The data collected in this study was used to identify the highest levels of concentration of PAHs accumulated in the bile of the eels in respect to the characteristics of the estuarine environment from where they were collected.

Rudolph, A.; Yáñez, R.; Troncoso, L.; González, R. **Stimulation of enzymatic defense mechanisms and appearance of liver damage in juvenile trout (*Oncorhynchus mykiss*) exposed to water-accomodated trace petroleum residues.** *Bulletin of Environmental Contamination and Toxicology*. 2002; 68 (5):644-651. ISSN: 0007-4861.
Juvenile trout were exposed to petroleum hydrocarbons for a period of 30 days. Blood samples were obtained from the trout and analyzed for the effects of water-accommodated fraction on activation of the multifunction oxidase systems in the trout.

Ruggerone, Gregory T.; Rogers, Donald E. **Multi-year effects of high densities of sockeye salmon spawners on juvenile salmon growth and survival: a case study from the *Exxon Valdez* oil spill.** *Fisheries Research*. 2003; 63 (3):379-392. ISSN: 0165-7836.
Sockeye salmon populations were investigated to assess the importance of spawning fish densities on multi-year juvenile sizes and adult abundances years after the *Exxon Valdez* oil spill. Results of data presented suggest that spawning population levels have an impact on juvenile size and adult production in subsequent years.

Ryan, Kelly. **Penguins in oil spill peril.** *Herald Sun*. Melbourne, Australia: Nationwide News Pty Limited; December 15, 2002; p. 8.
Dozens of oiled carcasses of Adelie penguins began to wash ashore on Philip Island, Antarctica around early December 2001. Authorities investigated potential culprits by conducting oil fingerprinting tests and studying shipping routes.

Rye, H.; Johansen, O.; Reed, M.; Ekrol, N.; Deqi, X. **Exposure of fish larvae to hydrocarbon concentration fields generated by subsurface blowouts.** *Spill Science & Technology Bulletin*. September 2000; 6 (2):113-124. ISSN: 1353-2561.
Computer models are employed to show that dispersed components of oil from deepwater spills and blowouts off the coast of Norway can adversely affect fish larval populations and have a negative impact on future fish stocks.

Saasen, A. et al. **The effect of drilling fluid base-oil properties on occupational hygiene and the marine environment.** *SPE Drilling and Completion*. 2001; 16 (3):150-153. ISSN: 1064-6671.
In the Norwegian sector of the North Sea, the drilling industry has moved from using synthetic and other base oils to nonaromatic base oils. Comparisons of the nonaromatic oils to diesel oils are described. Further results demonstrate the benefits of using nonaromatic oils in regard to human contact and environmental impact.

Saba, V. S.; Spotila, J. R. **Survival and behavior of freshwater turtles after rehabilitation from an oil spill.** *Environmental Pollution*. 2003; 126 (2):213-223. ISSN: 0269-7491.
A number of freshwater turtles that were exposed to spilled oil and rehabilitated were compared to potentially exposed and to non-exposed turtles months later to determine differences between the groups. Researchers found that there were no differences in survival, home range, or water temperature preference between groups or species, indicating that rehabilitation of the species was successful.

Sabaté, J.; Viñas, M.; Bayona, Josep M.; Solanas, A. M. **Isolation and taxonomic and catabolic characterization of a 3,6-dimethylphenanthrene-utilizing strain of *Sphingomonas* sp.** *Canadian Journal of Microbiology*. 2003; 49 (2):120-129. ISSN: 0008-4166.
A microbial strain was isolated and exposed to creosote-contaminated soil to assess its effectiveness in degrading hydrocarbons. The bacterium was observed mineralizing various three- and four-ring hydrocarbons, and researchers identified intermediate metabolite activity during the degradation process.

Salazar, Sandie. **Impacts of the *Jessica* oil spill on sea lion (*Zalophus wollebaeki*) populations.** *Marine Pollution Bulletin*. 2003; 47 (7-8):313-318. ISSN: 0025-326X.
Colonies of sea lions located near the grounding site of the *Jessica* tanker were observed to assess population changes. Population numbers collected from these sites were compared to previous colony declines resulting from catastrophic events. No significant population decreases were recorded.

Schell, Donald M.; Hirons, Amy C. **Isotope Ratio Studies of Marine Mammals in Prince William Sound.** Ancorage, Ak.: Alaska Department of Fish and Game, Habitat and Restoration Division; 1999;130 pp.
Investigators noted a decline in carbon isotope ratios in vibrissae (whiskers) of seals over a long period of time. They concluded that food stress from lower abundances of prey was the likely cause.

Schratzberger, Michaela et al. **Response of estuarine meio- and macrofauna to *in situ* bioremediation of oil-contaminated sediment.** *Marine Pollution Bulletin*. 2003; 46 (4):430-443. ISSN: 0025-326X.
The addition of nutrients to improve biodegradation rates did not speed up recolonization rates for meio- and macrobenthic life forms. Investigators found that within weeks of the nutrient treatment, population levels of dominant species such as nematodes decreased, resulting in more even species populations in overall community structure.

Schroder, Jackie L. et al. **Ecotoxicological risks associated with land treatment of petrochemical wastes. I. Residual soil contamination and bioaccumulation by cotton rats (*Sigmodon hispidus*).** *Journal of Toxicology and Environmental Health - Part A*. 2003; 66 (4):302-325. ISSN: 1528-7394.
Researchers monitored the accumulation of various by-products associated with petroleum wastes in tissues and organs of cotton rats over a two-year period.

Schuler, Lance J.; Wheeler, Matthew; Bailer, A. John; Lydy, Michael J. **Toxicokinetics of sediment-sorbed benzo[a]pyrene and hexachlorobiphenyl using the freshwater invertebrates *Hyalella azteca*, *Chironomus tentans*, and *Lumbriculus variegatus*.** *Environmental Toxicology and Chemistry*. 2003; 22 (2):439-449. ISSN: 0730-7268.
Bioassays were conducted on three freshwater benthic invertebrates to estimate the effects of their uptake and elimination of long-term aging sediments. Researchers also examined the organisms' ability to biotransform B(a)P by using a toxicokinetic modeling method along with a statistical comparisons method in order to gain increased accuracy when analyzing bioaccumulation factors for biotransformed compounds.

Seeb, James E. **Genetic Discrimination of Prince William Sound Herring Populations.** Ancorage, Ak.: Alaska Department of Game and Fish, Genetics Laboratory; 1999;various pages.

Seeb, L. W. et al. **Genetic diversity of sockeye salmon of Cook Inlet, Alaska, and its application to management of populations affected by the *Exxon Valdez* oil spill.** *Transactions of the American Fisheries Society*. 2000; 129 (6):1223-1249. ISSN: 0002-8487.
Salmon were analyzed to collect genetic information on populations in the upper Cook Inlet. Investigators found a substantial amount of genetic diversity within the fish population.

Sei, Kazunari; Sugimoto, Yoshiro; Mori, Kazuhiro; Maki, Hideaki; Kohno, Tetsuro. **Monitoring of alkane-degrading bacteria in a sea-water microcosm during crude oil degradation by polymerase chain reaction based on alkane-catabolic genes.** *Environmental Microbiology*. 2003; 5 (6):517-522. ISSN: 1462-2912.
Using a DNA extraction method, authors were able to identify two groups of bacteria based on different biodegradation mechanisms as evidenced by alkane-catabolic genes, which separated the microbes by their preference for alkanes with sorter versus longer chain lengths.

Seiser, Pamela Edith. et al. **Comparison of pigeon guillemot, *Cepphus columba*, blood parameters from oiled and unoiled areas of Alaska eight years after the *Exxon Valdez* oil spill.** *Marine Pollution Bulletin*. 2000; 40 (2):152-164. ISSN: 0025-326X.
Blood samples were taken from pigeon guillemots, starting 20-30 days after hatching and going into adulthood, and compared. Differences between chicks in oiled and unoiled areas included calcium levels and mean cell volume, but little direct evidence of continuing oil injury was established. In adults, elevated aspartate aminotransferase activity in birds from oiled areas was noted.

Seiser, Pamela Edith. **Mechanism of Impact and Potential Recovery of Pigeon Guillemots (*Cepphus columba*) after the *Exxon Valdez* Oil Spill.** Thesis (M.S.): University of Alaska Fairbanks; 2000; 102 leaves.

Selck, Henriette; Palmqvist, Annemette; Forbes, Valery E. **Uptake, depuration, and toxicity of dissolved and sediment-bound fluoranthene in the polychaete, *Capitella* sp I.** *Environmental Toxicology and Chemistry*. 2003; 22 (10):2354-2363. ISSN: 0730-7268.
In some polychaetes, the nutritional state and the exposure route can determine the critical body residue of a contaminant, according to researchers.

Seubert, J. M.; Kennedy, C. J. **Benzo[a]pyrene toxicokinetics in rainbow trout (*Oncorhynchus mykiss*) acclimated to different salinities.** *Archives of Environmental Contamination and Toxicology*. 2000; 38 (3):342-349. ISSN: 0090-4341.
B(a)P accumulation in rainbow trout was shown to differ according to different amounts of salinity in water. Acute salinity changes after B(a)P injection also affected the amount of material retained by the fishes.

Sevigny, James H.; Tindal, Miles J.; Robins, Geneva L.; Staudt, Wilfried; Serbin, Larry. **Importance of different volatile petroleum hydrocarbon fractions in human health risk assessment.** *Human and Ecological Risk Assessment*. 2003; 9 (4):987-1001. ISSN: 1080-7039.
Soil vapor data for PAHs and benzene was collected and used within the context of Canadian government standards for qualifying acceptable exposure levels for human risk assessment.

Shailaja, M. S.; Rodrigues, A. **Nitrite-induced enhancement of toxicity of phenanthrene in fish and its implications for coastal waters.** *Estuarine Coastal and Shelf Science*. 2003; 56 (5-6):1107-1110. ISSN: 0272-7714.
Oreochromis mossambicus was tested to establish the effects of exposure to water-borne nitrite in the presence of phenanthrene over a period of 9 days. Biomarker analysis showed a significant increase in phenanthrene metabolism, as evidenced by enzyme activity, and enhanced liver damage in fish exposed to both nitrite and phenanthrene than the fish only exposed to the PAH.

Shakir Hanna, Safwat H.; Weaver, R. W. **Earthworm survival in oil contaminated soil.** *Plant and Soil*. 2002; 240 (1):127-132. ISSN: 0032-079X.
Soil was contaminated with different concentrations of crude oil to determine mortality in two species of earthworm. Results led researchers to note that the regulatory level of 1% oil contamination might need to be reduced to insure survivability of earthworms.

Shaw, J. P. et al. **Seasonal variation in cytochrome P450 immunopositive protein levels, lipid peroxidation and genetic toxicity in digestive gland of the mussel *Mytilus edulis*.** *Aquatic Toxicology*. 2004; 67 (4):325-336. ISSN: 0166-445X.
Seasonal studies of a mussel found that cytochrome P4501A and DNA strand breaks occurred less frequently in December but no correlation between PAH exposure and DNA strand breaks was noticed.

Shilaja, M. S.; D'Silva, Classy. **Evaluation of impact of PAH on a tropical fish, *Oreochromis mossambicus* using multiple biomarkers.** *Chemosphere*. 2003; 53 (8):835-841. ISSN: 0045-6535.
Exposure to low concentrations of phenanthrene resulted in cell injury as a result of insufficient detoxification of metabolites in tilapia. Researches believe this fish is an excellent candidate for biomonitoring in tropical waters.

Sho, Michiei; Hamel, Chantal; Greer, Charles W. **Two distinct gene clusters encode pyrene degradation in *Mycobacterium* sp strain S65.** *FEMS Microbiology Ecology*. 2004; 48 (2):209-220. ISSN: 0168-6496.

Shriadah, M. A. **Petroleum hydrocarbon concentrations in Arabian Gulf fish tissues.** *Bulletin of Environmental Contamination and Toxicology*. 2001; 67 (4):560-567. ISSN: 0007-4861.
This paper provides data regarding values for petroleum hydrocarbons in several fish species commonly consumed by the population in the Arabian Gulf. It also presents data on the relationship of total hydrocarbon concentrations in fish tissues with seasonal and lipid changes in the fish.

Siddiqui, Samina; Adams, W. A. **The fate of diesel hydrocarbons in soils and their effect on the germination of perennial ryegrass.** *Environmental Toxicology*. 2002; 17 (1):49-62. ISSN: 1520-4081
The fate and effect of diesel fuel in soil was determined by the monitoring of bacterial population, fungal hyphal length, and soil respiration. Ryegrass germination was inhibited by low mass hydrocarbons in the diesel fuel, and lag phases between different treatment amounts were noted.

Široká, Z.; Drastichová, J. **Biochemical markers of aquatic environment contamination - cytochrome P450 in fish. A review.** *Acta Veterinaria Brno*. 2004; 73 (1):123-132. ISSN: 0001-7213.
A review of the role of cytochrome P450 as a biomarker points out research on the classification of its isoforms, functions and involvement in the metabolism of xenobiotics, particularly as it relates to the use of fish in toxicology monitoring of ecosystems.

Siu, William H. L. et al. **Micronucleus induction in gill cells of green-lipped mussels (*Perna viridis*) exposed to mixtures of polycyclic aromatic hydrocarbons and chlorinated pesticides.** *Environmental Toxicology and Chemistry*. 2004; 23 (5):1317-1325. ISSN: 0730-7268.
Micronucleus formation was assessed as a biomarker to exposure from a number of contaminants, including specific PAHs. Results show that micronucleus induction correlated with body burdens of PAHs in a species of mussel, making it a useful biomarker for genotoxic exposure.

Skalski, John R.; Coats, Douglas A.; Fukuyama, Allan K. **Criteria for oil spill recovery: a case study of the intertidal community of Prince William Sound, Alaska, following the *Exxon Valdez* oil spill.** *Environmental Management*. 2001; 28 (1):9-18. ISSN: 0364-152X.
Populations of several species residing in Prince William Sound were monitored over several years in cleaned and uncleaned oiled sites. Evidence for the recovery of many species is presented by the existence of "parallelism" in population growth rates between treated and non-treated areas after initial disturbance.

Small, Robert J.; Pendleton, Grey W.; Pitcher, Kenneth W. **Trends in abundance of Alaska harbor seals, 1983-2001.** *Marine Mammal Science*. 2003; 19 (2):344-362. ISSN: 0824-0469.
Estimates of population trends in harbor seal abundance were derived by collecting daily counts throughout the pupping and molting periods over several years and throughout several regions of Alaska. In addition, an operating-model approach was implemented to simulate factors that affect trend estimates generated from aerial survey data.

Smreczak, Bozena; Maliszewska-Kordybach, Barbara. **Seeds germination and root growth of selected plants in PAH contaminated soil.** *Fresenius Environmental Bulletin*. 2003; 12 (8):946-949. ISSN: 1018-4619.
Researchers tested four PAH compounds in two types of soil to assess the effect of the contaminants on early stages of development for maize, barley, mustard, and sunflower plants. Seed germination was less affected by the presence of PAHs than later root growth, which experienced different amounts of inhibited development depending upon type of plant and hydrocarbon tested.

Snyder, M. J.; Girvetz, E.; Muler, E. P. **Induction of marine mollusc stress proteins by chemical or physical stress.** *Archives of Environmental Contamination and Toxicology*. 2001; 41 (1):22-29. ISSN: 0090-4341.
Authors examined the response of heat shock or stress proteins (HSPs) by thermal or chemical exposure. Biologically degraded crude oil was also used to understand the relationship between HSP induction and levels of CYP4Y1 mRNA in dose-response experiments. HSP responses may be an important part of a group of biomarkers in mussels exposed to hydrocarbons.

Sol, Sean Y.; Johnson, Lyndal L.; Horness, Beth H.; Collier, Tracy K. **Relationship between oil exposure and reproductive parameters in fish collected following the *Exxon Valdez* oil spill.** *Marine Pollution Bulletin*. 2000; 40 (12):1139-1147. ISSN: 0025-326X.
Female pollock (*Theagra chalcogramma*), dolly varden (*Salvelinus malma*), and yellowfin sole (*Limanda asprea*) were used in experiments to determine the reproductive injury of these fish due to oil exposure. Dolly varden and yellowfin sole, which live on or near the bottom sediment, had higher concentrations of biliary fluorescent aromatic compounds than pollock.

Stachowitsch, Michael; Kikinger, Reinhard; Herler, Jürgen; Zolda, Pamela; Geutebrück, Ernst. **Offshore oil platforms and fouling communities in the southern Arabian Gulf (Abu Dhabi).** *Marine Pollution Bulletin*. 2002; 44 (9):853-860. ISSN: 0025-326X.
Fouling organisms were found on the legs of offshore oil platforms in depths of 11 and 22 meters. Biomass values were determined for each platform, and community structures were compared between the two sites.

Stagg, R. M. et al. **Effects of polycyclic aromatic hydrocarbons on expression of CYP1A in salmon (*Salmo salar*) following experimental exposure and after the *Braer* oil spill.** *Environmental Toxicology and Chemistry*. 2000; 19 (11):2797-2805. ISSN: 0730-7268.
Comparable results were found in both field and experimental tests in measurements of CYP1A activity in exposed fish.

Stark, Jonathan S.; Snape, Ian; Riddle, Martin J. **The effects of petroleum hydrocarbon and heavy metal contamination of marine sediments on recruitment of Antarctic soft-sediment assemblages: a field experimental investigation.** *Journal of Experimental Marine Biology and Ecology*. 2003; 283 (1-2):21-50. ISSN: 0022-0981.
Defaunated sediments were spiked with PAHs or heavy metals and then placed on the seabed for 11 weeks to monitor recruitment and colonization by soft-sediment organisms. Hydrocarbon contamination was found to affect recruitment, which later impacted assemblage structure.

Stehr, Carla M.; Myers, Mark S.; Johnson, Lyndal L.; Spencer, Sylvester; Stein, John E. **Toxicopathic liver lesions in English sole and chemical contaminant exposure in Vancouver Harbour, Canada.** *Marine Environmental Research*. 2004; 57 (1-2):55-74. ISSN: 0141-1136.
Research shows a correlation between high levels of aromatic hydrocarbons in sediments and multiple toxicopathic liver lesions in combination with increased levels of aromatic hydrocarbon metabolites in bile of fish collected from contaminated sites.

Stekoll, M. S.; Deysher, L. **Response of the dominant alga *Fucus gardneri* (Silva) (*Phaeophyceae*) to the *Exxon Valdez* oil spill and clean-up.** *Marine Pollution Bulletin*. 2000; 40 (11):1028-1041. ISSN: 0025-326X.
Habitat types were monitored at Prince William Sound, Cook Inlet-Kenai, and Kodiak-Alaska Peninsula to determine the effects of the spill on the dominant algae of the region. Over time, varying rates of recovery in different locations was noted.

Stentiford, G. D. et al. **Histopathological biomarkers in estuarine fish species for the assessment of biological effects of contaminants.** *Marine Environmental Research*. 2003; 55 (2):137-159. ISSN: 0141-1136.
Three species of fish found in PAH-contaminated estuaries were investigated for inflammations and lesions on organ tissues. Although there is no direct link between PAHs and the existence of abnormalities, this study indicates that histopathology can play an important role in environmental monitoring.

Stephens, S. M.; Frankling, S. C.; Stagg, R. M.; Brown, J. A. **Sub-lethal effects of exposure of juvenile turbot to oil produced waters.** *Marine Pollution Bulletin*. 40 (11):928-937. ISSN: 0025-326X.
Juvenile turbot exposed to produced water showed no negative effect on the survival rate of the fish, although sub-lethal impacts were apparent. Fish exposed to higher concentrations of produced water did have higher rates of hydrocarbon accumulation.

Stickle, William B. **Effects of Simultaneous Exposure to Petroleum Hydrocarbons, Hypoxia, and Prior Exposure on the Tolerance and Sublethal Responses of Marine Animals: Blue Crabs and Killifish.** New Orleans, La.: U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region; 2002; OCS Study MMS 2002-009; 18 pp.

Storelli, M. M.; Marcotrigiano, G. O. **Polycyclic aromatic hydrocarbons in mussels (*Mytilus galloprovincialis*) from the Ionian Sea, Italy.** *Journal of Food Protection*. 2001; 64 (3):405-409. ISSN: 0362-028X.
Analysis of mussels collected along the coastline found concentrations of eight PAHs, with phenanthrene being the most common. The highest concentrations of PAHs were found in mussels collected in areas where higher levels of human activity were evident.

Suderman, Barbara L.; Marcus, Nancy H. **The effects of Orimulsion and Fuel Oil #6 on the hatching success of copepod resting eggs in the seabed of Tampa Bay, Florida.** *Environmental Pollution*. 2002; 120 (3):787-795. ISSN: 0269-7491.
Resting egg mortality was not significantly increased in the presence of 700 and 7000 ppm Orimulsion or Fuel Oil #6 when compared with controls.

Suleiman, M. K.; Bhat, N. R. **Performance of ornamental plants in bioremediated soil.** *Arid Land Research and Management*. 2003; 17 (2):169-176. ISSN: 1532-4982.
Bioremediated soil was found to support the establishment of various ornamental plants. The soil was found to have varying degrees of influence on the growth rates of plants, depending on species.

Suprun, S. M. et al. **Perspectives on the use of hydrocarbon-oxidizing micromycetes and rhodococci for purification of oil-polluted soils.** *In* Wise, D. L.; Trantolo, D. J.; Cichon, H. I.; Stottmeister, U. (Eds.) *Bioremediation of Contaminated Soils (Environmental Science and Pollution Control Series, v.22)*. New York: Marcel Dekker; 2000; p. 445-453. ISBN: 0-8247-0333-2.

Sverdrup, Line E.; Fürst, Charlotte S.; Weideborg, Mona; Vik, Eilen A.; Stenersen, Jørgen. **Relative sensitivity of one freshwater and two marine acute toxicity tests as determined by testing 30 offshore E & P chemicals.** *Chemosphere*. 2002; 46 (2):311-318. ISSN: 0045-6535.
The effects of chemicals were found, in some cases, to affect marine species greater than freshwater organisms. Because of this, marine species should be used when determining the environmental risk of materials used in offshore exploration and production.

Sverdrup, Line E.; Jensen, John; Kelley, Aaxel E.; Krogh, Paul Henning.; Stenersen, Jørgen. **Effects of eight polycyclic aromatic compounds on the survival and reproduction of *Enchytraeus crypticus* (Oligochaeta, Clitellata).** *Environmental Toxicology and Chemistry*. 2002; 21 (1):109-114. ISSN: 0730-7268.
Survival and reproductive rates of enchytraeids were monitored after exposure to different PAHs. Dose-response curves show that PAHs affected reproductive rates far greater than survival rates.

Sverdrup, Line E.; Jensen, John; Krogh, Paul Henning; Stenersen, Jørgen. **Studies on the effect of soil aging on the toxicity of pyrene and phenanthrene to a soil-dwelling springtail.** *Environmental Toxicology and Chemistry*. 2002; 21 (3):489-492. ISSN: 0730-7268.
Pyrene and phenanthrene were used to contaminate soil in differing concentrations and the soil was aged up to 120 days to determine declining toxicity rates over time. Results showed no reduction in toxicity for the test species, *S. fimetaria*, possibly due to high concentrations of contaminants and low content of organic carbon.

Sverdrup, Line E.; Krogh, Paul Henning; Nielsen, Torben; Stenersen, Jørgen. **Relative sensitivity of three terrestrial invertebrate tests to polycyclic aromatic compounds.** *Environmental Toxicology and Chemistry*. 2002; 21 (9):1927-1933. ISSN: 0730-7268.
PAC concentrations above 25 mg/kg soil dry weight negatively impacted the growth of the earthworm *Eisenia veneta*. Results of experiments on this species were compared to previous data collected on the sensitivity of springtails and enchytraeids to PACs.

Tang, Jixin; Liste, Hans-Holger; Alexander, Martin. **Chemical assays of availability to earthworms of polycyclic aromatic hydrocarbons in soil.** *Chemosphere*. 2002; 48 (1):35-42. ISSN: 0045-6535.
Bioavailability of PAHs was tested in earthworms by assimilation. Rates of uptake were determined in separate experiments involving anthracene, chrysene, pyrene, and benzo(a)pyrene.

Tay, Kok-Leng; Teh, Swee Joo; Doe, Ken; Lee, Ken; Jackman, Paula. **Histopathologic and histochemical biomarker responses of Baltic clam, *Macoma balthica*, to contaminated Sydney Harbour sediment, Nova Scotia, Canada.** *Environmental Health Perspectives*. 2003; 11 (3):273-280. ISSN: 0091-6765.
Histologic lesions in digestive glands and gonads were found in clams exposed to a variety of contaminants, including PAHs, in sediment from Sydney Harbour. In addition, researchers discovered high rates of acid phosphatase activity in the organisms.

Taylor, Christopher; Ben-David, Merav; Bowyer, R. Terry; Duffy, Lawrence K. **Response of river otters to experimental exposure of weathered crude oil: fecal porphyrin profiles.** *Environmental Science & Technology*. 2001; 35 (4):747-752. ISSN: 0013-936X.
Male river otters were exposed to weathered crude oil, and profiles of porphyrins were characterized in fecal samples to determine effects on heme synthesis.

Taylor, Christopher; Duffy, Lawrence K.; Bowyer, R. Terry; Blundell, Gail M. **Profiles of fecal porphyrins in river otters following the *Exxon Valdez* oil spill.** *Marine Pollution Bulletin*. 2000; 40 (12):1132-1138. ISSN: 0025-326X.
Investigations of otters in oiled and non-oiled areas of Prince William Sound found that levels of fecal porphyrins in the two groups differed, leading authors to conclude that these compounds are excellent indicators of environmental stress.

Telli-Karakoç, F. et al. **Correlative changes in metabolism and DNA damage in turbot (*Scophthalmus maximus*) exposed to benzo[a]pyrene.** *Marine Environmental Research*. 2002; 54 (3-5):511-516. ISSN: 0141-1136.
Results of research suggest that hydrophobic DNA adducts can form from metabolized B(a)P without a concurrent increase in EROD activity.

The Americas: Galápagos spill spells disaster. *Financial Times*. London: Financial Times Limited; January 23, 2001; p.10.
The impact of oil on flora and fauna as a result of the wrecked oil tanker, *Jessica*, was already being noted. The wrecked vessel in the Pacific Ocean threatened an ecological catastrophe for the Galápagos Islands.

Thomas, Kevin V.; Balaam, Jan; Hurst, Mark R.; Thain, John E. **Identification of *in vitro* estrogen and androgen receptor agonists in North Sea offshore produced water discharges.** *Environmental Toxicology and Chemistry*. 2004; 23 (5):1156-1163. ISSN: 0730-7268.
Five produced water samples taken from oil production platforms showed evidence of estrogen receptor agonists. Further analysis identified them by use of fractionation procedure followed by full-scan GC-(EI)MS.

Thomas, Robert E.; Brodersen, Christine; Carls, Mark G.; Babcock, Malin; Rice, Stanley D. **Lack of physiological responses to hydrocarbon accumulation by *Mytilus trossulus* after 3-4 years chronic exposure to spilled *Exxon Valdez* crude oil in Prince William Sound.** *Comparative Biochemistry and Physiology Part C: Pharmacology Toxicology and Endrocrinology*. 1999; 122C (1):153-163. ISSN: 0742-8413.
Mussels were collected from both heavily oiled and non-oiled areas of Prince William Sound and physiological differences were examined. After comparing byssal thread production, condition index, clearance rate, and glycon content, no significant differences between the two groups were discovered. Researchers speculate that chronically exposed mussels might develop a physiological tolerance to PAH, but this could not be determined in this study.

Timmerman, M. D.; Fuller, L. G.; Burton, D. L. **The effects of a crude oil spill on microbiological indices of soil biological quality.** *Canadian Journal of Soil Science*. 2003; 83 (2):173-181. ISSN: 0008-4271.
Authors used microbial biomass carbon, dehydrogenase activity and microbial metabolic diversity indices to monitor the effects of an oil spill and four remediation treatments on the biological composition of an agricultural soil.

Timmermann, Karen; Andersen, Ole. **Bioavailability of pyrene to the deposit-feeding polychaete *Arenicola marina*: importance of sediment versus water uptake routes.** *Marine Ecology - Progress Series*. 2003; 246;163-172. ISSN: 0171-8630.
Researchers found that ingestion was the main uptake route of pyrene in worms, and pyrene suspended in water at similar concentrations as in sediment was not found to be a dominant means of uptake.

Timmermann, Karen; Christensen, Mette; Banta, Gary T.; Andersen, Ole. **Bioavailability and metabolism of pyrene in sediments with the polychaete *Arenicola marina*.** *In* Rodriguez, G. R.; Brebbia, C. A. (Eds.) *Oil and Hydrocarbon Spills, Modelling, Analysis and Control II*. Billerica, Ma.: Computational Mechanics Inc.; 2000; p. 85-94. ISBN: 1-85312-828-7.
A study was undertaken to look at the relationship between the lugworm, a sediment feeding polychaete, and the breakdown of pyrene in sediment. Results suggest that polychaetes reduce the retention time of PAHs in contaminated sediments, and that the toxicity of PAHs affects the intensity of polychaete bioturbation.

Tornberg, K.; Baath, E.; Olsson, S. **Fungal growth and effects of different wood decomposing fungi on the indigenous bacterial community of polluted and unpolluted soils.** *Biology and Fertility of Soils*. 2003; 37 (3):190-197. ISSN: 0178-2762.
Phospholipid faty acids were monitored to ascertain changes in the community structure of native bacteria in PAH-contaminated and uncontaminated soils after the introduction of fungal isolates.

Toro, Beatriz; Navarro, Jorge M.; Palma-Fleming, Hernán. **Relationship between bioenergetics responses and organic pollutants in the giant mussel, *Choromytilus chorus* (Mollusca: Mytilidae).** *Aquatic Toxicology*. 2003; 63 (3):257-269. ISSN: 0166-445X.
Scope for growth (SFG), a physiological index, was used to assess the effects of contaminants on a species of mussel. SFG values extrapolated from mussels in polluted waters indicate severe stress related to the buildup of toxins in tissues of the organisms.

Toro, Beatriz; Navarro, Jorge M.; Palma-Fleming, Hernán. **Use of clearance rate in *Choromytilus chorus* (Bivalvia: Mytilidae) as a non-destructive biomarker of aquatic pollution.** *Revista Chilena de Historia Natural*. 2003; 76 (2):267-274. ISSN: 0716-078X.

Toro, Beatriz; Palma-Fleming, Hernán; Navarro, Jorge M. **Organic pollutant burden of the giant mussels *Choromytilus chorus* from the south-central Chilean coast.** *Chemosphere*. 2004; 55 (2):267-275. ISSN: 0045-6535.
A quantitative analysis of organic pollutants was undertaken in the giant mussel after being collected from various bays in south-central Chile. Results showed that PAH levels were below what is considered unsafe for human consumption.

Underhill, Les G.; Whittington, Philip A.; Crawford, Robert J. M.; Wolfaardt, Anton C. **Five years of monitoring African penguins (*Spheniscus demersus*) after the "*Apollo Sea*" oil spill: a success story identified by flipper bands.** *Vogelwarte*. 2000; 40 (4):315-318. ISSN: 0049-6650.

van der Wal, L.; van Gestel, C. A. M.; Hermens, J. L. M. **Solid phase microextraction as a tool to predict internal concentrations of soil contaminants in terrestrial organisms after exposure to a laboratory standard soil.** *Chemosphere*. 2004; 54 (4):561-568. ISSN: 0045-6535.
In a laboratory experiment, terrestrial organisms were exposed to three chlorobenzenes. Bioaccumulation uptake levels of the chlorobenzenes were established by solid phase microextration, which was used to analyze internal concentrations of soil contaminants within the organisms.

Van Hoofe, Patricia L.; Kukkonen, Jussi V. K.; Landrum, Peter F. **Impact of sediment manipulation on the bioaccumulation of polycyclic aromatic hydrocarbons from field-contaminated and laboratory-dosed sediments by an oligochaete.** *Environmental Toxicology and Chemistry*. 2001; 20 (8):1752-1761. ISSN: 0730-7268.
After testing *Lumbriculus variegatus* for PAH accumulation in contaminated sediments, the authors conclude with a list of recommendations for a standardized protocol for bioaccumulation testing of the species.

van Schanke, Arne et al. **Dose- and time-dependent formation of biliary Benzo[a]pyrene metabolites in the marine flatfish dab (*Limanda limanda*).** *Environmental Toxicology and Chemistry*. 2001; 20 (8):1641-1647. ISSN: 0730-7268.
CYP1A and GST activity were monitored in dab at 3, 6, and 12 days after exposure to B(a)P. Authors conclude that B(a)P metabolites are a more sensitive indicator of recent PAH exposure in this species of fish.

Venkatesan, M. I.; Northrup, T.; Phillips, C. R. **Determination of linear alkylbenzenes in fish tissue by gel permeation chromatography and gas chromatography-mass spectrometry.** *Journal of Chromatography A*. 2002; 942 (1-2):223-230. ISSN: 0021-9673.

Verweij, Frank; Booij, Kees; Satumalay, Karel; van der Molen, Natascha; van der Oost, Ron. **Assessment of bioavailable PAH, PCB and OCP concentrations in water, using semipermeable membrane devices (SPMDs), sediments and caged carp.** *Chemosphere*. 2004; 54 (11):1675-1689. ISSN: 0045-6535.
In evaluating bioavailable water concentrations for a number of contaminants, researchers found significant correlation between biliary PAH metabolite levels in fish and data from semipermeable membrane devices estimating aqueous PAH concentrations.

Vidakovic-Cifrek, Z. et al. **Cytogenetic damage in shallot *(Allium cepa)* root meristems induced by oil industry "high-density brines".** *Archives of Environmental Contamination and Toxicology*. 2002; 43 (3):284-291. ISSN: 0090-4341.
Several biodegradation experiments were monitored to understand how different hydrocarbon metabolites act as inhibitors or stimulants for other hydrocarbons during the degradation process.

Vines, C. A.; Robbins, T.; Griffin, F. J.; Cherr, G. N. **The effects of diffusible creosote-derived compounds on development in Pacific herring (*Clupea pallasi*).** *Aquatic Toxicology*. 2000; 51 (2):225-239. ISSN: 0166-445X.
Toxicity of creosote to Pacific herring was evaluated by investigating embryonic development, cardiac function, embryo/larval activity, hatching success, and larval morphology.

Vitaliano, Joseph J. et al. **Comparison of benthic invertebrate assemblages at *Spartina alterniflora* marshes reestablished after an oil spill and existing marshes in the Arthur Kill (NY/NJ).** *Marine Pollution Bulletin*. 2002; 44 (10):1100-1108. ISSN: 0025-326X.
Investigators found no significant differences in community structures of benthic invertebrates from existing versus reestablished marshes three to four years after the planting of *S. alterniflora* in oil-impacted areas.

Wang, Wen-Xiong; Chow, Alex T. S. **Benzo[a]pyrene absorption and exposure pathways in the green mussel *Perna viridis*.** *Environmental Toxicology and Chemistry*. 2002; 21 (2):451-458. ISSN: 0730-7268.
Absorption efficiency was monitored in green mussels to determine differences in uptake due to diet or biology. Results suggest that aqueous uptake is the most important contributor to B(a)P accumulation, even though dietary intake can contribute to a significant amount of hydrocarbon ingestion.

Wang, X. et al. **Determination of toxicokinetic parameters for bioconcentration of water-soluble fraction of petroleum hydrocarbon associated with No. 0 diesel in Changjiang Estuary and Jiaozhou Bay: model versus mesocosm experiments.** *Archives of Environmental Contamination and Toxicology*. 2002; 42 (3):272-279. ISSN: 0090-4341.
This paper describes the development of a technique to determine toxicokinetic boundaries for the bioconcentration of PAHs by phytoplankton in field conditions. The advantages of the model, according to the authors, are both economical and practical.

Watanabe, Kazuya. **Linking genetics, physiology and ecology: an interdisciplinary approach for advancing bioremediation.** *Journal of Bioscience and Bioengineering*. 2002; 94 (6):557-562. ISSN: 1389-1723.
Data on phenol-degrading organisms was used to demonstrate the application of genetic and physiological information for furthering knowledge of bioremediation processes.

Webster, L. et al. **The polycyclic aromatic hydrocarbon composition of mussels (*Mytilus edulis*) from Scottish coastal waters.** *Journal of Environmental Monitoring*. 2003; 5 (1):150-159. ISSN: 1464-0325.
Concentrations and composition of individual hydrocarbon compounds were established for blue mussels collected from coastal waters in Shetland and Orkney. After comparing PAH concentrations, researchers concluded that the bioavailability of PAHs was limited in areas with highly contaminated sediments.

Weinstein, John E. **Influence of salinity on the bioaccumulation and photoinduced toxicity of fluoranthene to an estuarine shrimp and oligochaete.** *Environmental Toxicology and Chemistry*. 2003; 22 (12):2932-2939. ISSN: 0730-7268.
Salinity was found to affect the severity of toxicity and bioaccumulation related to fluoranthene in two estuarine organisms. This is probably due to physiological responses related to internal osmotic volume changes.

Weinstein, John E.; Sanger, Denise M. **Comparative tolerance of two estuarine annelids to fluoranthene under normoxic and moderately hypoxic conditions.** *Marine Environmental Research*. 2003; 56 (5):637-648. ISSN: 0141-1136.
Two species of annelids were exposed to fluoranthene under varying levels of dissolved oxygen. Results indicate a species-dependent tolerance to this pollutant under different oxygen conditions.

Weinstein, John E.; Sanger, Denise M.; Holland, A. Frederick. **Bioaccumulation and toxicity of fluoranthene in the estuarine oligochaete *Monopylephorus rubroniveus*.** *Ecotoxicology and Environmental Safety*. 2003; 55 (3):278-286. ISSN: 0147-6513.
Experiments showed that an oligochaete was sensitive to waterborne fluoranthene in the presence of UV light, but tolerant to the compound in sediments in the absence of UV radiation, even at high levels of bioaccumulation.

Weise, Francis K.; Ryan, Pierre C. **The extent of chronic marine oil pollution in southeastern Newfoundland waters assessed through beached bird surveys 1984-1999.** *Marine Pollution Bulletin*. 2003; 46 (9):1090-1101. ISSN: 0025-326X.
The authors review 16 years of data collected from surveys of beached birds found on the Newfoundland coastline, dead from chronic oil pollution, in an effort to understand the trends that influence data results.

Wells, P. G. **Oil and seabirds-the imperative for preventing and reducing the continued illegal oiling of the seas by ships.** *Marine Pollution Bulletin*. 2001; 42 (4):251-252. ISSN: 0025-326X.
Illegal oil discharge of busy shipping lanes and coastal waters by ships continues. Oil slicks, regardless of size, cause mortality in birds on the sea in coastal and offshore environments. The International Maritime Organization (IMO) is coordinating and vigorously pursuing an educational campaign toward the world community in regards to marine biodiversity and wildlife conservation measures.

Wertheimer, A. C. et al. **Straying of adult pink salmon from their natal stream following embryonic exposure to weathered *Exxon Valdez* crude oil.** *Transactions of the American Fisheries Society*. 2000; 129 (4):989-1004. ISSN: 0002-8487.
Experiments on pink salmon failed to support the hypothesis that PAH exposure to embryos in intertidal spawning grounds was the cause of mass strays (adult fish spawning in nonnatal streams) following the *Exxon Valdez* oil spill.

Wheelock, C. E.; Baumgartner, T. A.; Newman, J. W.; Wolfe, M. F.; Tjeerdema, R. S. **Effect of nutritional state on Hsp60 levels in the rotifer *Brachionus plicatilis* following toxicant exposure.** *Aquatic Toxicology*. 2002; 61 (1-2):89-93. ISSN: 0166-445X.
The poor nutritional health of an organism directly affects how it responds when exposed to toxic material. Because of this, the nutritional health of organisms must be taken into consideration in toxicological assessments.

Whomersley, P.; Picken, G. B. **Long-term dynamics of fouling communities found on offshore installations in the North Sea.** *Journal of the Marine Biological Association of the United Kingdom*. 2003; 83 (5):897-901. ISSN: 0025-3154.
A survey of platforms found mussels, hydroids, and tubeworms. Community structure was related to depth zonation, and long-term population dynamics show that succession occurs on artificial structures.

Widdows, J. et al. **Measurement of stress effects (scope for growth) and contaminant levels in mussels (*Mytilus edulis*) collected from the Irish Sea.** *Marine Environmental Research*. 2002; 53 (4):327-356. ISSN: 0141-1136.
Samples of tissues were collected from the mussel *(Mytilus edulis)* along 38 coastal sites around the Irish Sea, to quantify the impact of pollution based on the combined measurement of scope for growth and chemical contaminants.

Wiegman, Saskia; van Vlaardingen, Peter L. A.; Bleeker, Eric A. J.; de Voogt, Pim; Kraak, Michiel H. S. **Phototoxicity of azaarene isomers to the marine flagellate *Dunaliella tertiolecta*.** *Environmental Toxicology and Chemistry*. 2001; 20 (7):1544-1550. ISSN: 0730-7268.
Eight azaarene isomers were tested for phototoxicity on marine algae and baseline toxicity for each isomer was established. Authors stress that photoenhanced toxicity of azaarenes needs to be acknowledged and incorporated into future water-quality criteria.

Wiens, John A.; Crist, Thomas O.; Day, Robert H.; Murphy, Stephen M.; Hayward, Gregory D. **A canonical correspondence analysis of the effects of the *Exxon Valdez* oil spill on marine birds.** *Ecological Applications*. 2001; 11 (3):828-839. ISSN: 1051-0761.
Data on bird populations was collected between 1989 and 1996 in 10 bays that were exposed to different amounts of oil. 1996 data showed a continuing recovery of birds, even in areas that were greatly impacted by the spill.

Wiese, Francis K. et al. **Seabirds at risk around offshore oil platforms in the northwest Atlantic.** *Marine Pollution Bulletin*. 2001; 42 (12):1285-1290. ISSN: 0025-326X.
Due to the location of offshore oil platforms in the northwest Atlantic, migratory seabirds congregate around them. In an effort to monitor the long-term impact of platforms on the health and population of seabirds, the author proposes that independent observers be stationed on platforms to gather data.

Wiese, Francis K.; Jones, Ian L. **Experimental support for a new drift block design to assess seabird mortality from oil pollution.** *Auk*. 2001; 118 (4):1062-1068. ISSN: 0004-8038.
The author presents an experiment that attempts to estimate the drift patterns of dead birds at sea. Wooden blocks and carcasses are used to assess the predominant factor determining movement over large distances. Results varied greatly depending on environmental conditions and distances from shore.

Wiese, Francis K.; Robertson, Gregory J.; Gaston, Anthony J. **Impacts of chronic marine oil pollution and the murre hunt in Newfoundland on thick-billed murre *Uria lomvia* populations in the eastern Canadian Arctic.** *Biological Conservation*. 2004; 116 (2):205-216. ISSN: 0006-3207.
The authors present a modeling technique that evaluates and quantifies the impacts of chronic oil pollution and legal hunting on breeding and wintering thick-billed murre populations.

Wikelski, M.; Wong, V.; Chevalier, B.; Rattenborg, N.; Snell, H. L. **Marine iguanas die from trace oil pollution.** *Nature*. 2002; 417 (6889):607-608. ISSN: 0028-0836.
Residual oil contamination from the *Jessica* spill of January 2001 is believed to be responsible for a 62% rise in mortality of marine iguanas the year following the accident.

Willett, Kristine L.; Wilson, Cody; Thomsen, Jane; Porter, Weston. **Evidence for and against the presence of polynuclear aromatic hydrocarbons and 2,3,7,8-tetrachloro-*p*-dioxin binding proteins in the marine mussels, *Bathymodiolus* and *Modiolus modiolus*.** *Aquatic Toxicology*. 2000; 48 (1):51-64. ISSN: 0166-445X.
Chemosynthetic mussels were collected close to petroleum seeps in the Gulf of Mexico, and tested for the existence of either the aryl hydrocarbon receptor, or the 4S PAH binding protein (PBP).

Willette, T. M. et al. **Ecological processes influencing mortality of juvenile pink salmon (*Oncorhynchus gorbuscha*) in Prince William Sound, Alaska.** *Fisheries Oceanography*. 2001; 10 (Supp. 1):14-41. ISSN: 1054-6006.

Williams, Jim; Roderick, Carol; Alexander, Ross. **Sublethal effects of Orimulsion-400® on eggs and larvae of Atlantic herring (*Clupea harengus* L.).** *Environmental Toxicology and Chemistry*. 2003; 22 (12):3044-3048. ISSN: 0730-7268.
Increased concentrations of Orimulsion-400 in oil-in-water dispersion did not have a significant impact on mortality levels or percentage of hatch from eggs of Atlantic herring. However, a concentration of 1,000 mg/L did result in higher incidents of premature hatch, abnormalities, total length, and other differences not seen in lesser doses.

Wilson, James A. et al. **Ecotoxicological risks associated with land treatment of petrochemical wastes. III. Immune function and hematology of cotton rats.** *Journal of Toxicology and Environmental Health - Part A*. 2003; 66 (4):345-363. ISSN: 1528-7394.
Researchers found changes in hematology and immune system deficiencies in cotton rats found living near abandoned petrochemical waste treatment areas, suggesting negative health effects from residual petrochemical wastes.

Wilson, Mark S.; Herrick, James B.; Jeon, Che Ok; Hinman, David E.; Madsen, Eugene L. **Horizontal transfer of *phnAc* dioxygenase genes within one of two phenotypically and genotypically distinctive naphthalene-degrading guilds from adjacent soil environments.** *Applied and Environmental Microbiology*. 2003; 69 (4):2172-2181. ISSN: 0099-2240.
The authors investigated differences in microbial acclimation of PAH pollutants from different areas within a field site. Results of research emphasize the importance of lateral transfer in the biodegradation of contaminants.

Winkler, R. **Oil-stained kittiwakes *Rissa tridactyla* in Switzerland.** *Der Ornithologische Beobachter*. 2001; 98 (3):271-272. ISSN: 0030-5707.

Wittig, Rüdiger; Ballach, Hans-Joachim; Kuhn, Achim. **Exposure of the roots of *Populus nigra* L. cv. Loenen to PAHs and its effect on growth and water balance.** *Environmental Science and Pollution Research - International*. 2003; 10 (4):235-244. ISSN: 0944-1344.
Transpiration, nutrient uptake, biomass, and growth inhibition were lower in poplar cuttings exposed to PAHs than the control group, but the water content of leaves was no different in the two groups.

Wolfaardt, Anton C.; Underhill, Leslie G.; Crawford, Robert J. M.; Klages, Norbert T. W. **Results of the 2001 census of African penguins *Spheniscus demersus* in South Africa: first measures of the impact of the *Treasure* oil spill on the breeding population.** *Transactions of the Royal Society of South Africa*. 2001; 56 (1):45-49. ISSN: 0035-919X.
Researchers investigate the continuing population decline in African penguins in Namibia. Data shows two compelling factors that are contributing to the population decline and provide scenarios that may benefit recovery attempts of the penguin population.

Wolfe, M. F. et al. **Influence of dispersants on the bioavailability and trophic transfer of petroleum hydrocarbons to larval topsmelt (*Atherinops affinis*).** *Aquatic Toxicology*. 2001; 52 (1):49-60. ISSN: 0166-445X.
Researchers investigated whether a dispersant (Corexit 9527®) applied to crude oil increased the amount of PAH accumulation in larval topsmelt. Naphthalene uptake and bioaccumulation was not found to be significantly higher between groups exposed to dispersed and non-dispersed oil.

Wood, Kevin A.; Harrod, Fred W., Jr. **Investigation of migratory bird mortality in Arkansas oil pits.** *Proceedings of the Fifty-fourth Annual Conference*. Baton Rouge, La.: Southeastern Association of Fish and Wildlife Agencies; 2000;469-477.
Open oil pits are death traps for waterfowl, passerine birds and bats. A census of dead birds at several open pits resulted in legal action against owners by the U.S. Fish and Wildlife Service for violations of the Migratory Bird Treaty Act and the Oil Pollution Act. The Environmental Protection Agency was alerted to assess potential violations of the Clean Water and Resource Conservation and Recovery Acts.

Wootton, E. C.; Dyrynda, E. A.; Pipe, R. K.; Ratcliffe, N. A. **Comparisons of PAH-induced immunomodulation in three bivalve molluscs.** *Aquatic Toxicology*. 2003; 65 (1):13-25. ISSN: 0166-445X.
A comparative study used three bivalves by exposing them to hydrocarbons to illustrate the effects on the immune response of species within the same class. Researchers suggest that future studies should compare species that are resilient with species more sensitive to pollution to obtain more comprehensive immune responses.

Wootton, E. C.; Dyrynda, E. A.; Ratcliffe, N. A. **Bivalve immunity: comparisons between the marine mussel (*Mytilus edulis*), the edible cockle (*Cerastoderma edule*) and the razor-shell (*Ensis siliqua*).** *Fish & Shellfish Immunology*. 2003; 15 (3):195-210. ISSN: 1050-4648.
Post-spill observations found that while mussels experienced no oil-induced mortality, other bivalves showed mass mortalities. Researchers found significant differences in immune cells and functions between species, leading them to argue for a wider range of species to be included in pollution monitoring.

Xiong, De-Qi; Reed, Mark; Ekrol, Marve. **Biological exposure models for oil spill impact analysis.** *Journal of Environmental Sciences (China)*. 2000; 12 (4):482-485. ISSN: 1001-0742.

Xu, L.; Chen, J.; Zhang, Y.; Cheung, C. C. C.; Lam, P. K. S. **Biomarker studies on gold-lined sea bream (*Rhabdosargus sarba*) exposed to benzo[a]pyrene.** *Water Science and Technology*. 2001; 43 (2):155-160. ISSN: 0273-1223.
Three days after being intraperitoneally injected with B(a)P, livers of fish were tested for changes in enzyme activity. Exposure led to reduced ATPase activity; higher GST activity and DNA adduct level, but no change in EROD activity.

Yang, C. Y. et al. **Increased risk of preterm delivery among people living near the three oil refineries in Taiwan.** *Environment International*. 2004; 30 (3):337-342. ISSN: 0160-4120.
The occurrence of preterm birth infants was found to be significantly higher in areas in close proximity to oil refinery plants.

Yang, C.Y. et al. **Increased risk of preterm delivery in areas with cancer mortality problems from petrochemical complexes.** *Environmental Research*. 2002; 89 (3):195-200. ISSN: 0013-9351.

Yang, Xuan; Peterson, Daniel S.; Baumann, Paul C.; Lin, Edith C. L. **Fish biliary PAH metabolites estimated by fixed-wavelength fluorescence as an indicator of environmental exposure and effects.** *Journal of Great Lakes Research*. 2003; 29 (1):116-123. ISSN: 0380-1330.
This study describes a simple and fast method of measuring concentrations of PAH metabolites in the bile of fish.

Yi, Cheung-Pui. **Molecular Analysis of Mycobacterium Community Shifts in Soil During the Biodegradation of Polycyclic Aromatic Hydrocarbons.** Thesis (Ph. D.): University of Cincinnati; 2001; 139 leaves.

Youssef, Tarek**. Evidence for reduced post-spill recovery by the halophyte *Sporobulus iocladus* (Nees ex Trin.) Nees in oil-contaminated sediments.** *Marine Pollution Bulletin*. 2002; 44 (4):334-339. ISSN: 0025-326X.
This study examines the effect of hydrocarbon contamination on the germination success of *S. iocladus* seeds under different salinity concentrations.

Youssef, Tarek. **Physiological responses of *Avicennia marina* seedlings to the phototoxic effects of the water-soluble fraction of light Arabian crude oil.** *Arab Gulf Journal of Scientific Research*. 2002; 20 (1):1-9. ISSN: 1015-4442.

Youssef, Tarek.; Ghanem, A. **Salt secretion and stomatal behaviour in *Avicennia marina* seedlings fumigated with the volatile fraction of light Arabian crude oil.** *Environmental Pollution*. 2002; 116 (2):215-223. ISSN: 0269-7491.
Mangrove seedlings were exposed to fumes from light Arabian crude oil. The fumes were found to affect transpiration and salt secretion in the plants.

Ziccardi, Michael Howard. **Development and validation of a luciferase cell culture bioassay for the direct detection of PAH and oil exposure in mink as a model for sea otters (*Enhydra lutris*).** Thesis (Ph. D.): University of California Davis; 2001; 1 leaf.

CHEMISTRY/GEOCHEMISTRY/GEOLOGY

Abed, Raeid M. M. et al. **Microbial diversity of a heavily polluted microbial mat and its community changes following degradation of petroleum compounds.** *Applied & Environmental Microbiology*. 2002; 68 (4):1674-1683. ISSN: 0099-2240.
Cyanobacteria-dominated communities were observed degrading aliphatic and aromatic compounds in varying conditions of lightness and darkness. As a result, the species best able to degrade hydrocarbons became dominant in the community.

Acheson, Carolyn M.; Zhou, Qin; Shan, Yonggui; Sayles, Gregory D.; Kupferle, Margaret J. **Comparing the solid phase and saline extract Microtox® assays for two polycyclic aromatic hydrocarbon-contaminated soils.** *Environmental Toxicology and Chemistry*. 2004; 23 (2):245-251. ISSN: 0730-7268.
Solid phase Microtox assay was found to be superior to saline Microtox assay in evaluating soil samples. In a second experiment, the solid phase assay was useful in analyzing four soil samples contaminated with PAHs.

Acquaviva, M.; Bertrand, J. C.; Gilewicz, M. **Effect of a synthetic surfactant on phenanthrene and *n*-eicosane utilization by two pure marine strains grown separately in batch cultures with or without sand particles**. *World Journal of Microbiology & Biotechnology*. 2001; 17 (5):481-485. ISSN: 0959-3993.
Tween 80 was used to determine what effect surfactants have on the degradation rates of two strains of bacteria, *Sphingomonas* sp. and *Corynebacterium* sp. The use of Tween 80 was found to influence the degradation rates of the two strains of bacteria in different ways, and in different mediums.

Adebajo, Moses O.; Frost, Ray L. **Infrared and C-13 MAS nuclear magnetic resonance spectroscopic study of acetylation of cotton.** *Spectrochimica Acta Part A - Molecular and Biomolecular Spectroscopy*. 2004; 60 (1-2):449-453. ISSN: 1386-1425.
Researchers used Fourier transform infrared and C MAS NMR spectroscopy to establish the acetylation of cotton fibers by exposure to acetic anhydride. It is believed that cotton can be readily developed into hydrophobic sorbent materials suitable for oil-spill cleanup by acetylation.

Aguedo, Mario; Waché, Yves; Coste, Florence; Husson, Florence; Belin, Jean-Marc. **Impact of surfactants on the biotransformation of methyl ricinoleate into gamma-decalactone by *Yarrowia lipolytica*.** *Journal of Molecular Catalysis B - Enzymatic*. 2004; 29 (1-6):31-36. ISSN: 1381-1177.
Two ionic surfactants were tested to understand their effects on yeast during degradation of organic contaminants. Toxic effects were noted for both surfactants, which were believed to be associated with a reduction of cell membrane integrity.

Ahmed, Manzur; George, Simon C. **Changes in the molecular composition of crude oils during their preparation for GC and GC-MS analyses.** *Organic Geochemistry*. 2004; 35 (2):137-155. ISSN: 0146-6380.
A comprehensive assessment of the negative effects that preparatory processes for GC-MS analysis have on the molecular composition of crude oils found that rotary evaporation had the least destructive effect on compounds. Research monitored the influence of solvent reduction, pressure, length of drying, and temperature on specific compounds and ratios of compound types during the preparation process.

Ahrens, Michael J.; Depree, Craig V. **Inhomogeneous distribution of polycyclic aromatic hydrocarbons in different size and density fractions of contaminated sediment from Auckland Harbour, New Zealand: an opportunity for mitigation.** *Marine Pollution Bulletin*. 2004; 48 (3-4):341-350. ISSN: 0025-326X.
Distribution of PAHs in sediments from Auckland Harbour, New Zealand, were measured and separated into several size fractions and then into sub-fractions by flotation in sodium-polytungstate solution. Samples were further analyzed for PAH concentrations and relative PAH composition for future mitigations efforts.

Ahrens, Michael J.; Hickey, Christopher W. **Extractability of polycyclic aromatic hydrocarbons in sediments: a matter of association?** *Australian Journal of Chemistry*. 2003; 56 (2-3):193-199. ISSN: 0004-9425.
Authors find fault with the use of a single value coefficient to attempt the accurate prediction of the bioavailability of fluoranthene.

CHEMISTRY/GEOCHEMISTRY/GEOLOGY

Aislabie, Jakie; Fraser, Rhonda; Duncan, Shona; Farrell, Roberta L. **Effects of oil spills on microbial heterotrophs in Antarctic soils.** *Polar Biology*. 2001; 24 (5):308-313. ISSN: 0722-4060.
Analysis of microbial community structure found that the presence of hydrocarbons in the soils resulted in a shift in diversity of types of fungi. Hydrocarbon degradation was most likely the result of bacterial action.

Akiyama, R.; Takagai, Y.; Igarashi, S. **Determination of lower sub ppt levels of environmental analytes using high-powered concentration system and high-performance liquid chromatography with fluorescence detection.** *Analyst*. 2004; 129 (5):396-397. ISSN: 0003-2654.
Authors describe a novel method of detecting PAHs in liquid solution.

Akkanen, Jarkko; Kukkonen, Jussi V. K. **Measuring the bioavailability of two hydrophobic organic compounds in the presence of dissolved organic matter.** *Environmental Toxicology and Chemistry*. 2003; 22 (3):518-524. ISSN: 0730-7268.
The effect of dissolved organic matter (DOM) on the bioavailability of B(a)P and TCB were analyzed with equilibrium dialysis, reverse-phase separation, liquid-liquid extraction, and bioconcentration experiments. All methods showed that the bioavailability of both contaminants was reduced by increasing DOM concentrations.

Al Iawati, Hussain Ahmed; Jamin, Adil Rabia; Jones, Mark Spencer; Wygrala, Bjorn. **Middle East still holds frontier potential: 'giant field' prospects exist offshore Oman.** *Offshore*. 2003; 63 (4):36-37. ISSN: 0030-0608.
Large structural closures indicated in a seismic survey of the Sohar basin revealed direct hydrocarbon indicators, suggesting the potential for future hydrocarbon production.

Alagappan, Gunaseelan; Cowan, Robert. **Substrate inhibition kinetics for toluene and benzene degrading pure cultures and a method for collection and analysis of respirometric data for strongly inhibited cultures.** *Biotechnology and Bioengineering*. 2003; 83 (7):798-809. ISSN: 0006-3592.
After exposing cultures to high concentrations of toluene and benzene, investigators discuss the mechanisms behind substrate inhibition and reveal an improved methodology for collecting oxygen uptake data used in the quantification of substrate inhibition kinetics.

Al-Awadhi, H.; Al-Hasan, R. H.; Radwan, Samir. S. **Comparison of the potential of coastal materials loaded with bacteria for bioremediating oily sea water in batch culture.** *Microbiological Research*. 2002; 157 (4):331-336. ISSN: 0944-5013.

Al-Awadhi, H.; Al-Hasan, R. H.; Sorkhoh, N. A.; Salamah, S.; Radwan, Samir. S. **Establishing oil-degrading biofilms on gravel particles and glass plates.** *International Biodeterioration & Biodegradation*. 2003; 51 (3):181-185. ISSN: 0964-8305.
A method of successfully securing hydrocarbon-rich biofilms on gravel particles and glass plates is described. Authors follow up with a discussion of suggested environmental applications of the biofilms.

Albaigés, Joan; Porte, C.; Pastor, D.; Biosca, X.; Solé, M. **Integrated use of chemical and biochemical markers for assessing the effects of the *Aegian Sea* oil spill in the Galicia coast (NW Spain).** *In* Rodriguez, G. R.; Brebbia, C. A. (Eds.) *Oil and Hydrocarbon Spills, Modelling, Analysis and Control II*. Billerica, Ma.: Computational Mechanics Inc.; 2000; p. 73-84. ISBN: 1-85312-828-7.
Researchers studied the breakdown of hydrocarbon components between 3 and 34 months following the *Aegean Sea* oil spill. They compared this data with the effect of the hydrocarbons on mussels, specifically, cytochrome P450 analysis, enzyme activity, and lipid peroxidation up to 1 year after the spill. They noted a decline in hydrocarbon content between 3 and 6 months post-spill, but an increase a year later, possibly due to resuspension of polluted sediments during winter storms.

Alberdi, M.; Moldowan, J. M.; Peters, K. E.; Dahl, J. E. **Stereoselective biodegradation of tricyclic terpanes in heavy oils from the Bolivar Coastal fields, Venezuela.** *Organic Chemistry*. 2001; 32 (1):181-191. ISSN: 0146-6380.

Alemzadeh, I.; Vossoughi, M. **Oil biodegradation in sea water.** *Iranian Journal of Science and Technology, Transaction B: Technology*. 2001; 25 (1):87-92. ISSN: 0360-1307.

Alimi, Hossein; Ertel, Thomas; Schug, Bettina. **Fingerprinting of hydrocarbon fuel contaminants: literature review.** *Environmental Forensics*. 2003; 4 (1):25-38. ISSN: 1527-5922.
In this review, updated fingerprinting techniques are discussed, as well as new combinations of techniques for more detailed analysis of tracing sources of hydrocarbon contaminants.

Allen, C. A.; Wagner, S. C. **Rhizosphere activity of cattail (*Typha latifolia*) and spike rush (*Eleocharis tuberculosa*) inhabiting an oil spill.** *Texas Journal of Science*. 2000; 52 (4):335-344. ISSN: 0040-4403.
Microbial communities at an oil spill site seemed to be minimally affected by the contamination. Investigators note that some microbes were capable of metabolizing the crude oil, even when salt was added to the soil in experiments.

Al-Sabagh, A. M.; Ahmed, N. S.; Nassar, A. M.; Gabr, M. M. **Synthesis and evaluation of some polymeric surfactants for treating crude oil emulsions - Part I: treatment of sandy soil polluted with crude oil by monomeric and polymeric surfactants.** *Colloids and Surfaces A - Physicochemical and Engineering Aspects*. 2003; 216 (1-3):9-19. ISSN: 0927-7757.

Al-Sabagh, A. M.; Nehal, S. A.; Amal, M. N.; Gabr, M. M. **Synthesis and evaluation of some polymeric surfactants for treating crude oil - Part II: destabilization of naturally occurring water-in-oil emulsions by polyalkylphenol formaldehyde amine resins.** *Polymers for Advanced Technologies*. 2002; 13 (5):346-352. ISSN: 1042-7147.

Alshafie, Mohammed; Ghoshal, Subhasis. **Naphthalene biodegradation from non-aqueous-phase liquids in batch and column systems: comparison of biokinetic rate coefficients.** *Biotechnology Progress*. 2003; 19 (3):844-852. ISSN: 8756-7938.
Biodegradation kinetic coefficients were found to be similar between flow-through column and completely mixed batch reactor systems. Because of this, coefficients from either system are applicable for modeling studies.

Alva, Victor A.; Peyton, Brent M. **Phenol and catechol biodegradation by the haloalkaliphile *Halomonas campisalis*: influence of pH and salinity.** *Environmental Science & Technology*. 2003; 37 (19):4397-4402. ISSN: 0013-936X.
Authors discovered that a microbe used the β-ketoadipate metabolic pathway to degrade phenol and catechol in saline and alkaline environments.

Alzaga, Roberto; Montuori, Paolo; Ortiz, Laura; Bayona, Josep M.; Albaigés, Joan. **Fast solid-phase extraction-gas chromatography-mass spectrometry procedure for oil fingerprinting - application to the *Prestige* oil spill.** *Journal of Chromatography A*. 2004; 1025 (1):133-138. ISSN: 0021-9673.
A fast and straightforward procedure for accurately determining aliphatic and aromatic hydrocarbons in petroleum samples was discovered by the successful testing of fuel oil collected following the *Prestige* spill. Furthermore, this method can be combined with GC-MS for fingerprinting the sources of future oil spills.

Amador-Hernández, J.; Fernández-Romero, J. M.; Luque de Castro, M. Dolores. **Flow injection screening and semiquantitative determination of polycyclic aromatic hydrocarbons in water by laser induced spectrofluorimetry-chemometrics.** *Analytica Chimica Acta*. 2001; 448 (1-2):61-70. ISSN: 0003-2670.
A method is proposed for rapid, constant detection of PAHs in water samples. Tests determined that the method can detect hydrocarbons, and suggestions are made for real-time, *in situ* monitoring of pollutants in natural waters.

CHEMISTRY/GEOCHEMISTRY/GEOLOGY

Amellal, Najat; Portal, Jean-M.; Vogel, Timothy; Berthelin, Jacques. **Distribution and location of polycyclic aromatic hydrocarbons (PAHs) and PAH-degrading bacteria within polluted soil aggregates.** *Biodegradation*. 2001; 12 (1):49-57. ISSN: 0923-9820.
Analysis of polluted soil found that PAHs and PAH-degrading bacteria were more numerous in fine silt and clay than in larger fractions or unfractionated soil. Because of the discovered amounts of degraded PAHs by soil particle size, it appears that the organization of soil particles and structure of soil aggregates are important for the characterization of polluted soil.

Amezcua-Allieri, M. A.; Lead, J. R.; Meléndez-Estrada, J.; Rodríguez-Vázquez, R. **Phenanthrene removal in a selected Mexican soil by the fungus *Penicillium frequentans*: role of C:N ratio and water content.** *Soil & Sediment Contamination*. 2003; 12 (3):387-399. ISSN: 1532-0383.
An isolated strain of *Penicillium frequentans*, a fungus grown on sugar cane bagasse pith, was investigated for its effectiveness in the removal of phenanthrene in selected Mexican soil. Simultaneously, researchers discovered that phenanthrene removal efficiency was obtained when the moisture content reached 40% with a C:N ratio of 60.

An, Jingyi; Xu, Zhicheng; Zhang, Lu; Zhao, Sui; Yu, Jiayong. **Thin liquid films containing crude oil fractions with different structures - emulsion stability.** *Journal of Dispersion Science and Technology*. 2003; 24 (6):803-810. ISSN: 0193-2691.
Researchers isolated two acid fractions from crude oil and studied the relationship between their structures and the stability of thin liquid films from emulsified crude oil. In addition to structure, alkali type and concentration have a great impact on the lifetime of liquid film.

Anderson, S. M.; Jørgensen, C.; Jacobsen, C. S. **Development and utilisation of a medium to isolate phenanthrene-degrading *Pseudomonas* spp.** *Applied Microbiology and Biotechnology*. 2001; 55 (1):112-116. ISSN: 0175-7598.
Authors describe the isolation of 23 phenanthrene degraders after the addition of sodium lauryl sarcosine and trimethoprim to agar plates.

Andersson, B. Erik et al. **Incomplete degradation of polycyclic aromatic hydrocarbons in soil inoculated with wood-rotting fungi and their effect on the indigenous soil bacteria.** *Environmental Toxicology and Chemistry*. 2003; 22 (6):1238-1243. ISSN: 0730-7268.
Chemical analysis was used to monitor the effectiveness of white-rot fungi and brown-rot fungi in the degradation of PAH-contaminated soils. Investigators noted the accumulation of PAH metabolites where white-rot fungus was used, harming the indigenous microbial communities. However, brown-rot fungus degraded PAHs at similar levels without PAH metabolites accumulating in the soil.

Andersson, Terhi; Hartonen, Kari; Hyötyläinen, Tuulia; Riekkola, Marja-Liisa**. Pressurised hot water extraction and thermal desorption of polycyclic aromatic hydrocarbons from sediment with use of a novel extraction vessel.** *Analytica Chimica Acta*. 2002; 466 (1):93-100. ISSN: 0003-2670.
Authors test a laboratory-made extraction device, the results of which compare favorably with commercially-constructed vessels in the recovery of PAHs.

Andersson, Terhi; Hartonen, Kari; Hyötyläinen, Tuulia; Riekkola, Marja-Liisa. **Stability of polycyclic aromatic hydrocarbons in pressurised hot water.** *Analyst*. 2003; 128 (2):150-155. ISSN: 0003-2654.
PAHs were mixed into aqueous solutions and the mixtures were heated between 110 and 350 degrees C. GC-MS analysis showed that even short heating times at 300 degrees caused degradation of PAHs.

Anissimov, Leonid; Bylinkin, Gennady. **Washing processes and fluid variations: phase equilibria to petroleum geochemistry.** *Oil & Gas Journal*. 2003; 101 (1):32-37. ISSN: 0030-1388.
Geochemical methods were used to identify and describe the composition of a petroleum reservoir in the North Caspian Basin.

CHEMISTRY/GEOCHEMISTRY/GEOLOGY

Antizar-Ladislao, B.; Lopez-Real, J. M.; Beck, A. J. **Bioremediation of polycyclic aromatic hydrocarbon (PAH)-contaminated waste using composting approaches.** *Critical Reviews in Environmental Science and Technology*. 2004; 34 (3):249-289. ISSN: 1064-3389.
In this review of research on the role of composting in bioremediation of PAHs, the authors critically evaluate existing studies to assess the effectiveness of different approaches.

Armenta-Arteaga, Gustavo; Elizalde-González, Mariá. **Contamination by PAHs, PCBs, PCPs and heavy metals in the Mecoacán Lake estuarine water and sediments after oil spilling.** *Journal of Soils and Sediments*. 2003; 3 (1):35-40. ISSN: 1439-0108.
Researchers analyzed samples collected from the Mecoacán petroleum region in February 1993 and 1996 following an oil spill to determine the origin and distribution of a number of contaminants, including PAHs.

Artz, Rebekka R. E.; Semple, Kirk T.; Killham, Ken; Prosser, Jim I.; Paton, Graeme I. **The potential for anaerobic mineralisation of hydrocarbon constituents of oily drill cuttings from the North Sea seabed.** *Journal of Environmental Monitoring*. 2002; 4 (4):553-557. ISSN: 1464-0325.
Partial mineralization of hexadecane demonstrates that natural attenuation of some hydrocarbon-based compounds in oily drill cuttings is possible.

Arzayus, Krisa M.; Dickhut, Rebecca M.; Canuel, Elizabeth A. **Effects of physical mixing on the attenuation of polycyclic aromatic hydrocarbons in estuarine sediments.** *Organic Geochemistry*. 2002; 33 (12):1759-1769. ISSN: 0146-6380.

Aske, Narve; Orr, Robert; Sjöblom, Johan; Harakd, Kallevik; Øye, Gisle. **Interfacial properties of water-crude oil systems using the oscillating pendant drop. Correlations to asphaltene solubility by near infrared spectroscopy.** *Journal of Dispersion Science and Technology*. 2004; 25 (3):263-275. ISSN: 0193-2691.
Interfacial rheological properties are determined by the chemistry of active interfacial components and their amounts in crude oils.

Atagana, H. I.; Haynes, R. J.; Wallis, F. M. **Batch culture enrichment of indiginous soil microorganisms capable of catabolizing creosote components.** *Water, Air, & Soil Pollution*. 2002; 141 (1-4):233-246. ISSN: 0049-6979.

Atagana, H. I.; Haynes, R. J.; Wallis, F. M. **Optimization of soil physical and chemical conditions for the bioremediation of creosote-contaminated soil.** *Biodegradation*. 2003; 14 (4):297-307. ISSN: 0923-9820.
In biodegradation experiments involving creosote-contaminated soil, investigators found that phenolic compounds and lower molecular mass PAHs were more susceptible to degradation, especially with amendments of nutrients and effective management of aeration, moisture content and pH levels.

Atekwana, Estella A. et al. ***In-situ*** **apparent conductivity measurements and microbial population distribution at a hydrocarbon-contaminated site.** *Geophysics*. 2004; 69 (1):56-63. ISSN: 0016-8033.
Higher bulk electrical conductivity was found at sites where higher concentrations of oil-degrading microbial populations were located. This suggests that biogeochemical processes associated with biodegradation can affect geoelectrical properties of contaminated sites.

Auflem, Inge Harald; Westvik, Arild; Sjöblom, Johan. **Destabilization of water-in-crude oil emulsions based on recombined oil samples at various pressures.** *Journal of Dispersion Science and Technology*. 2003; 24 (1):103-112. ISSN: 0193-2691.
Water-in-oil emulsions were made stable by the recombination of crude oil with gases such as N_2, CO_2, CH_4, C_2H_6, and dry natural gas.

Bachoon, D. S.; Araujo, R.; Molina, M.; Hodson, R. E. **Microbial community dynamics and evaluation of bioremediation strategies in oil-impacted salt marsh sediment microcosms.** *Journal of Industrial Microbiology & Biotechnology*. 2001; 27 (2):72-79. ISSN: 1367-5435.

Bachoon, Dave S.; Hodson, Robert E.; Araujo, Rochelle. **Microbial community assessment in oil-impacted salt marsh sediment microcosms by traditional and nucleic acid-based indices.** *Journal of Microbiological Methods*. 2001; 46 (1):37-49. ISSN: 0167-7012.
Investigations discovered that degradation of hydrocarbon components was delayed when plant detritus was present in salt marsh sediments, compared to sediments without plant matter.

Backhus, Debera A.; Golini, Christina; Castellanos, Edwin. **Evaluation of fluorescence quenching for assessing the importance of interactions between nonpolar organic pollutants and dissolved organic matter.** *Environmental Science & Technology*. 2003; 37 (20):4717-4723. ISSN: 0013-936X.
Fluorescence quenching proved to be a quick and dependable screening tool in determining interactions between dissolved organic matter and hydrophobic organic contaminants.

Bagheri, Habib; Mohammadi, Abdorreza. **Pyrrole-based conductive polymer as the solid-phase extraction medium for the preconcentration of environmental pollutants in water samples followed by gas chromatography with flame ionization and mass spectrometry detection.** *Journal of Chromatography A*. 2003; 1015 (1-2):23-30. ISSN: 0021-9673.
A pyrrole-base polymer was tested as a sorbent for hydrocarbons in contaminated aqueous samples. The polymer was found to have higher recovery rates for aromatic versus aliphatic compounds.

Bahrami, A.; Shojaosadati, S. A.; Mohebali, G. **Biodegradation of dibenzothiophene by thermophilic bacteria.** *Biotechnology Letters*. 2001; 23 (11):899-901. ISSN: 0141-5492.
A mixed microbial culture was tested on Iranian crude oil in anaerobic conditions. The culture degraded 98% of dibenzothiophene after 15 days.

Bailey, V. L.; McGill, W. B. **Fate of ^{14}C-labeled pyrene in a creosote- and octadecane in an oil-contaminated soil.** *Soil Biology & Biochemistry*. 2002; 34 (4):423-433. ISSN: 0038-0717.
In order to understand the disappearance of dichloromethane-extractable organic carbon in the process of biodegradation, investigators traced the transformation of carbon fractions in hydrocarbon-contaminated soils.

Bakierowska, Anna-Maria; Trzeszczynski, Jerzy. **Graphical method for the determination of water/gas partition coefficients of volatile organic compounds by a headspace gas chromatography technique.** *Fluid Phase Equilibria*. 2003; 213 (1-2):139-146. ISSN: 0378-3812.

Bakr, Mohamed M. Y.; Wilkes, Heinz. **The influence of facies and depositional environment on the occurrence and distribution of carbazoles and benzocarbazoles in crude oils: a case study from the Gulf of Suez, Egypt.** *Organic Geochemistry*. 2002; 33 (5):561-580. ISSN: 0146-6380.
In the Gulf of Suez, benzocarbazoles in crude oils are determined not by the maturity of the geological formation, but by the variations in faces and depositional environments.

Balbinski, E. F.; Element, D. J.; Goodyear, S. G.; Jayasekera, A. J. **Prediction of offshore viscous oil field performance using reservoir simulation.** *Petroleum Geoscience*. 2002; 8 (2):151-157. ISSN: 1354-0793.

Baldwin, B. R.; Mesarch, M. B.; Nies, L. **Broad substrate specificity of naphthalene- and biphenyl-utilizing bacteria.** *Applied Microbiology and Biotechnology*. 2000; 53 (6):748-753. ISSN: 0175-7598.
Isolated strains of bacteria were tested for their ability to utilize either biphenyl or naphthalene as their sole source of carbon. One strain, BP18, was particularly effective in biodegradation of biphenyl as well as benzene, toluene, ethylbenzine and xylene isomers (BTEX). Evidence suggests that biodegradation by this strain is linked to a catabolic pathway.

Ballach, Hans-Joachim; Kuhn, Achim; Wittig, Rüdiger. **Biodegradation of anthracene in the roots and growth substrate of poplar cuttings.** *Environmental Science and Pollution Research - International*. 2003; 10 (5):308-316. ISSN: 0944-1344.
Researchers detected traces of nine substances associated with the biodegradation of anthracene, including phthalic acid, 9,10 anthraquinone, hydroxyanthracene and methoxyanthracene on or near roots of *Populus nigra*.

Banerjee, A.; Jha, M.; Mittal, A. K.; Thomas, N. J.; Misra, K. N. **The effective source rocks in the north Cambay Basin, India.** *Marine and Petroleum Geology*. 2000; 17 (10):1111-1129. ISSN: 0264-8172.

Banks, M. Katherine et al. **The effect of plants on the degradation and toxicity of petroleum contaminants in soil: a field assessment.** *In* Tsao, D. (Ed.) *Phytoremediation (Series: Advances in Biochemical Engineering Biotechnology, v.78)*. Berlin: Springer Verlag; 2003; p. 75-96. ISBN: 3-540-43385-6.

Banks, M. Katherine; Mallede, Hadessa; Rathbone, Karrie. **Rhizosphere microbial characterization in petroleum-contaminated soil.** *Soil & Sediment Contamination*. 2003; 12 (3):371-385. ISSN: 1532-0383.
Microbial communities were differentiated by use of enumeration and metabolic diversity assessments in contaminated soils and sediments taken from a phytoremediation field. This information was compared to resident populations from non-vegetated soils and sediments to determine differences in microbial activity and rates of remediation.

Baran, S.; Bielinska, J. E.; Oleszczuk, P. **Enzymatic activity in an airfield soil polluted with polycyclic aromatic hydrocarbons.** *Geoderma*. 2004; 118 (3-4):221-232. ISSN: 0016-7061.
Researchers used PAH-contaminated soils to understand the influences that regulate enzymatic activity in the presence of hydrocarbons. Their research found that soil properties such as total organic content and pH play a large role in the effects PAHs have on enzymatic activity.

Baraniecki, C. A.; Aislabie, J.; Foght, J. M. **Characterization of *Sphingomonas* sp. Ant 17, an aromatic hydrocarbon-degrading bacterium isolated from Antarctic soil.** *Microbial Ecology*. 2002; 43 (1):44-54. ISSN: 0095-3628.
A strain of cold-tolerant bacteria was tested and found to be successful in bioremediation tests. The strain also displayed more tolerance to UV light and freeze-thaw cycles than the isolate *Sphingomonas* sp. WPO-1.

Barathi, S.; Vasudevan, N. **Bioremediation of crude oil contaminated soil by bioaugmentation of Pseudomonas fluorescens NS1.** *Journal of Environmental Science and Health Part A - Toxic/Hazardous Substances & Environmental Engineering*. 2003; 38 (9):1857-1866. ISSN: 1093-4529.
Wheat bran as a bulking agent quickly increased biodegradation of crude oil-contaminated soil by *P. fluorescens*, compared to other amendments.

Barathi, S.; Vasudevan, N. **Utilization of petroleum hydrocarbons by *Pseudomonas fluorescens* isolated from a petroleum-contaminated soil.** *Environment International*. 2001; 26 (5-6):413-416. ISSN: 0160-4120.
P. fluorescens successfully emulsified a number of hydrocarbon substrates, including toluene, hexane, naphthalene and phenanthrene. GC analysis confirmed that short and long chain *n*-alkanes were utilized.

Barbeau, Katherine; Zhang, Guangping; Live, David H.; Butler, Alison. **Petrobactin, a photoreactive siderophore produced by the oil-degrading marine bacterium *Marinobacter hydrocarbonoclasticus*.** *Journal of the American Chemical Society*. 2002; 124 (3):378-379. ISSN: 0002-7863.
Authors identify and structurally characterize the first siderophores, Fe(III) transport ligands produced by bacteria, in the hydrocarbon-degrading *M. hydrocarbonoclasticus*.

Bayona, Josep M.; Monjonell, Amanda; Miguel, Juan Carlos; Fowler, Scott W.; Albaigés, Joan. **Biogeochemical characterization of particulate organic matter from a coastal hydrothermal vent zone in the Aegean Sea.** *Organic Geochemistry*. 2002; 33 (12):1609-1620. ISSN: 0146-6380.
Biogeochemical evidence of PAHs and biomarkers from algae and zooplankton was gathered from particle interceptor traps near hydrothermal vents. Researchers believe that zooplankton play an important role in the downward transport of hydrocarbons in plumes associated with hydrothermal vents.

CHEMISTRY/GEOCHEMISTRY/GEOLOGY

Beller, Harry R.; Kane, Staci R.; Legler, Tina C.; Alvarez, Pedro J. J. **A real-time polymerase chain reaction method for monitoring anaerobic, hydrocarbon-degrading bacteria based on a catabolic gene.** *Environmental Science &Technology*. 2002; 36 (18):3977-3984. ISSN: 0013-936X.
Researchers identify a catabolic gene associated with the first step of anaerobic degradation of toluene and xylene, and incorporate the gene activity into a sensitive, real-time monitoring tool.

Bengtsson, G.; Zerhouni, P. **Effects of carbon substrate enrichment and DOC concentration on biodegradation of PAHs in soil.** *Journal of Applied Microbiology*. 2003; 94 (4):608-617. ISSN: 1364-5072.
Researchers show that the addition of water can increase the rates of biodegradation of PAHs in creosote-contaminated soils. The presence of other carbon substrates, such as analog compounds, impede the degradation process.

Bhattacharya, Santanu; Krishnan-Ghosh, Yamuna. **First report of phase selective gelation of oil from oil/water mixtures. Possible implications toward containing oil spills.** *Chemical Communications*. 2001; (2):185-186. ISSN: 1359-7345.
A simple amino acid derivative was shown to be effective in being able to gelate oil from a mixture with water. Scanning Electron Microscopy and Fourier Transform Infrared Spectroscopy provided molecular-level insights into the process of gelation.

Bhupathiraju, Vishvesh K. et al. **Assessment of *in-situ* bioremediation at a refinery waste-contaminated site and an aviation gasoline contaminated site.** *Biodegradation*. 2002; 13 (2):79-90. ISSN: 0923-9820.
Geochemical, microbiological and isotopic methods were employed to monitor the effectiveness of *in-situ* bioremediation of petroleum-contaminated soil. Researchers focused on the radiocarbon content of methane and carbon dioxide to evaluate the effectiveness of ongoing PAH degradation.

Bidwell, Joseph R.; Cherry, Donald S.; Merski, A. Thomas. **Toxicity evaluation of a commercial bioremediation agent mixed with crude oil.** *Environmental Toxicology and Chemistry*. 2003; 22 (1):84-91. ISSN: 0730-7268.
Juvenile *Menidia beryllina* were used to establish toxicity levels of a commercial bioremediation agent (CBA) in experiments involving oil degradation. Toxicity levels for the CBA were found to be lower than the toxicity of crude oil to which the CBA was applied.

Bielicka, K.; Kaczorek, E.; Olszanowski, A.; Voelkel, A. **Examination of biodegradation of hydrocarbons in emulsified systems.** *Polish Journal of Environmental Studies*. 2002; 11 (1):11-16. ISSN: 1230-1485.

Bielicka, K.; Voelkel, A. **Selectivity of solid-phase extraction phases in the determination of biodegradation products.** *Journal of Chromatography A*. 2001; 918 (1):145-151. ISSN: 0021-9673.
Solid-phase extraction (SPE) and liquid-liquid extraction were both used to investigate the degradation of hydrocarbons by bacterial strains. SPE-GC analysis resulted in the qualitative and quantitative results of the biodegradation process.

Blakely, Julie K.; Neher, Deborah A.; Spongberg, Alison L. **Soil invertebrate and microbial communities, and decomposition as indicators of polycyclic aromatic hydrocarbon contamination.** *Applied Soil Ecology*. 2002; 21 (1):71-88. ISSN: 0929-1393.
This study investigated the effects of PAH contamination from creosote on soil food webs. Community structure was more affected by altered habitat than direct toxicity, according to researchers.

Boehm, Paul. D. et al. **Total organic carbon, an important tool in an holistic approach to hydrocarbon source fingerprinting.** *Environmental Forensics*. 2002; 3 (3-4):243-250. ISSN: 1527-5922.

Boese, B. L. et al. **Phototoxic evaluation of marine sediments collected from a PAH-contaminated site.** *Archives of Environmental Contamination and Toxicology*. 2000; 38 (3):274-282. ISSN: 0090-4341.
Rhepoxynius abronius and *Leptocheirus plumulosus* were exposed to PAH-contaminated soils, in conjunction with intermittent UV radiation. Experiments resulted in five- to eightfold increase in toxicity, with resulting mortality in the species. Authors note that their results suggest that standard toxicity tests underestimate potential ecological risks of PHA-contaminated sediments to animals exposed to sunlight.

Bogan, Bill W. et al. "**Humic coverage index" as a determining factor governing strain-specific hydrocarbon availability to contaminant-degrading bacteria in soils.** *Environmental Science & Technology*. 2003; 37 (22):5168-5174. ISSN: 0013-936X.
A humic coverage index (HCI) was developed to aid in assessing rates of mineralization of contaminants. Results of some experiments show that although HCI conditions were optimal for degradation of specific hydrocarbons, the existence of other PAHs in soil meant that overall degradation rates would be lower than expected.

Bogan, Bill W.; Lahner, Lisa M.; Sullivan, Wendy R.; Paterek, J. Robert. **Degradation of straight-chain aliphatic and high-molecular-weight polycyclic aromatic hydrocarbons by a strain of *Mycobacterium austroafricanum*.** *Journal of Applied Microbiology*. 2003; 94 (2):230-239. ISSN: 1364-5072.
Investigators characterize a newly isolated strain of bacteria capable of degrading a range of PAHs in liquid and soil environments.

Bogan, Bill W.; Lahner, Lisa M.; Trbovic, Vesna; Szajkovics, Ann M.; Paterek, J. Robert. **Effects of alkylphosphates and nitrous oxide on microbial degradation of polycyclic aromatic hydrocarbons.** *Applied & Environmental Microbiology*. 2001; 67 (5):2139-2144. ISSN: 0099-2240.
Different gaseous nutrients were studied for their ability to aid in the biodegradation of PAHs. Authors found that the organophosphates didn't result in higher degradation rates and that *in situ* use should be assessed on a case-by-case basis.

Bogan, Bill W.; Sullivan Wendy R. **Physicochemical soil parameters affecting sequestration and mycobacterial biodegradation of polycyclic aromatic hydrocarbons in soil.** *Chemosphere*. 2003; 52 (10):1717-1726. ISSN: 0045-6535.
Fulvic acid was found in large amounts following the biodegradation of PAHs by *Mycobacterium austroafricanum*. The addition of fulvic acid to humic and fulvic acid-depleted soils caused higher levels of pyrene metabolism by the microbes.

Bogan, Bill W.; Trbovic, Vesna; Paterek, J. Robert. **Inclusion of vegetable oils in Fenton's chemistry for remediation of PAH-contaminated soils.** *Chemosphere*. 2003; 50 (1):15-21. ISSN: 0045-6535.
The addition of vegetable oils with a reagent caused increased oxidation, especially with high-molecular-weight PAHs. Researchers also found that combining palm kernal oil with calcium peroxide instead of hydrogen peroxide led to additional PAH removal.

Boonchan, Sudarat; Britz, Margaret L.; Stanley, Grant A. **Degradation and mineralization of high-molecular-weight polycyclic aromatic hydrocarbons by defined fungal-bacterial cocultures.** *Applied & Environmental Microbiology*. 2000; 66 (3):1007-1019. ISSN: 0099-2240.
Bacterial consortia and fungus found growing in contaminated soil were investigated for their ability to degrade specific types of PAHs.

Boopathy, Ramaraj. **Anaerobic biodegradation of No. 2 diesel fuel in soil: a soil column study.** *Bioresource Technology*. 2004; 94 (2):143-151. ISSN: 0960-8524.
Anaerobic degradation experiments over a period of 310 days found that under mixed electron acceptor conditions, 81% of diesel fuel was degraded while under sulfate reducing conditions, 54.5% degradation rates were achieved.

Boopathy, Ramaraj. **Anaerobic degradation of No. 2 diesel fuel in the wetland sediments of Barataria-Terrebonne estuary under various electron acceptor conditions.** *Bioresource Technology*. 2003; 86 (2):171-175. ISSN: 0960-8524.
Improved biodegradation of diesel fuel in estuarine sediments occurred under sulfate reducing, nitrate reducing, methanogenic, and mixed electron acceptor conditions.

Boopathy, Ramaraj. **Use of anaerobic soil slurry reactors for the removal of petroleum hydrocarbons in soil.** *International Biodeterioration & Biodegradation*. 2003; 52 (3):161-166. ISSN: 0964-8305.
Diesel-contaminated soil was collected to monitor the success of native anaerobic bacteria in the biodegradation of hydrocarbons. Results indicate that the mixed microbial populations from the spill site were capable of degrading diesel fuel.

Borde, Xavier et al. **Synergistic relationships in algal-bacterial microcosms for the treatment of aromatic pollutants.** *Bioresource Technology*. 2003; 86 (3):293-300. ISSN: 0960-8524.
Authors present findings in the first published study of photosynthesis-enhanced biodegradation of specific PAHs by a combination of algal and bacterial species.

Bost, F. D.; Frontera-Suau, R.; McDonald, T. J.; Peters, K.E.; Morris, P. J. **Aerobic biodegradation of hopanes and norhopanes in Venezuelan crude oils.** *Organic Geochemistry*. 2001; 32 (1):105-114. ISSN: 0146-6380.
GC-MS was used to analyze the results of microbial degradation of crude oil after an incubation time of 5 weeks. Results indicate that bacteria remove isomers from both hopanes and 25-norphanes in aerobic environments.

Bouchez, M.; Blanchet, D.; Bardin, V.; Haeseler, F.; Vandecasteele, J. P. **Efficiency of defined strains and of soil consortia in the biodegradation of polycyclic aromatic hydrocarbon (PAH) mixtures.** *Biodegradation*. 1999; 10 (6):429-435. ISSN: 0923-9820.
Different combinations of bacteria were tested for their ability to degrade mixtures of five PAHs. Investigators conclude that a bacterial consortium from PAH-contaminated soil was most effective at breaking down hydrocarbons.

Boukir, A. et al. **Subfractionation, characterization and photooxidation of crude oil resins.** *Chemosphere*. 2001; 43 (3):279-286. ISSN: 0045-6535.

Bouw, L.; Essink, G. H. P. Oude. **Fluid flow in the northern Broad Fourteens Basin during Late Cretaceous inversion.** *Netherlands Journal of Geosciences - Geologie en Mijnbouw*. 2003; 82 (1):55-69. ISSN: 0016-7746.
In this study, the authors assess the depositional history, hydrogeological parameters, and hydrodynamic evolution of the Broad Fourteens Basin area, offshore Netherlands.

BP assays field in Gulf of Mexico. *Oil & Gas Journal*. 2003; 101 (7):54-55. ISSN: 0030-1388.
BP PLC and its partners are planning to begin production of the Atlantis, Holstein, and Mad Dog fields located in deepwaters of the Gulf of Mexico.

Brack, Werner. **Effect-directed analysis: a promising tool for the identification of organic toxicants in complex mixtures?** *Analytical and Bioanalytical Chemistry*. 2003; 377 (3):397-407. ISSN: 1618-2310.
The author reviews the current methodologies employing effect-directed analysis with the objective of establishing criteria for using this technique for toxicity tests.

Brack, Werner; Kind, T.; Hollert, H.; Schrader, S.; Moder, M. **Sequential fractionation procedure for the identification of potentially cytochrome P4501A-inducing compounds.** *Journal of Chromatography A*. 2003; 986 (1):55-66. ISSN: 0021-9673.

Braida, Washington J.; White, Jason C.; Pignatello, Joseph J. **Indices for bioavailability and biotransformation potential of contaminants in soils.** *Environmental Toxicology and Chemistry*. 2004; 23 (7):1585-1591. ISSN: 0730-7268.
Indices found low values for bioavailability and biotransformation in a microbe when a polymeric substance was present, indicating poor potential of the adsorbent in site remediation.

Bramwell, Debbie-Ann P.; Laha, Shonali. **Effects of surfactant addition on the biomineralization and microbial toxicity of phenanthrene.** *Biodegradation*. 2000; 11 (4):263-277. ISSN: 0923-9820.
Four surfactants were added to liquid culture and soil-water suspensions inoculated with *Pseudomonas aeruginosa* and studied over 15 weeks. None of the surfactants, regardless of dose or liquid/soil-water mediums, enhanced the biodegradation of phenanthrene.

CHEMISTRY/GEOCHEMISTRY/GEOLOGY

Bressler, D. C.; Fedorak, P. M. **Identification of disulfides from the biodegradation of dibenzothiophene.** *Applied & Environmental Microbiology*. 2001; 67 (11):5084-5093. ISSN: 0099-2240.
Pseudomonas sp. strain BT1d was grown on dibenzothiophene and three disulfides were detected as a byproduct. A proposed mechanism was presented to account for the abiotic and biotic reactions necessary for the creation of the disulfides.

Brodskii, E. S.; Lukashenko, I. M.; Kalinkevich, G. A.; Savchuk, S. A**. Identification of petroleum products in environmental samples using gas chromatography and gas chromatography-mass spectrometry.** *Journal of Analytical Chemistry*. 2002; 57 (6):486-490. ISSN: 1061-9348.
Investigators demonstrate the effectiveness of laboratory techniques in the identification of the origin of oil pollutants.

Brown, Gary S. **Polycyclic Aromatic Hydrocarbons: Enhanced Microbial Degradation by Chemical Oxidative Treatment.** Thesis (Ph. D.): University of New Mexico; 2000; 133 leaves.

Brusa, T. et al. **Aromatic hydrocarbon degradation patterns and catechol 2,3-dioxygenase genes in microbial cultures from deep anoxic hypersaline lakes in the eastern Mediterranean sea.** *Microbiological Research*. 2001; 156 (1):49-58. ISSN: 0944-5013.

Buco, S.; Moragues, M.; Doumenq, P.; Noor, A.; Mille, G. **Analysis of polycyclic aromatic hydrocarbons in contaminated soil by Curie point pyrolysis coupled to gas chromatography-mass spectrometry, an alternative to conventional methods.** *Journal of Chromatography A*. 2004;1026 (1-2):223-229. ISSN: 0021-9673.
Curie point pyrolysis coupled with GC-MS was compared with other well-known extraction techniques on 16 types of PAH. Results validated by certified soil analysis indicate that highest recoveries were obtained with Curie point pyrolysis and KOH digestion.

Budzinski, Hélèn; Mazeas, Laurent; LeMenach, K. **^{13}C analysis of PAH: a new dimension in source assessment studies.** *Chimia*. 2003; 57 (1-2):41-43. ISSN: 0009-4293.

Bugge,Tom et al. **Shallow stratigraphic drilling applied in hydrocarbon exploration of the Nordkapp Basin, Barents Sea.** *Marine and Petroleum Geology*. 2002; 19 (1):13-37. ISSN: 0264-8172.
A geographical description of the Nordkapp Basin suggests that there are hydrocarbon reserves in the area. A recent exploration well drilled in the area supports this thesis.

Bugna, G. C. et al. **A field test of δ^{13}C as a tracer of aerobic hydrocarbon degradation.** *Organic Geochemistry*. 2004; 35 (2):123-135. ISSN: 0146-6380.
Transport and degradation of PAHs was traced by monitoring carbon isotopes as they were exposed to reactants and products in a field setting. Products of hydrocarbon respiration correlated with δ^{13}C values of substrates, indicating the usefulness of using this isotope as a tracer of degradation.

Bundy, Jacob G.; Campbell, Colin, D.; Paton, Graeme I. **Comparison of response of six different luminescent bacterial bioassays to bioremediation of five contrasting oils.** *Journal of Environmental Monitoring*. 2001; 3 (4):404-410. ISSN: 1464-0325.

Bundy, Jacob G.; Paton, Graeme I.; Campbell, Colin D. **Microbial communities in different soil types do not converge after diesel contamination.** *Journal of Applied Microbiology*. 2002; 92 (2):276-288. ISSN: 1364-5072.
Three soil types were contaminated with diesel fuel and observed to determine bacterial community structure during biodegradation. Community profiles were found to differ with each soil type, based on inherent microbial potential of soil sample. Researchers note that inherent microbial potential should be taken into account in impact and risk assessments.

Burguera, José et al. **Optimum phase-behavior formulation of surfactant/oil/water systems for the determination of chromium in heavy crude oil and in bitumen-in-water emulsion.** *Talanta*. 2003; 61 (3):353-361. ISSN: 0039-9140.
A formulation was used to find the optimum proportion of oil-water mixture and sufficient dilution of emulsions for establishing chromium levels in heavy crude oil samples via electrothermal atomic absorption spectrometry.

Burns, K. A.; Codi, S.; Duke, C. **Gladstone, Australia field studies: weathering and degradation of hydrocarbons in oiled mangrove and salt marsh sediments with and without the application of an experimental bioremediation protocol.** *Marine Pollution Bulletin*. 2000; 41 (7-12):392-402. ISSN: 0025-326X.
Gippsland and Bunker C oils were used in this study to test the effect of bioremediation on the amount of hydrocarbons absorbed by marine sediments following a spill.

Buszewski, B.; Buszewska, T.; Szumski, M.; Siepak, J. **Simultaneous determination of phenols and polyaromatic hydrocarbons isolated from environmental samples by SFE-SPE-HPLC.** *Chemia Analityczna*. 2003; 48 (1):13-25. ISSN: 0009-2223.

Bystol, Adam J.; Thorstenson, Tim; Campiglia, Andres D. **Laser-induced multidimensional fluorescence spectroscopy in Shpol'skii matrixes for the analysis of polycyclic aromatic hydrocarbons in HPLC fractions and complex environmental extracts.** *Environmental Science & Technology*. 2002; 36 (20):4424-4429. ISSN: 0013-936X.
Fluorescence measurements were taken of PAHs in water samples at 4.2 K by the application of an improved methodology for laser-excited time-resolved Shpol'skii spectroscopy. There is great potential for this method of screening and quantification of PAHs, due in part to speed of the process.

Bystol, Adam J.; Whitcomb, Jennifer L.; Campiglia, Andres D. **Solid-liquid extraction laser excited time-resolved Shpol'skii spectrometry: a facile method for the direct detection of 15 priority pollutants in water samples.** *Environmental Science & Technology*. 2001; 35 (12):2566-2571. ISSN: 0013-936X.
Authors describe a three-step procedure that detects PAHs in water in five minutes, with detection limits at subparts per billion levels. Simplicity, speed and data analysis are an improvement for routine water analysis.

Cajthaml, Tomás; Bhatt, M.; Sasek, Václav; Mateju, V. **Bioremediation of PAH-contaminated soil by composting: a case study.** *Folia Microbiologica*. 2002; 47 (6):696-700. ISSN: 0015-5632.

Cajthaml, Tomás; Möder, Monika; Kacer, Petr; Sasek, Václav; Popp, Peter. **Study of fungal degradation products of polycyclic aromatic hydrocarbons using gas chromatography with ion trap mass spectrometry detection.** *Journal of Chromatography A*. 2002; 974 (1-2):213-222. ISSN: 0021-9673.
Irpex lacteus, a ligninolytic fungus, was observed degrading types of PAHs. Researchers gained insights into the mechanisms behind degradation of PAHs by observing the processes with different tools, including product ion scans.

Calvo, C.; Martínez-Checa, F.; Toledo, F. L.; Porcel, J.; Quesada, E. **Characteristics of bioemulsifiers synthesised in crude oil media by *Halomonas eurihalina* and their effectiveness in the isolation of bacteria able to grow in the presence of hydrocarbons.** *Applied Microbiology & Biotechnology*. 2002; 60 (3):347-351. ISSN: 0175-7598.

Calvo, C.; Toledo, F. L.; González-López, J. **Surfactant activity of a naphthalene degrading *Bacillus pumilus* strain isolated from oil sludge.** *Journal of Biotechnology*. 2004; 109 (3):255-262. ISSN: 0168-1656.
A strain of bacteria isolated from solid waste oil was used in tests involving crude oil and naphthalene under aerobic conditions and found to be promising for future use in remediation.

Cameotra, Swaranjit Singh; Bollag, Jean-Marc. **Biosurfactant-enhanced bioremediation of polycyclic aromatic hydrocarbons.** *Critical Reviews in Environmental Science & Technology*. 2003; 33 (2):111-126. ISSN: 1064-3389.
This review highlights several studies showing the role biosurfactants play in enhancing bioremediation rates, and the functions and processes by which they assist in the removal of PAHs.

Campbell, Sonia; Paquin, Daniel; Awaya, Jonathan D.; Li, Qing X. **Remediation of benzo[a]pyrene and chrysene-contaminated soil with industrial hemp (*Cannabis sativa*).** *International Journal of Phytoremediation*. 2002; 4 (3):157-168. ISSN: 1522-6514.
Industrial hemp was found to have a very high tolerance to B(a)P and chrysene in growth experiments, suggesting that it could be a prime candidate species for remediation studies.

Capelli, S. Mana; Busalmen, J. P.; de Sánchez, S. R. **Hydrocarbon bioremediation of a mineral-base contaminated waste from crude oil extraction by indigenous bacteria.** *International Biodeterioration & Biodegradation*. 2001; 47 (4):233-238. ISSN: 0964-8305.
Mud polluted from petroleum exploration was exposed to bacteria and observed for 45 days. Total hydrocarbon content was lessened by 30%, with rates of various fractions as high as 40% degraded. The resins fraction was only degraded by 20%.

Capotorti, Guido; Digianvincenzo, Paolo; Cesti, Pietro; Bernardi, Antonella; Guglielmetti, Gianfranco. **Pyrene and benzo(a)pyrene metabolism by an *Aspergillus terreus* strain isolated from a polycylic aromatic hydrocarbons polluted soil.** *Biodegradation*. 2004; 15 (2):79-85. ISSN: 0923-9820.
A fungal species was isolated and monitored during biodegradation of two PAHs. Investigators observed the conversion of pyrene to pyrenylsulfate and B(a)P to benzo(a)pyrenylsulfate, a reaction also previously seen in non lignolinolytic fungi.

Carberry, Judith Bower; Wik, John. **Comparison of *ex situ* and *in situ* bioremediation of unsaturated soils contaminated by petroleum.** *Journal of Environmental Science and Health. Part A: Toxic Hazardous Substances and Environmental Engineering*. 2001; 36 (8):1491-1503. ISSN: 1093-4529.
A study of remediation processes led the authors to conclude that *ex situ* bioremediation was the safest and most predictable method of treating contaminated soil.

Cardoso, Vitor Vale; Rodrigues, Alexandre; Correia, Judite; Benoliel, Maria João. **Application of SPME in the analysis of polynuclear aromatic hydrocarbons in water by HPLC with DAD detection.** *Polycyclic Aromatic Compounds*. 2000; 19 (1-4):227-239. ISSN: 1040-6638.
SPME, when used in conjunction with a polydimethylsiloxane (PDMS) coated fiber, was found to be precise and sensitive enough to detect low levels of PAHs in water. Authors note that the addition of a fluorescence detector would further increase the ability to detect hydrocarbons in water.

Carlstrom, C. J.; Tuovinen, O. H. **Mineralization of phenanthrene and fluoranthene in yardwaste compost.** *Environmental Pollution*. 2003; 124 (1):81-91. ISSN: 0269-7491.
Researchers measured the evolution of $^{14}CO_2$ as an indicator of mineralization of ^{14}C-labeled phenanthrene and ^{14}C-labeled fluoranthene in yardwaste compost.

Carman, Kevin R.; Means, Jay C. **Assessment of PAH Composition of Diesel Fuel Sorbed to Marine Sediments and their Toxicity to Aquatic Food Webs.** New Orleans, La.: U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region; 1999; OCS Study MMS 98-0057; 28 pp.
During a 28-day microcosm study, diesel-contaminated sediments were examined for their effects on the sedimentary bacterial community of a Louisiana salt marsh that had been chronically exposed to petroleum hydrocarbons for decades.

Carrasco, E. A. et al. **Study of the interaction of pollutant nitro polycyclic aromatic hydrocarbons with different metallic surfaces by surface-enhanced vibrational spectroscopy (SERS and SEIR).** *Journal of Physical Chemistry A*. 2003; 107 (45):9611-9619. ISSN: 1089-5639.

Carretero, Antonio Segura; Cruces-Blanco, Carmen; Sánchez-Polo, M.; Ávila-Rosón, J. C.; Fernández-Gutiérrez, Alberto. **Study of different normal-microemulsion compositions by room-temperature phosphorescence to determine benzo[a]pyrene in environmental samples.** *Analytica Chimica Acta*. 2002; 474 (1-2):91-98. ISSN: 0003-2670.
Authors describe a novel method of determining B(a)P in environmental samples.

Cassella, Ricardo J.; de Sant'Ana, Otoniel D.; Santelli, Ricardo E. **Determination of arsenic in petroleum refinery streams by electrothermal atomic absorption spectrometry after multivariate optimization based on Doehlert design.** *Spectrochimica Acta Part B: Atomic Spectroscopy*. 2002; 57 (12):1967-1978. ISSN: 0584-8547.
Authors develop and successfully test a methodology for detecting arsenic in refinery aqueous streams that contain large amounts of volatile organic compounds.

Castelli, Francesco; Librando, Vito; Sarpietro, Maria Grazia. **Calorimetric approach of the interaction and absorption of polycyclic aromatic hydrocarbons with model membranes.** *Environmental Science & Technology*. 2002; 36 (12):2717-2723. ISSN: 0013-936X.
Differential scanning calorimetry was employed to observe the way in which PAHs enter cell membranes. Research determined that PAHs migrate into cell membranes by dispersal in a lipophilic medium.

Catallo, W. James. **Biodegredation of Aromatic Heterocycles from Petroleum-Produced Water and Pyrogenic Sources in Marine Sediments.** New Orleans, La.: U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region; 2000; OCS Study MMS 2000-060; 28 pp.

Cebulak, Stefan; Pacha, Jerzy; Wydmuch, Zenobia; Skret, Urszula; Fabianska, Monika. **Oxyreactive thermal analysis in control of oil decomposition in soils with low and higher organic matter content.** *Fresenius Environmental Bulletin*. 2004; 13 (3A):207-210. ISSN: 1018-4619.
Oxyreactive thermal analysis was used to detect characteristics of oils suitable to control degradation in soils containing both low and high amounts of organic matter. Thermal analysis can be a quick and inexpensive technique for monitoring the behavior of oil in contaminated soils.

Chaîneau, C. H.; Yepremian, C.; Vidalie, J. F.; Ducreux, J.; Ballerini, D. **Bioremediation of a crude oil-polluted soil: biodegradation, leaching and toxicity assessments.** *Water, Air, & Soil Pollution*. 2003; 144 (1-4):419-440. ISSN: 0049-6979.
In a two-year field experiment, contaminated soil was placed in windrows and treated with active biological organisms. Bioremediation analyses were used to assess the biodegradation rate, along with chemical analyses of residual pollutants to establish the levels of toxicity and leaching of hydrocarbons and metabolites in the treated soil.

Chang, B. V.; Wei, S. H.; Yuan, S. Y. **Biodegradation of phenanthrene in soil.** *Journal of Environmental Science and Health Part B - Pesticides Food Contaminants and Agricultural Wastes*. 2001; 36 (2):177-187. ISSN: 0360-1234.

Chang, Chiang-Po. **Quantification of Benzo[a]Pyrene-Guanine Adducts in Vitro and *in Vivo* Tissue Samples by LC Tandem Mass Spectrometry.** Thesis (Ph. D.): Western Michigan University; 2001; 98 leaves.

Chang, Suk Tai; Lee, Hyun Joo; Gu, Man Bock. **Enhancement in the sensitivity of an immobilized cell-based soil biosensor for monitoring PAH toxicity.** *Sensors and Actuators B - Chemical*. 2004; 97 (2-3):272-276. ISSN: 0925-4005.
The detection limit and sensitivity of a biosensor was improved by using smaller-sized glass beads than previously used in combination with a bioluminescent microbial species.

Chang, Yun-Juan et al. **Phylogenetic analysis of aerobic freshwater and marine enrichment cultures efficient in hydrocarbon degradation: effect of profiling method.** *Journal of Microbiological Methods*. 2000; 40 (1):19-31. ISSN: 0167-7012.
Enrichment cultures taken from polluted sediments in both freshwater and saltwater environments were tested for hydrocarbon degradation by feeding them crude oil as a sole carbon source. The level of protobacteria of the cultures was determined by rDNA analysis.

Chávez-Gómez, B. et al. **Removal of phenanthrene from soil by co-cultures of bacteria and fungi pregrown on sugarcane bagasse pith.** *Bioresource Technology*. 2003; 89 (2):177-183. ISSN: 0960-8524.
Four fungi species isolated from contaminated soil and four species of bacteria were used to create 16 co-cultures that were employed to investigate phenanthrene remediation in 18-day experiments.

Chen, Bao-liang; Zhu, Li-zhong. **Partition of polycyclic aromatic hydrocarbons on organobentonites from water.** *Journal of Environmental Sciences - China*. 2001; 13 (2):129-136. ISSN: 1001-0742.
Researchers used naphthalene, phenanthrene, anthracene, and acenaphthene to analyze and quantify the equilibrium sorption of hydrocarbons to several organobentonites from water.

Chen, J. P. et al. **Geochemical evidence for mudstone as the possible major oil source rock in the Jurassic Turpan Basin, Northwest China.** *Organic Geochemistry*. 2001; 32 (9):1103-1125. ISSN: 0146-6380.

Chen, Peng; Pickard, Michael A.; Gray, Murray R. **Surfactant inhibition of bacterial growth on solid anthracene.** *Biodegradation*. 2000; 11 (5):341-347. ISSN: 0923-9820.
Trinton X-100, a surfactant, was tested for its ability to enhance biodegradation. Researchers found that low concentrations tended to inhibit the rate of growth of *Mycobacterium* sp. and *Pseudomonas* sp. using solid anthracene as their sole carbon source. Further investigation confirmed suspicions that retarded growth was related to inhibition of microbial adhesion of cells to anthracene.

Chen, Yen-Chih; Banks, M. Katherine; Schwab, A. Paul. **Pyrene degradation in the rhizosphere of tall fescue (*Festuca arundinacea*) and switchgrass (*Panicum virgatum* L.).** *Environmental Science & Technology*. 2003; 37 (24):5778-5782. ISSN: 0013-936X.
Degradation rates of pyrene were greatly improved in the rhizosphere of fescue and switchgrass, compared with unplanted control.

Chernova, T. G. et al. **The composition and the source of hydrocarbons in sediments taken from the techtonically active Andaman Backarc Basin, Indian Ocean.** *Marine Chemistry*. 2001; 75 (1-2):1-16. ISSN: 0304-4203.
Analysis of sediments in the Andaman Basin led researchers to conclude that recent tectonic activity caused the release of hydrocarbons in the area.

Cheung, Pui-Yi; Kinkle, Brian K. ***Mycobacterium* diversity and pyrene mineralization in petroleum-contaminated soils.** *Applied & Environmental Microbiology*. 2001; 67 (5):2222-2229. ISSN: 0099-2240.
Genetic diversity and population dynamics of a bacterial community were investigated by RNA analysis. Heavily contaminated soils were found to have less diversity, and the introduction of biodegrading bacteria created competition with the indigenous microorganisms.

Choi, Ok Kyoung; Cho, Kyung Suk; Ryu, Hee Wook; Chang, Yong Keun. **Enhancement of phase separation by the addition of de-emulsifiers to three-phase (diesel oil/biocatalyst/aqueous phase) emulsion in diesel biodesulfurization.** *Biotechnology Letters*. 2003; 25 (1):73-77. ISSN: 0141-5492.
Ethanol was successfully used to separate a three-phase emulsion consisting of oil, bacterial cells, and an aqueous phase and recover oil via centrifugation.

Christensen, Jan H.; Hansen, Asger B.; Andersen, Ole; Mortensen, John. **Development and application of a hyphenated analytical and chemometric method in petroleum characterization, identification and degradation.** *In* Rodriguez, G. R.; Brebbia, C. A. (Eds.) *Oil and Hydrocarbon Spills, Modelling, Analysis and Control II*. Billerica, Ma.: Computational Mechanics Inc.; 2000; p. 189-198. ISBN: 1-85312-828-7.
This paper reports on the success of using a combined analytical, computerized, and statistical methods for identification, characterization and degradation studies of complex petroleum samples.

Christensen, Jan H.; Hansen, Asger B.; Tomasi, Giorgio; Mortensen, John; Andersen, Ole. **Integrated methodology for forensic oil spill identification.** *Environmental Science & Technology*. 2004; 38 (10):2912-2918. ISSN: 0013-936X.
A methodology intergrating GC-MS, data and statistical analyses was successfully used to identify two sources of spilled oil, and distinguish the identified source from closely related source oils.

Chunk, W. K.; King, G. M. **Isolation, characterization, and polyaromatic hydrocarbon degradation potential of aerobic bacteria from marine microfaunal burrow sediments and description of *Lutibacterium anuloederans* gen. nov., sp. nov., and *Cycloclasticus spirillensus* sp. nov.** *Applied & Environmental Microbiology*. 2001; 67 (12):5585-5592. ISSN: 0099-2240.
In identifying several types of aerobic bacteria found in burrow sediments, researchers discovered two new species. These strains were then tested in biodegradation experiments by using sediment slurries contaminated with phenanthrene.

Cigolini, John F. **Molecular Analysis of Polycyclic Aromatic Hydrocarbon Degradation by *Mycobacterium* sp. Strain PYO1.** Thesis (Ph. D.): Rutgers University; 2000; 187 leaves.

Clark, Jordan F.; Leifer, Ira; Washburn, Libe; Luyendyk, Bruce P. **Compositional changes in natural gas bubble plumes: observations from the Coal Oil Point marine hydrocarbon seep field.** *Geo - Marine Letters*. 2003; 23 (3-4):187-193. ISSN: 0276-0460.
Gas bubbles from hydrocarbon seeps were studied as they ascended through the water column. As bubbles rose, a rapid exchange of gasses occurred with methane, carbon dioxide and heavier hydrocarbons being emitted or left behind, while nitrogen and oxygen were introduced.

Clausen, Kim. **Enzymatic oil-degumming by a novel microbial phospholipase.** *European Journal of Lipid Science and Technology*. 2001; 103 (6):333-340. ISSN: 1438-7697.

Clement, Ray E.; Yang, Paul W.; Koester, Carolyn J. **Environmental analysis.** *Analytical Chemistry*. 2001; 73 (12):2761-2790. ISSN: 0003-2700.
Developments in applied environmental chemistry between November 1998 and October 200 are reviewed in this article.

Clemente, A. R.; Anazawa, T. A.; Durrant, L. R. **Biodegradation of polycyclic aromatic hydrocarbons by soil fungi.** *Brazilian Journal of Microbiology*. 2001; 32 (4):255-261. ISSN: 1517-8382.

Clemente, Joyce S.; MacKinnon, Michael D.; Fedorak, Phillip M. **Aerobic biodegradation of two commercial naphthenic acids preparations.** *Environmental Science & Technology*. 2004; 38 (4):1009-1016. ISSN: 0013-936X.
Aerobic cultures were isolated from produced waters used in oil sands operations and exposed to naphthenic acids in aqueous solution. Naphthenic acid concentrations dropped considerably after exposure to microbes, and researchers noted reduced acute toxicity as a result.

Clemente, Joyce S.; Yen, T. W.; Fedorak, Phillip M. **Development of a high performance liquid chromatography method to monitor the biodegradation of naphthenic acids.** *Journal of Environmental Engineering and Science*. 2003; 2 (3):177-186. ISSN: 1496-2551.
Researchers used high performance liquid chromatography to monitor the depletion of naphthenic acids by aerobic microbial cultures. Cultures were found to remove 40% of naphthenic acids over a period ranging from 30 to 40 days.

Cloutier, Danielle; Amos, Carl L.; Hill, Philip R.; Lee, Kenneth. **Oil erosion in an annular flume by seawater of varying turbidities: a critical bed shear stress approach.** *Spill Science & Technology Bulletin*. 2002; 8 (1):83-93. ISSN: 1353-2561.
Artificially weathered Hibemia crude oil was placed into an annular flume treated with natural seawater that was pre-filtered to establish how varying turbidities of sea water affect oil erosion.

Coates, John D. et al. **Anaerobic benzene oxidation coupled to nitrate reduction in pure culture by two strains of *Dechloromonas*.** *Nature*. 2001; 411 (6841):1039-1043. ISSN: 0028-0836.
Two strains of *Dechloromonas*, JJ and RCB, were isolated from different environments on the basis of different metabolic capabilities. Both strains were able to reduce benzene to carbon dioxide in the absence of oxygen.

Cohen, Michael F.; Williams, Jolene; Yamasaki, Hideo. **Biodegradation of diesel fuel by an *Azolla*-derived bacterial consortium.** *Journal of Environmental Science and Health Part A - Toxic/Hazardous Substances & Environmental Engineering*. 2002; 37 (9):1593-1606. ISSN: 1093-4529.

Copper, Christine L. **Analysis of intermediates from polycyclic aromatic hydrocarbon biodegradation.** *Journal of Separation Science*. 2003; 26 (18):1683-1687. ISSN: 1615-9314.
In this study, capillary electrophoresis was used to identify intermediate compound types and concentrations occurring during biodegradation of PAHs.

Corgié, S. C.; Beguiristain, T.; Leyval, Corinne. **Spatial distribution of bacterial communities and phenanthrene degradation in the rhizosphere of *Lolium perenne* L.** *Applied and Environmental Microbiology*. 2004; 70 (6):3552-3557. ISSN: 0099-2240.
Researchers monitor the spatial modification of behavior in phenanthrene-degrading bacteria in contaminated soil.

Corgié, S. C.; Joner, Erik. J.; Leyval, Corinne. **Rhizospheric degradation of phenanthrene is a function of proximity to roots.** *Plant and Soil*. 2003; 257 (1):143-150. ISSN: 0032-079X.
Researchers found a correlation between the distances of ryegrass roots from phenanthrene layers and biodegradation rates by microbial populations associated with those root systems.

Cortazar, E. et al. **MultiSimplex optimisation of the solid-phase microextraction-gas chromatographic-mass spectrometric determination of polycyclic aromatic hydrocarbons, polychlorinated biphenyls and phthalates from water samples.** *Journal of Chromatography A*. 2002; 978 (1-2):165-175. ISSN: 0021-9673.
The MultiSimplex program was used to evaluate the accuracy of environmental sampling with solid phase microextraction coupled to GC-MS. The program was able to determine pollutants from samples while simultaneously studying different variables and responses.

Cubitto, M. A.; Cabezali, C. B. **Tipificación y evaluación de la actividad degradadora de hidrocarburos de una cepa bacteriana aislada del estuario de Bahía Blanca, Argentina.** *Revista Argentina de Microbiología*. 2001; 33 (3):141-148. ISSN: 0325-7541.
Authors characterize and evaluate hydrocarburolytic activity of a strain of marine bacteria. A study of biodegradation activity shows that *n*-alkanes were reduced by 86%, while pristane and phitane decreased by 63%.

Cuypers, Chiel; Clemens, R.; Grotenhuis, Tim; Rulkens, Wim. **Prediction of petroleum hydrocarbon bioavailability in contaminated soils and sediments.** *Soil & Sediment Contamination*. 2001; 10 (5):459-482. ISSN: 1522-6514.

Cuypers, Chiel; Pancras, Tessa; Grotenhuis, Tim; Rulkens, Wim. **The estimation of PAH bioavailability in contaminated sediments using hydroxypropyl-beta-cyclodextrin and Triton X-100 extraction techniques.** *Chemosphere*. 2002; 46 (8):1235-1245. ISSN: 0045-6535.
Three extraction techniques were compared for determining the most reliable method of predicting PAH bioavailability. Results of hydroxypropyl-beta-cyclodextrin extraction indicated that it might be a good method for predicting bioavialability, but Tritin X-100 extraction was unfit, due to its role in the degradation of PAHs.

da Silva, Manuela; Cerniglia, Carl E.; Pothuluri, Jairaj V.; Canhos, Vanderlei P.; Esposito, Elisa. **Screening filamentous fungi isolated from estuarine sediments for the ability to oxidize polycyclic aromatic hydrocarbons.** *World Journal of Microbiology & Biotechnology*. 2003; 19 (4):399-405. ISSN: 0959-3993.
Isolates from 19 species of fungi were used to assess their ability to degrade pyrene. *Cyclothyrium* sp. was the most efficient fungus, and authors identified compounds that resulted from the degradation process.

Daane, L. L.; Harjono, I.; Zylstra, G. J.; Haggblom, M. M. **Isolation and characterization of polycyclic aromatic hydrocarbon-degrading bacteria associated with the rhizosphere of salt marsh plants.** *Applied & Environmental Microbiology*. 2001; 67 (6):2683-2691. ISSN: 0099-2240.
Results of this study indicate that the rhizosphere of salt marsh plants contains a diverse population of PAH-degrading bacteria, and the use of plant-associated microorganisms has the potential for bioremediation of contaminated sediments.

Dabrowska, H.; Dabrowska, L.; Biziuk, M.; Namiesnik, J. **Solid-phase extraction clean-up of soil and sediment extracts for the determination of various types of pollutants in a single run.** *Journal of Chromatography A*. 2003; 1003 (1-2):29-42. ISSN: 0021-9673.
Researchers created profiles of analytes and interfering components of sorbents to help determine the best materials for assisting the solid-phase extraction cleanup of polluted soil.

Dafter, Ray. **Plenty of life left in the North Sea.** *Oil & Gas Journal*. 2003; 101 (8):51-53. ISSN: 0030-1388.
A recent geological study in areas off the coasts of the United Kingdom, Norway, and Denmark suggests that ample reserves remain in these areas of the North Sea.

Dahlen, Elizabeth P.; Rittmann, Bruce E. **Two-tank suspended growth process for accelerating the detoxification kinetics of hydrocarbons requiring initial monooxygenation reactions.** *Biodegradation*. 2002; 13 (2):101-116. ISSN: 0923-9820.
Authors present the results of an experimental evaluation of the effectiveness of a two-tank system designed to speed the biodegradation process of phenol and 2,4-dichlorophenol aromatic hydrocarbons.

Daling, Per S.; Faksness, Liv-Guri; Hansen, Asger B.; Stout, Scott A. **Improved and standardized methodology for oil spill fingerprinting.** *Environmental Forensics*. 2002; 3 (3-4):263-278. ISSN: 1527-5922.
This article describes a methodological approach that the authors believe should be incorporated in the revision of the Nordtest Methodology for Oil Spill Identification.

Daniels, R. E. et al. **Natural degradation of hydrocarbons in sandy soils and its potential application to disposal of oil-contaminated materials.** *In* Garcia-Martinez, R.; Brebbia, C. A. (Eds.). *Oil and Hydrocarbon Spills, Modelling, Analysis and Control*. Billerica, Ma.: Computational Mathematics, Inc.; 1998; p. 187-198. ISBN: 1-85312-526-1.
A series of experiments, conducted under varying conditions, were undertaken to judge the cost-effectiveness of bioremediation of weathered oil.

Daniels, R.; Davies, J.; Gravell, A.; Rowland, P. **Movement of petroleum hydrocarbons in sandy coastal soils.** *Journal of Environmental Monitoring*. 2000; 2 (6):645-650. ISSN: 1464-0325.
Oiled beach sand was buried in a coastal dune system to monitor and assess the rate of leaching of inorganic ions and hydrocarbons from the deposit.

Daugulis, Andrew J.; Janikowski, Tine B. **Scale-up performance of a partitioning bioreactor for the degradation of polyaromatic hydrocarbons by *Sphingomonas aromaticivorans*.** *Biotechnology Letters*. 2002; 24 (8):591-594. ISSN: 0141-5492.
Authors observe the success of using a two-phase partitioning bioreactor (TPPB) system to degrade naphthalene and phenanthrene. High degradation rates were observed in a short amount of time, possibly enhanced by the presence of dodecane as a solvent.

Davidova, I.; Hicks, M. S.; Fedorak, P. M.; Suflita, J. M. **The influence of nitrate on microbial processes in oil industry production waters.** *Journal of Industrial Microbiology & Biotechnology*. 2001; 27 (2):80-86. ISSN: 1367-5435.

Davidson, C. T.; Daugulis, A. J. **The treatment of gaseous benzene by two-phase partitioning bioreactors: a high performance alternative to the use of biofilters.** *Applied Microbiology and Biotechnology*. 2003; 62 (2-3):297-301. ISSN: 0175-7598.
In a two-phase partitioning bioreactor, benzene was trapped by *n*-hexadecane acting as an organic solvent, then biodegraded in an aqueous phase by the bacterium *Alcaligenes xylosoxidans* Y234.

De Santis, F.; Fino, A.; Menichelli, S.; Vazzana, C.; Allegrini, I. **Monitoring the air quality around an oil refinery through the use of diffusive sampling.** *Analytical and Bioanalytical Chemistry*. 2004; 378 (3):782-788. ISSN: 1618-2642.
Diffusive sampling for a number of airborne contaminants near an oil refinery found measured concentrations of compounds much lower than limits imposed by European Directives. The authors believe that this method of sampling can be used for long-term monitoring and can help to identify pollution "hotspots".

Dean, J. R.; Xiong, G. H. **Extraction of organic pollutants from environmental matrices: selection of extraction technique.** *TRAC - Trends in Analytical Chemistry*. 2000; 19 (9):553-564. ISSN: 0165-9936.
Authors review a variety of extraction techniques for removal of pollutants from soil, including supercritical fluid extraction, microwave-assisted extraction, and pressurized fluid extraction.

Dean, Stacy M.; Jin, Yan; Cha, Daniel K.; Wilson, Sviatlana V.; Radosevich, Mark. **Phenanthrene degradation in soils co-inoculated with phenanthrene-degrading and biosurfactant-producing bacteria.** *Journal of Environmental Quality*. 2001; 30 (4):1126-1133. ISSN: 0047-2425.
Researchers tested the bioavailability of phenanthrene with two strains of *Pseudomonas* bacteria in the presence of two different biosurfactant sources. The bacterial strains exhibited different degradation capacities of the phenanthrene in soil and aqueous experiments.

Dean-Ross, Deborah; Moody, Joanna; Cerniglia, C. E. **Utilization of mixtures of polycyclic aromatic hydrocarbons by bacteria isolated from contaminated sediment.** *FEMS Microbiology Ecology*. 2002; 41 (1):1-7. ISSN: 0168-6496.
The interactive effects of different compounds in a mixture of PAHs were noted during experiments monitoring biodegradation by the bacterial strains *Mycobacterium flavescens* and *Rhosococcus* sp. Interactive effects need to be considered while estimating degradation rates of a specific hydrocarbon in the presence of other PAHs.

DeFoe, David L.; Ankley, Gerald T. **Evaluation of time-to-effects as a basis for quantifying the toxicity of contaminated sediments.** *Chemosphere*. 2003; 51 (1):1-5. ISSN: 0045-6535.
Investigators were able to establish the expression of toxicity between three contaminated samples exposed to *Hyalella azteca* and *Chironomus tentans*. It is believed that time-to-effects studies can be used to quantify relative toxicity of pollutants.

Del Vento, Sabino; Dachs, Jordi. **Prediction of uptake dynamics of persistent organic pollutants by bacteria and phytoplankton.** *Environmental Toxicology and Chemistry*. 2002; 21 (10):2099-2107. ISSN: 0730-7268.
A model is described which is used for estimating the uptake, depuration, adsorption, and desorption rate constants by bacteria and phytoplankton for a range or organic pollutants, including a variety of PAHs.

Del'Arco, J. P.; de França, F. P. **Influence of oil contamination levels on hydrocarbon biodegradation in sandy sediment.** *Environmental Pollution*. 2001; 112 (3):515-519. ISSN: 0269-7491.
Experiments were undertaken to evaluate the influence of concentrations of oil on the degrading ability of bacteria. A single inoculation of light Arabian crude was applied to sandy sediment, and the sediment was analyzed after 28 days. Authors concluded that biodegradation was inversely proportional to increasing oil contamination.

DeLaune, R.D.; Lindau, C. W.; Gambrell, R. P.; (Eds.) **Effect of Produced-Water Discharge on Bottom Sediment Chemistry.** New Orleans, La.: U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region; 1999; OCS Study MMS 99-0060; 47 pp.
The degradation of petroleum hydrocarbons, among other pollutants from produced water discharges, was investigated in soil samples. Higher molecular weight compounds were the primary hydrocarbons found in the sediment. Authors note that nutrient amendments in contaminated sediments greatly increased the breakdown of hydrocarbons.

Delille, D.; Delille, B.; Pelletier, E. **Effectiveness of bioremediation of crude oil contaminated subantarctic intertidal sediment: the microbial response.** *Microbial Ecology*. 2002; 44 (2):118-126. ISSN: 0095-3628.
Researchers note the presence of a microbial population in Antarctic sediments with a high potential for rapid biodegradation of hydrocarbons. Results of their investigation indicate that the bacteria targeted and degraded the less toxic material, leaving a large part of the toxic fraction undisturbed.

Delille, D.; Pelletier, E. **Natural attenuation of diesel-oil contamination in a subantarctic soil (Crozet Island).** *Polar Biology*. 2002; 25 (9):682-687. ISSN: 0722-4060.
An investigation of diesel fuel-contaminated soil on Crozet Island found a tenfold increase in the number of bacteria, despite severe environmental conditions and nutrient limitations.

Dhouib, A.; Hamad, N.; Hassairi, I.; Sayadi, S. **Degradation of anionic surfactants by *Citrobacter braakii*.** *Process Biochemistry*. 2003; 38 (8):1245-1250. ISSN: 0032-9592.

Dias, A. C. P.; Fernandes, P.; Cabral, J. M. S.; Pinheiro, H. M. **Isolation of a biodegradable sterol-rich fraction from industrial wastes.** *Bioresource Technology*. 2002; 82 (3):253-260. ISSN: 0960-8524.

Díaz, María P.; Boyd, K. G.; Grigson, Steve J. W.; Burgess, J. Grant. **Biodegradation of crude oil across a wide range of salinities by an extremely halotolerant bacterial consortium MPD-M, immobilized onto polypropylene fibers.** *Biotechnology and Bioengineering*. 2002; 79 (2):145-153. ISSN: 0006-3592.

Díaz, María P.; Grigson, Steve J. W.; Peppiatt, Chris J.; Burgess, J. Grant. **Isolation and characterization of novel hydrocarbon-degrading euryhaline consortia from crude oil and mangrove sediments.** *Marine Biotechnology*. 2000; 2 (6):552-532. ISSN: 1436-2228.
Bacterial consortia derived from two sources, the Cormorant Field in the North Sea, and sediment associated with mangrove roots, were tested for remediation of hydrocarbons in different salinities.

Díaz-del-Río, V. et al. **Vast fields of hydrocarbon-derived carbonate chimneys related to the accretionary wedge/olistostrome of the Gulf of Cádiz.** *Marine Geology*. 2003; 195 (1-4):177-200. ISSN: 0025-3227.
Authors report finding vast fields of carbonate chimneys, possibly formed from thermogenic hydrocarbons and biogenic methane, at depths between 500 and 1200 meters along the continental slope in the Gulf of Cádiz.

Díaz-Ramírez, I. J.; Ramírez-Saad, H.; Gutiérrez-Rojas, M.; Favela-Torres, E. **Biodegradation of Maya crude oil fractions by bacterial strains and a defined mixed culture isolated from *Cyperus laxus* rhizosphere soil in a contaminated site.** *Canadian Journal of Microbiology*. 2003; 49 (12):755-761. ISSN: 0008-4166.
Ten bacterial strains were monitored for biodegradation abilities on aliphatics and an aromatic-polar mixture of hydrocarbons, with oxygen uptake used to determine culture transfer timing at each enrichment stage. Results of hydrocarbon degradation for individual and mixed cultures are presented.

Dimov, N.; Pavlova, A. **Traceability from weathered oil spills in the marine environment to the original contamination source. A case study.** *Journal of Environmental Monitoring*. 2000; 2 (3):266-270. ISSN: 1464-0325.
An algorithm is proposed to trace weathered oil spills to the source of contamination. A series of steps, from simple to complex, seek to trace the source of contamination by trying to identify differences between the weathered sample and the suspected source.

Discoveries, offshore oil attract firms to northern Perth basin. *Oil & Gas Journal*. 2003; 101 (6):36-37. ISSN: 0030-1388.
Approximately 80-100 million bbl of oil are thought to reside in the northern Perth basin located off Cliff Head, in Western Australia. At present, eight of 21 hydrocarbon reservoirs in the Perth basin are considered commercial, and Australian independents are planning to conduct several more exploratory and well appraisals in this region.

Dobson, Richard; Schroth, Martin H.; Schuermann, Andreas; Zeyer, Josef. **Methods to assess the amenability of petroleum hydrocarbons to bioremediation.** *Environmental Toxicology and Chemistry*. 2004; 23 (4):929-937. ISSN: 0730-7268.
A combination of techniques was used to monitor the performance of bioremediation of PAHs and to evaluate bioavailability based on a method of partitioning of tracer compounds and analysis of gas chromatography-flame ionization detector chromatograms.

Dolson, John C. et al. **Petroleum potential of an emerging giant gas province, Nile Delta and Mediterranean Sea off Egypt.** *Oil & Gas Journal*. 2002; 100 (20):32-37. ISSN: 0030-1388.
Comprehensive geological and geophysical data indicates that shallow hydrocarbon seeps above deeper and larger accumulations of Pliocene age reservoirs can be easily detected and retrieved. These untapped resources, along the northern coastline of Egypt, might be the first indications of a larger reservoir below the Pliocene in the Nile Delta region.

Doong, R. A.; Chang, S. M.; Sun, Y. C. **Solid-phase microextraction and headspace solid-phase microextraction for the determination of high molecular-weight polycyclic aromatic hydrocarbons in water and soil samples.** *Journal of Chromatographic Science*. 2000; 38 (12):528-534. ISSN: 0021-9665.

Dowty, R. A. et al. **Phytoremediation of small-scale oil spills in fresh marsh environments: a mesocosm simulation.** *Marine Environmental Research*. 2001; 52 (3):195-211. ISSN: 0141-1136.
A mesocosm facility was established to asses the impact of oiling on fresh-marsh plant communities and to test the efficacy of techniques that may be used to enhance the bioremediation of crude oil spills in these environments while minimizing secondary anthropogenic impacts.

Dries, J.; Smets, D. B. **Transformation and mineralization of benzo[a]pyrene by microbial cultures enriched on mixtures of three- and four-ring polycyclic aromatic hydrocarbons.** *Journal of Industrial Microbiology & Biotechnology*. 2002; 28 (2):70-73. ISSN: 1367-5435.
Bacterial cultures originating from contaminated soils were able to mineralize three- and four-ring PAH mixtures in the presence of B(a)P in laboratory experiments.

Drozdowska, Violetta; Babichenko, Sergey; Lisin, Aleksey. **Natural water fluorescence characteristics based on lidar investigations of a surface water layer polluted by an oil film; the Baltic cruise - May 2000.** *Oceanologia*. 2002; 44 (3):339-354. ISSN: 0078-3234.
Researchers investigated the effect of oil in the surface layer of seawater to detect its influence on the natural fluorescing components and fluorescent characteristics normally found in seawater. Oil on the water surface was found to distort the lidar signal entering the water and the return signal as well, prompting the need for further investigations to redress this problem.

Duke, Norman C. et al. **Dispersant use and a bioremediation strategy as alternate means of reducing impacts of large oil spills on mangroves: the Gladstone field trials.** *Marine Pollution Bulletin*. 2000; 41 (7-12):403-412. ISSN: 0025-326X.
Use of dispersants led to less mangrove mortality in comparison with a non-treated spill. Bioremediation didn't seem to help save more trees than in non-treated sites, but authors noted that leaf densities in trees that survived were higher in areas treated with bioremediation, one year after the oiling.

Duncan, Kathleen; Jennings, Eleanor; Buck, Paul; Wells, Harrington. **Multi-species ecotoxicity assessment of petroleum-contaminated soil.** *Soil & Sediment Contamination*. 2003; 12 (2):181-206. ISSN: 1532-0383.
Three lysimeters used in a 1992 study were investigated three and five years after initial soil restoration experiments to identify hydrocarbon-degrading communities, rates of bioremediation, types and numbers of nematodes, and plant diversity associated with either use of fertilizer or no amendment added to contaminated soils.

Dutta, T. K.; Harayama, S. **Analysis of long side chain alkylaromatics in crude oil for evaluation of their fate in the environment.** *Environmental Science & Technology*. 2001; 35 (1):102-107. ISSN: 0013-936X.
GC-MS was used to analyze the effectiveness of degradation of *n*-alkylbenzenes by UV and bacteria. Authors found that *n*-alkylbenzenes were susceptible to biodegradation but not to photooxidation, and that *n*-alkylbenzothiophenes were effectively photooxidized and biodegraded.

Dutta, T. K.; Harayama, S. **Biodegradation of *n*-alkylcycloalkanes and *n*-alkylbenzenes via new pathways in *Alcanivorax* sp strain MBIC 4326.** *Applied & Environmental Microbiology*. 2001; 67 (4):1970-1974. ISSN: 0099-2240.

Dutta, T. K.; Harayama, S. **Time-of-flight mass spectrometric analysis of high-molecular-weight alkanes in crude oil by silver nitrate chemical ionization after laser desorption.** *Analytical Chemistry*. 2001; 73 (5):864-869. ISSN: 0003-2700.

Dyman, Thaddeus S.; Schmoker, James W.; Schenk, Christopher J. **Relative uncertainty of conventional natural gas plays in the Gulf Coast region.** *In* Dyman, Thaddeus S.; Kuuskraa, Vello A. (Eds.) *Geologic Studies of Deep Natural Gas Resources (CD-ROM)*. Reston, Va.: U.S. Geological Survey; 2001; USGS Digital Data Series DDS-67; 6 pp.

Ebihara, T.; Bishop, P. L. **Effect of acetate on biofilms utilized in PAH bioremediation.** *Environmental Engineering Science*. 2002; 19 (5):305-319. ISSN: 1092-8758.
Acetate acted as a supplemental growth substrate by increasing viable biomass content, which aided the biodegradation process in a porous media.

Eckford, R. E.; Fedorak, P. M. **Chemical and microbiological changes in laboratory incubations of nitrate amendment "sour" produced waters from three western Canadian oil fields.** *Journal of Industrial Microbiology & Biotechnology*. 2002; 29 (5):243-254. ISSN: 1367-5435.
Researchers investigated which types of nitrate-reducing bacteria (NRB) thrived when exposed to nitrate-amended "sour" waters from three oil fields. Results suggest that in order to accelerate sulfide removal, an active heterotrophic NRB population must overtake sulfate-reducing bacteria and suspend anaerobic sulfur cycling.

Eckford, R. E.; Fedorak, P. M. **Planktonic nitrate-reducing bacteria and sulfate-reducing bacteria in some western Canadian oil field waters.** *Journal of Industrial Microbiology & Biotechnology*. 2002; 29 (2):83-92. ISSN: 1367-5435.
A one-year study found that bioturbation processes have a significant influence on the fate of acyclic hydrocarbons following petroleum contamination. Sizeable losses of hydrocarbons were contributed to macrobenthic organisms, which aided in the degradation process.

Eckford, Ruth; Cook, Fred D.; Saul, David; Aislabie, Jackie; Foght, Julia. **Free-living heterotrophic nitrogen-fixing bacteria isolated from fuel-contaminated Antarctic soils.** *Applied & Environmental Microbiology*. 2002; 68 (10):5181-5185. ISSN: 0099-2240.
Bacteria found in contaminated soil from Antarctica were isolated and then investigated for evidence of diazotrophy, the effects of temperature on growth rate, and their ability to utilize carbon.

Ehrenberg, S. N.; Jakobsen, K. G. **Plagioclase dissolution related to biodegradation of oil in Brent Group sandstones (Middle Jurassic) of Gullfaks Field, northern North Sea.** *Sedimentology*. 2001; 48 (4):703-721. ISSN: 0037-0746.
Researchers describe a set of mineralogical data from cores in the Gullfaks Field, where absence of plagioclase corresponds spatially to an area of biodegrated oil composition, suggesting mesogenetic timing of dissolution. However, not all observations are accounted for by this model. Researchers hope that results obtained from this work will guide other studies to recognize inorganic diagenetic effects of petroleum biodegradation.

Eichlerová, Ivana et al. **Screening of *Pleurotus ostreatus* isolates for their ligninolytic properties during cultivation on natural substrates.** *Biodegradation*. 2000; 11 (5):279-287. ISSN: 0923-9820.
Results from this study show that screening methods based on the behavior of strains tested under natural conditions are an essential step in the selection of relevant isolates prior to their introduction to contaminated sites.

Eiroa, A. Andrade; Blanco, E. Vázquez; Mahía, P. López; Lorenzo, S. Muniategui; Rodríguez, D. Prada. **Resolution of benzo[a]pyrene in complex mixtures of other polycyclic aromatic hydrocarbons. Comparison of two spectrofluorimetric methods applied to water samples.** *Analyst*. 2000; 125 (7):1321-1326. ISSN: 0003-2654.
Constant-wavelength synchronous luminescence (CWSL), in combination with multiple linear regression, and second-derivative constant-energy synchronous luminescence (SDCESL), were used in experiments to determine the quantity of B[a]P in mixtures containing other forms of PAH.

Ejechi, Bernard Onyekweli. **Biodegradation of wood in crude oil-polluted soil.** *World Journal of Microbiology & Biotechnology*. 2003; 19 (8):799-804. ISSN: 0959-3993.
The addition of crude oil initially hindered the biodegradation of obeche wood blocks buried in soil. However, the degradation of crude oil helped remove residual sugars, increasing the breakdown of wood at the cellular structure by decomposing fungi.

El Afifi, E. M.; Khalifa, S. M.; Aly, H. F. **Assessment of the ^{226}Ra content and the ^{222}Rn emanation fraction of TE-NORM wastes at certain sites of petroleum and gas production in Egypt.** *Journal of Radioanalytical and Nuclear Chemistry*. 2004; 260 (1):221-224. ISSN: 0236-5731.
Analysis with y-ray spectrometry show that the emanation fraction of the Rn isotope differs in oil and gas sites than from other release sources.

El-Din, N. M. N.; Adbel-Moati, M. A. R. **Accumulation of trace metals, petroleum hydrocarbons, and polycyclic aromatic hydrocarbons in marine copepods from the Arabian Gulf.** *Bulletin of Environmental Contamination and Toxicology*. 2001; 66 (1):110-117. ISSN: 0007-4861.
Zooplankton samples collected during the winter and summer of 1998 were analyzed to assess the impact of growing industrialization in this region of the Arabian Gulf on the marine environment.

El-Kadi, Aly I. **Modeling hydrocarbon biodegradation in tidal aquifers with water-saturation and heat inhibition effects.** *Journal of Contaminant Hydrology*. 2001; 51 (1-2):97-125. ISSN: 0169-7722.
This paper describes a model incorporates saturated and unsaturated flow, multi-species transport, heat transport, and bacterial growth to predict hydrocarbon degradation.

El-Tayeb, S. M.; Abed, K. F. **The effects of certain nutritional additives on the activity of *Sporosarcina ureae* in biodegrading oil in the Arabian Gulf water.** *Arab Gulf Journal of Scientific Research*. 1999; 17 (2):303-312. ISSN: 1015-4442.

Enell, Anja; Reichenberg, Fredrik; Warfvinge, Per; Ewald, Göran. **A column method for determination of leaching of polycyclic aromatic hydrocarbons from aged contaminated soil.** *Chemosphere*. 2004; 54 (6):707-715. ISSN: 0045-6535.
A combination of a sedimentation chamber and an on-line filtration method allows researchers to measure concentrations and extract minute amounts of hydrophobic organic contaminants leaching from aged contaminated soils.

Engelhardt, M. A.; Daly, K.; Swannell, R. P. J.; Head, I. M. **Isolation and characterization of a novel hydrocarbon-degrading, gram-positive bacterium, isolated from intertidal beach sediment, and description of *Planococcus alkanoclasticus* sp. nov.** *Journal of Applied Microbiology*. 2001; 90 (2):237-247. ISSN: 1364-5072.
Bacteria extracted from beach sediment in Somerset, UK, were found to be capable of extensive degradation of linear and branched alkanes in crude oil. Phenotypic and genotypic data led researchers to identify the strain as a new species of bacteria.

Eriksson, Mikael; Ka, J. O.; Mohn, William W. **Effects of low temperature and freeze-thaw cycles on hydrocarbon biodegradation in Arctic tundra soil.** *Applied and Environmental Microbiology*. 2001; 67 (11):5107-5112. ISSN: 0099-2240.
Degradation of hydrocarbons in Arctic soil was monitored at -5, 0 and 7° C, with freeze-thaw cycles simulating day and night temperatures. Hydrocarbons were degraded at or above 0°, and it was suggested that the freeze-thaw cycles may have stimulated the process.

Eriksson, Mikael; Sodersten, Erik; Yu, Zhongtang; Dalhammar, Gunnel; Mohn, William W. **Degradation of polycyclic aromatic hydrocarbons at low temperature under aerobic and nitrate-reducing conditions in enrichment cultures from northern soils.** *Applied &S Environmental Microbiology*. 2003; 69 (1):275-284. ISSN: 0099-2240.
Results of experiments show that some types of PAHs can be reduced by microbes at low temperatures under anaerobic conditions. Soil enrichment led to predominance of some bacterial species, which were then identified.

Ese, Marit-Helen; Kilpatrick, Peter K. **Stabilization of water-in-oil emulsions by naphthenic acids and their salts: model compounds, role of pH, and soap: acid ratio.** *Journal of Dispersion Science and Technology*. 2004; 25 (3):253-261. ISSN: 0193-2691.
Authors investigate the use of soaps to counteract acids in the creation of colloidal structures during petroleum production.

Exploration, appraisal drilling to expand offshore Ireland. *Offshore*. 2003; 63 (4):46,148. ISSN: 0030-0608.
Seep detection surveys and geochemical analyses of shallow core samples revealed the presence of gas chimneys in exploration appraisals of the Rockall and Erris basins.

Fähnrich, Karsten A.; Pravda, Miloslav; Guilbault, George G. **Immunochemical detection of polycyclic aromatic hydrocarbons (PAHs).** *Analytical Letters*. 2002; 35 (8):1269-1300. ISSN: 0003-2719.
This paper reviews types of immunochemical methods currently used for the detection of PAHs, and identifies further research possibilities, as well as limitations of the technologies, in comparison with other popular detection methodologies.

Faksness, Liv-Guri; Daling, Per S.; Hansen, Asger B. **Round Robin study - oil spill identification.** *Environmental Forensics*. 2002; 3 (3-4):279-291. ISSN: 1527-5922.
In order to test a methodology which the authors believe should be considered as part of new guidelines for oil spill identification, seven oil samples from the North Sea were studied to determine their origin.

Faksness, Liv-Guri; Grini, P. G.; Daling, Per S. **Partitioning of semi-soluble organic compounds between the water phase and oil droplets in produced water.** *Marine Pollution Bulletin*. 2004; 48 (7-8):731-742. ISSN: 0025-326X.
Settling experiments show a correlation between dispersed oil concentrations and water phase in produced water and concentrations of semi-soluble aromatics and alkylated phenols. There is a high variability in the distribution of dispersed oil and water phase for different component groups of PAHs.

Fall, Cheikh; Chaouki, Jamal; Chavarie, Claude; Elena-Ortega, Rosa. **Multivariate study on phenanthrene sorption in soils.** *Journal of Environmental Engineering - ASCE*. 2003; 129 (11):1030-1040. ISSN: 0733-9372.
A modeling approach was developed and tested to re-assess the impact that soil characteristics and liquid phase composition have on the adsorption of phenanthrene in complex soil-water structures. This study confirmed that the organic carbon content of soil was the main factor controlling adsorption, and detected two interactions and two main effects associated with the addition of amendments.

Fang, Jiasong; Lovanh, Nanh; Alvarez, Pedro J. J. **The use of isotopic and lipid toluene degradation to specific analysis techniques linking microorganisms: applications and limitations.** *Water Research*. 2004; 38 (10):2529-2536. ISSN: 0043-1354.
Using five microbial strains, researchers found evidence that caution should be used when looking for links between lipid data and changes in bacteria populations in biodegradation studies using ^{13}C-labeled tracers.

Fang, Meng-Der; Lee, Chon-Lin; Yu, Chia-Shun. **Distribution and source recognition of polycyclic aromatic hydrocarbons in the sediments of Hsin-Ta Harbour and adjacent coastal areas, Taiwan.** *Marine Pollution Bulletin*. 2003; 46 (8):941-953. ISSN: 0025-326X.
Contaminated sediment samples were collected from Hsin-Ta Harbour and adjacent coastal area and analyzed to characterize PAHs into groups for the purpose of fingerprinting to differentiate source recognition of the pollutants.

Farajzadeh, M. A.; Matin, A. A. **Semi-micro solvent extraction as a rapid and efficient preconcentration technique for the determination of *n*-alkanes in oil-contaiminated water and soil samples by capillary gas chromatography.** *Chromatographia*. 2002; 55 (3-4):225-229. ISSN: 0009-5893.
Authors explain a process used to study the optimization of liquid-liquid semi-micro extraction in the analysis of higher aliphatic hydrocarbons.

Fasnacht, Matthew P.; Blough, Neil V. **Aqueous photodegradation of polycyclic aromatic hydrocarbons.** *Environmental Science & Technology*. 2002; 36 (20):4364-4369. ISSN: 0013-936X.
Researchers measured kinetics and quantum yields for the photodegradation of 12 PAHs by exposing low concentrations of the hydrocarbons, in both pure and natural waters, to light in the solar rage.

Fedotov, Petr S.; Bauer, Coretta; Popp, Peter; Wennrich, Rainer. **Dynamic extraction in rotating coiled columns, a new approach to direct recovery of polycyclic aromatic hydrocarbons from soils.** *Journal of Chromatography A*. 2004; 1023 (2):305-309. ISSN: 0021-9673.
The application of rotating coiled columns has previously been applied to the fast continuous-flow extraction of heavy metals from soils. In this paper, the authors report that the same application has been successful in the direct recovery of PAHs from environmental solid samples.

Feely, M.; Parnell, J. **Fluid inclusion studies of well samples from the hydrocarbon prospective Porcupine Basin, offshore Ireland.** *Journal of Geochemical Exploration*. 2003; 78 (SI 9):55-59. ISSN: 0375-6742.
The presence of aqueous and oil-bearing fluids was determined in well samples by the use of UV light microscopy and microthermometry. Results indicate the existence of medium and light oils in the basin.

Feitkenhauer, Heiko; Märkl, Herbert. **Biodegradation of aliphatic and aromatic hydrocarbons at high temperatures.** *Water Science and Technology*. 2003; 47 (10):123-130. ISSN: 0273-1223.
Increasing the temperature of specific PAHs from 20° to 75° C enhanced bioavailability by raising the rates of solubility and oxygen transfer, leading to efficient conversion of PAHs and high growth rates of microbial mixed cultures.

Feitkenhauer, Heiko; Müller, Rudolf; Märkl, Herbert. **Degradation of polycyclic aromatic hydrocarbons and long chain alkanes at 60-70 °C by *Thermus* and *Bacillus* spp.** *Biodegradation*. 2003; 14 (6):367-372. ISSN: 0923-9820.
Biodegradation experiments used thermophilic microorganisms targeting PAH compounds and PAH/alkane mixtures under high temperature conditions with relatively neutral pH values. Results demonstrated conversion of 3-5 ring PAHs. However, an additional degradable liquid phase was necessary for bacteria to efficiently reduce PAHs, according to researchers.

Ferguson, Susan H. et al. **Effects of temperature on mineralisation of petroleum in contaminated Antarctic terrestrial sediments.** *Chemosphere*. 2003; 52 (6):975-987. ISSN: 0045-6535.
Effective rates of mineralization were established in contaminated Antarctic soil at temperatures between 27 and 42°C. The authors believe that a high-temperature treatment of Antarctic soil can be an option for the rapid biodegradation of contaminants.

Fernández-Sánchez, Jorge F.; Carretero, Antonio Segura; Cruces-Blanco, Carmen; Fernández-Gutiérrez, Alberto. **The development of solid-surface fluorescence characterization of polycyclic aromatic hydrocarbons for potential screening tests in environmental samples.** *Talanta*. 2003; 60 (2-3):287-293. ISSN: 0039-9140.
Fluorescence properties of PAHs were investigated on five types of solid-surfaces under experimental variables to determine the characterization of these hydrocarbons and to establish the best conditions for developing sensors for further screening.

Few operators equipped to exploit Gulf's deep shelf gas opportunities. *Oil & Gas Journal*. 2004; 102 (18):32-34. ISSN: 0030-1388.
The potential for deepwater discoveries in the Gulf of Mexico still remains high. However, the opportunities to exploit these reserves are low, because several factors are deterring operators from further deep shelf drilling.

Field, J. A. **Limits of anaerobic biodegradation.** *Water Science and Technology*. 2002; 45 (10):9-18. ISSN: 0273-1223.
The author reviews constraints on the ability of microbes to completely biodegrade hydrocarbons, including intrinsic recalcitrance and limitations on bioavailability.

Filimonova, Z. V.; Pokarzhevskii, A. D. **Enchytraeid *Enchytraeus cypticus* as a test organism for crude oil contaminitation of soil.** *Bulletin of Environmental Contamination and Toxicology*. 2000; 65 (3):407-414. ISSN: 0007-4861.
Sensitive species and parameters of soil biota are used as a biotest to assess crude oil contamination. It is difficult to estimate the direct impact of crude oil contamination on soil biota because of other factors that influence the change in soil biota.

Filonov, Andrei E. et al. **Efficiency of naphthalene biodegradation by *Pseudomonas putida* G7 in soil.** *Journal of Chemical Technology and Biotechnology*. 2004; 79 (6):562-569. ISSN: 0268-2575.
Authors describe a model used to assess the efficiency of naphthalene degradation incorporating growth kinetics accounting for the utilization of soil organic matter by *P. putida* G7.

Finkbeiner, T.; Zoback, M.; Flemings, P.; Stump, B. **Stress, pore pressure, and dynamically constrained hydrocarbon columns in the South Eugene Island 330 field, northern Gulf of Mexico.** *AAPG Bulletin*. 2001; 85 (6):1007-1031. ISSN: 0149-1423.
A "dynamic capacity model" was created by the authors to explain a rapidly formed basin and the migration of petroleum from considerable distances underneath.

Fleeger, John W.; Lotufo, Guilherme R. **Development and Application of a Sublethal Toxicity Test to PAH Using Marine Harpacticoid Copepods**. New Orleans, La.: U.S. Department of the Interior, Minerals Management Service, Resource Evaluation Division; 1999; OCS Study MMS 99-0001; 38 pp.
Nitocra lacustris and *Schizopera knabeni* were exposed to diesel fuel throughout stages in their life cycle to determine toxicity rates of PAHs, and to learn the mechanisms behind contaminant effects.

Flemings, Peter B.; Stump, Beth B.; Finkbeiner, Thomas; Zoback, Mark. **Flow focusing in overpressured sandstones: theory, observations, and applications.** *American Journal of Science*. 2002; 302 (10):827-855. ISSN: 0002-9599.
Authors estimate spatial variation in pressure at two Eugene Island 330 reservoirs in the Gulf of Mexico, based on mudstone pressures arrived at from porosity and sandstone pressure measurements. From this data, hydrocarbon flow and migration rates can be predicted.

Fletcher, Kristin A.; Pandey, Shubha; Storey, Isaiah K.; Hendricks, Ashley E.; Pandey, Siddharth. **Selective fluorescence quenching of polycyclic aromatic hydrocarbons by nitromethane within room temperature ionic liquid 1-butyl-3-methylimidazolium hexafluorophosphate.** *Analytica Chimica Acta*. 2002; 453 (1):89-96. ISSN: 0003-2670.
This paper describes a new method of analyzing PAHs by using 2-butyl-3- methylimidazolium hexafluorophosphate as an ionic liquid.

Flocco, C. G. et al. **Some physiological, microbial, and toxicological aspects of the removal of phenanthrene by hydroponic cultures of alfalfa (*Medicago sativa* L.).** *International Journal of Phytoremediation*. 2002; 4 (3):169-186. ISSN: 1522-6514.
Investigators monitored plant growth, chlorophyll content of leaves, and peroxidase activity in roots to ascertain the effectiveness of alfalfa in the phytoremediation of phenanthrene.

Fortin, Nathalie; Beaumier, Danielle; Lee, Kenneth; Greer, Charles W. **Soil washing improves the recovery of total community DNA from polluted and high organic content sediments.** *Journal of Microbiological Methods*. 2004; 56 (2):181-191. ISSN: 0167-7012.
Soil washing led to desorption of contaminants from sediment surfaces and improved the recovery of DNA in highly polluted marine and hydrocarbon-contaminated freshwater sediments.

Frontera-Suau, Roberto; Bost, F. Daniel; McDonald, Thomas J.; Morris, Pamela J. **Aerobic biodegradation of hopanes and other biomarkers by crude oil-degrading enrichment cultures.** *Environmental Science & Technology*. 2002; 36 (21):4585-4592. ISSN: 0013-936X.
Specifics and patterns of biomarker degradation were determined for mixed microbial cultures from various sites. In addition, an LC culture was tested for biomarker degradation profiles with crude oils from Alaska, Nigeria, and Venezuela.

Frysinger, Glenn S.; Gaines, Richard B. **Separation and identification of petroleum biomarkers by comprehensive two-dimensional gas chromatography.** *Journal of Separation Science*. 2001; 24 (2):87-96. ISSN: 1615-9306.

Frysinger, Glenn S.; Gaines, Richard B.; Xu, Li; Reddy, Christopher M. **Resolving the unresolved complex mixture in petroleum-contaminated sediments.** *Environmental Science & Technology*. 2003; 37 (8):1653-1662. ISSN: 0013-936X.
Researchers used comprehensive two-dimensional gas chromatography to analyze types of hydrocarbons from petroleum-contaminated marine sediment. Further analysis will focus on thousands of chemical components of the sample, which will help understand sources, weathering and toxicity of the hydrocarbons.

Gabriel, J. et al. **Degradation of BTEX and PAHs by Co(II) and Cu(II)-based radical-generating systems.** *Applied Catalysis B - Environmental*. 2004; 51 (3):159-164. ISSN: 0926-3373.
Various combinations of cobalt and copper with hydrogen peroxide and ascorbic acid were used to achieve 95% reduction rates for a number of PAHs within an hour. Further research traced the breakdown of specific PAHs in the formation of other compounds.

Gabryelski, Wojciech; Froese, Kenneth L. **Characterization of naphthenic acids by electrospray ionization high-field asymmetric waveform ion mobility spectrometry mass spectrometry.** *Analytical Chemistry*. 2003; 75 (17):4612-4623. ISSN: 0003-2700.
Authors describe a new and fast method of analyzing commercial and naturally occurring naphthenic acids. One advantage of this technique is the ability to separate structural isomers, an important factor in establishing the composition of the acids.

Gaile, A. A. et al. **Production of environmentally friendly diesel fuel and petroleum aromatic solvents by extraction combined with azeotropic distillation.** *Russian Journal of Applied Chemistry*. 2001; 74 (5):864-869. ISSN: 1070-4272.
Authors propose a method for the production of an environmentally-friendly diesel fuel. The new fuel is created by a five-step countercurrent extraction of aromatic hydrocarbons from the hydrofined diesel fraction with dimethylforamamide and pentane, followed by regeneration of extracts from azeotropic distillation.

Gallego, José L. R.; Loredo, Jorge; Llamas, Juan F.; Vázquez, Fernando; Sánchez, Jesús. **Bioremediation of diesel-contaminated soils: evaluation of potential *in situ* techniques by study of bacterial degradation.** *Biodegradation*. 2001; 12 (5):325-335. ISSN: 0923-9820.
Using a bioreactor design, researchers monitored biodegradation efficiency of bacteria in diesel-contaminated soil. The ongoing use of microbial and chemical analyses allowed for real-time improvements in degradation rates by active biostimulation of the contaminated soil. *Acinetobacter* sp. was identified as the predominant species in the degradation process.

Galushko, A. S.; Kiesele-Lang, U.; Kappler, A. **Degradation of 2-methylnaphthalene by a sulfate-reducing enrichment culture of mesophilic freshwater bacteria.** *Polycyclic Aromatic Compounds*. 2003; 23 (2):207-218. ISSN: 1040-6638.
An enrichment culture of sulfate-reducing bacteria was used to degrade a hydrocarbon compound under oxygen- and sulfate-reducing conditions. Researchers noted the accumulation of specific metabolites during the biodegradation process.

Gambus, G.; Patino, P. **Analysis of the properties of a CH_4/H_2 and its interactions with liquid hydrocarbons.** *Revista Mexicana de Fisica*. 2003; 49 (Supp. 3):143-145. ISSN: 0035-001X.

García-Junco, Marta; De Olmedo, Elvira; Ortega-Calvo, José-Julio. **Bioavailability of solid and non-aqueous phase liquid (NAPL)-dissolved phenanthrene to the biosurfactant-producing bacterium *Pseudomonas aeruginosa* 19SJ.** *Environmental Microbiology*. 2001; 3 (9):561-569. ISSN: 1462-2912.
In this study, the growth and production of rhamnolipids by *P. aeruginosa* were monitored to determine the effectiveness of the biodegradation of phenanthrene in both crystal and dissolved non-aqueous phase liquid forms.

Garcia-Junco, Marta; Gomez-Lahoz, Cesar; Niqui-Arroyo, Jose-Luis; Ortega-Calvo, José-Julio. **Biosurfactant- and biodegradation-enhanced partitioning of polycyclic aromatic hydrocarbons from nonaqueous-phase liquids.** *Environmental Science & Technology*. 2003; 37 (13):2988-2996. ISSN: 0013-936X.
Results of studies of partitioning kinetics conducted in the presence of surfactants and PAH-degrading bacteria suggest that *in situ* treatments of biosurfactants and biodegradation can efficiently enhance the partitioning of PAHs.

García-Rivero, M.; Saucedo-Castañeda, G.; Flores De Hoyos, S.; Gutiérrez-Rojas, M. **Mass transfer and hydrocarbon biodegradation of aged soil in slurry phase.** *Biotechnology Progress*. 2002; 18 (4):728-733. ISSN: 8756-7938.
Toluene added to petroleum-contaminated soil increased the desorption rate of total petroleum hydrocarbons, which improved the biodegradation rate. This was somewhat complicated by an inhibitory effect from the possible creation of a highly toxic toluene-hydrocarbon phase.

Gardner, Richard Andrew; Kinkade, Rebecca; Wang, Chaojie; Phanstiel, Otto IV. **Total synthesis of petrobactin and its homologues as potential growth stimuli for *Marinobacter hydrocarbonoclasticus*, an oil-degrading bacteria.** *Journal of Organic Chemistry*. 2004; 69 (10):3530-3537. ISSN: 0022-3263.
Researchers synthesized petrobactin and its homologues and them to a hydrocarbon-degrading microbe to learn how siderophores influence the growth of the species.

Garon, David; Krivobok, S.; Wouessidjewe, D.; Seigle-Murandi, Françoise. **Influence of surfactants on solubilization and fungal degradation of fluorene.** *Chemosphere*. 2002; 47 (3):303-309. ISSN: 0045-6535.
In order to determine the best combination of fluorene degradation abilities in assays, researchers used two nonionic surfactants (Tween 80 and Triton X-100) and an anionic surfactant (sodium dodecyl sulfate) in experiments with eighteen fungal strains.

Garon, David; Sage, Lucile; Seigle-Murandi, Françoise. **Effects of fungal bioaugmentation and cyclodextrin amendment on fluorene degradation in soil slurry.** *Biodegradation*. 2004; 15 (1):1-8. ISSN: 0923-9820.
The addition of cyclodextrin increased the solubility of fluorene in soil. In soil slurry experiments, the enhanced bioavailability of fluorene resulted in higher degradation levels by fungi originally isolated from PAH-contaminated soil.

Garon, David; Wouessidjewe, D.; Seigle-Murandi, Françoise. **Enhanced degradation of fluorene in soil slurry by *Absidia cylindrospora* and maltosyl-cyclodextrin.** *Chemosphere*. 2004; 56 (2):159-166. ISSN: 0045-6535.
After testing 47 fungal strains for their ability in the biodegradation of a PAH in liquid medium and soil slurry, authors identify the most efficient species. Further tests showed 90% degradation rate that was enhanced with the addition of maltosyl-cyclodextrin.

Gauthier, E. et al. **Initial characterization of new bacteria degrading high-molecular weight polycyclic aromatic hydrocarbons isolated from a 2-year enrichment in a two-liquid-phase culture system.** *Journal of Applied Microbiology*. 2003; 94 (2):301-311. ISSN: 1364-5072.
Bacteria were isolated from a consortium found to be degrading high molecular weight PAHs. Four promising species were identified from the group and a better understanding of the mechanisms behind biodegradation was obtained.

George, Gareth T. **Late Yeadonian (Upper Sandstone Group) incised valley supply and depositional systems in the South Wales peripheral foreland basin: implications for the evolution of the Culm Basin and for the Silesian hydrocarbon plays of onshore and offshore UK.** *Marine and Petroleum Geology*. 2001; 18 (6):671-705. ISSN: 0264-8172.
Thought to be a simple geological formation, the Upper Sandstone Group of North Wales is actually a complex formation that may hold hydrocarbon reservoirs.

George, Simon C.; Boreham, Christopher J.; Minifie, Sandra A.; Teerman, Stan C. **The effect of minor to moderate biodegradation on ^{5}C to ^{9}C hydrocarbons in crude oils.** *Organic Geochemistry*. 2002; 33 (12):1293-1317. ISSN: 0146-6380.
Analysis of 18 oil samples from areas of the Barrow Island oilfield, Australia, suggests that the kinetic isotope effect related to biodegradation is site specific and usually related to a terminal carbon.

Gerstl, Zev. **Quantitative structure-activity relationships (QSARs) as a tool for predicting the sorption of organic chemicals in soils.** *Israel Journal of Chemistry*. 2002; 42 (1):55-65. ISSN: 0021-2148.
This paper reviews the use of QSARs for predicting soil sorption coefficients for contaminants based on linear free-energy relationships, molecular connectivity indices, and quantum mechanical approaches.

Ghazali, F. M.; Rahman, R. N. Z. A.; Salleh, A. B.; Basri, M. **Biodegradation of hydrocarbons in soil by microbial consortium.** *International Biodeterioration & Biodegradation*. 2004; 54 (1):61-67. ISSN: 0964-8305.
Two separate bacterial consortiums, consisting of 3 and 6 strains, were selected for abilities to grow on crude oil or on specific PAHs. The groups were tested on soil samples contaminated with diesel, crude oil, or engine oil. The 6-member consortium was found to better reduce hydrocarbons in the soil.

Giamarchi, P.; Burel, L.; Stephan, L.; Lijour, Y.; LeBihan, A**. Laser-induced fluorescence with an OPO system. Part I. Optimisation of the analytical system by use of experimental design methodology. Application to the direct quantification of traces of benzo[a]pyrene.** *Analytical and Bioanalytical Chemistry*. 2002; 374 (3):490-497. ISSN: 1618-2642.
Laser-induced fluorescence was used for the direct analysis of trace pollutants in water, based on time-resolution potential and extremely high sensitivity. Detection levels for B(a)P were established in drinking water and raw water.

Gibb, Angela; Chu, Angus; Wong, Ron Chik Kwong; Goodman, Ron H. **Bioremediation kinetics of crude oil at 5° C.** *Journal of Environmental Engineering - ASCE*. 2001; 127 (9):818-824. ISSN: 0733-9372.
Researchers compared mineralization rates of Alberta Sweet Mix crude oil at 5° C and 21° C. They concluded that this type of crude oil could be degraded at cold temperatures.

Gibson, Richard G.; Bentham, Peter A. **Use of fault-seal analysis in understanding petroleum migration in a complexly faulted anticlinal trap, Columbus Basin, offshore Trinidad.** *AAPG Bulletin*. 2003; 87 (3):465-478. ISSN: 0149-1423.
To understand and effectively evaluate the role of a fault seal and how it controls petroleum migration, a model that predicts movement of petroleum through stratigraphic sequence using shale gouge ratio was investigated in the Columbus Basin, offshore Trinidad.

Gibson, Richard G.; Dzou, Leon I. P. **Shelf petroleum system of the Columbus basin, offshore Trinidad, West Indies: II. Field geochemistry and petroleum migration model.** *Marine and Petroleum Geology*. 2004; 21 (1):109-129. ISSN: 0264-8172.
The structural evolution of the Columbus basin is owed to complex interactions, leading to two mechanisms behind the migration of petroleum. Geochemical traits of petroleum in this system indicate mature oils from horizontal migration along great distances, in contradiction to previously proposed models of the basin, which suggested vertical migration.

Gibson, Richard G.; Dzou, Leon I. P.; Greeley, David F. **Shelf petroleum system of the Columbus basin, offshore Trinidad, West Indies. I. Source rock, thermal history, and controls on product distribution.** *Marine and Petroleum Geology*. 2004; 21 (1):97-108. ISSN: 0264-8172.
Examination of the Columbus basin indicates a combination of biogenic and thermogenic gases, as well as oil. The distribution of petroleum types varies geographically, with oil found more in the northwest part of the basin and gas to the southwest. Variations in thermal maturity are not believed to be the controlling factor on oil and gas distribution within the basin.

Gieg, Lisa M.; Suflita, Joseph M. **Detection of anaerobic metabolites of saturated and aromatic hydrocarbons in petroleum-contaminated aquifers.** *Environmental Science & Technology*. 2002; 36 (17):3755-3762. ISSN: 0013-936X.
Alkylsuccinic acids were identified as a derivative of the anaerobic decay of hydrocarbons by microorganisms. These metabolites are good bioindicators of hydrocarbon metabolism in contaminated aquifers.

Gimeno, R. A.; Altelaar, A. F. M.; Marcé, R. M.; Borrull, F. **Determination of polycyclic aromatic hydrocarbons and polycylic aromatic sulfur heterocycles by high-performance liquid chromatography with fluorescence and atmospheric pressure chemical ionization mass spectrometry detection in seawater and sediment samples.** *Journal of Chromatography A*. 2002; 958 (1-2):141-148. ISSN: 0021-9673.

Glasby, G. P. **Potential impact on climate of the exploitation of methane hydrate deposits offshore.** *Marine and Petroleum Geology*. 2003; 20 (2):163-175. ISSN: 0264-8172.
Due to the potential of environmental impacts associated with large-scale releases of CH_4, the author urges for a need to exercise caution before any attempt is made to exploit offshore methane hydrate resources.

Golet, D. S.; Ward, B. B. **Vertical distribution of denitrification potential, denitrifying bacteria, and benzoate utilization in intertidal microbial mat communities.** *Microbial Ecology*. 2001; 42 (1):22-34. ISSN: 0095-3628.
Microbial mats from two estuarine systems in California were tested to determine the importance of denitrification in the degradation of benzoate. Data from the experiments suggest that denitrification may be nitrate limited under *in situ* conditions.

Gordon, Linda; Dobson, Alan D. W. **Fluoranthene degradation in *Pseudomonas alcaligenes* PA-10.** *Biodegradation*. 2001; 12 (6):393-400. ISSN: 0923-9820.
Authors identify four intermediate compounds in the catabolic pathway while observing the degradation of phenanthrene by a strain of *P. alcaligenes*.

Gorshkov, A. G.; Marinaite, I. I.; Baram, G. I.; Sokov, I. A. **Application of high-performance liquid chromatography on short narrow-bore columns to the determination of priority polycyclic aromatic hydrocarbons in environmental samples.** *Journal of Analytical Chemistry*. 2003; 58 (8):768-774. ISSN: 1061-9348.
PAHs were separated by HPLC and determined in short narrow-bore columns measuring 2 x 75 mm. Authors propose detecting nonhomogeneous peaks by altering selectivity of mobile phase, detection wavelength, and column temperature.

Gourlay, Catherine; Miege, Cécile; Garric, Jeanne; Tusseau-Vuillemin, Marie-Hélène; Mouchel, Jean-Marie. **The use of spectrofluorimetry for monitoring the bioaccumulation and the biotransformation of polycyclic aromatic hydrocarbons in *Daphnia magna*.** *Polycyclic Aromatic Compounds*. 2002; 22 (3-4):501-516. ISSN: 1040-6638.
Spectrofluorimetric analysis was used to determine the accumulation of fluoranthene, as well as indicate the presence of metabolites of B[a]P, in *D. magna*. This method permits for the qualitative monitoring of bioaccumulation of PAHs in organisms over time.

Grauls, D. **Gas hydrates: importance and applications in petroleum exploration.** *Marine and Petroleum Geology*. 2001; 18 (4):519-523. ISSN: 0264-8172.
Gas hydrates are not expected to be recoverable in the near future, but their presence offers scientists the opportunity to assess geological structures that lead to hydrate formation on the ocean floor.

Grishchenkov, V. G. et al. **Degradation of petroleum hydrocarbons by facultative anaerobic bacteria under aerobic and anaerobic conditions.** *Process Biochemistry*. 2000; 35 (9):889-896. ISSN: 0032-9592.
Seven bacterial strains were tested for their ability to reduce nitrate and degrade petroleum hydrocarbons in both aerobic and anaerobic conditions in experiments ranging from 10 days (aerobic) to 50 days (anaerobic).

Grötzschel, Stefan; Köster, Jürgen; Abed, Raeid M. M.; de Beer, Dirk. **Degradation of petroleum model compounds immobilized on clay by a hypersaline microbial mat.** *Biodegradation*. 2002; 13 (4):273-283. ISSN: 0923-9820.
Chemical, molecular and functional analyses were used to follow the degradation of certain PAHs on a microbial mat. No significant community changes were detected during the experiments.

Grujic, Svetlana; Jovancicevic, Branimir; Polic, Predrag; Wehner, Hermann. **Biomarkers of oil-type pollutants in surface soil.** *Fresenius Environmental Bulletin*. 2003; 12 (4):359-363. ISSN: 1018-4619.
Biomarkers were used to assess the impact of PAHs on soil organisms five to six weeks after a significant amount of oil had been released. Authors note that degradation intensities fluctuated within relatively small depths of soil where *n*-alkanes were degraded by indigenous microorganisms.

Gu, G. et al. **Influence of water-soluble and water-insoluble natural surface active components on the stability of water-in-toluene-diluted bitumen emulsion.** *Fuel*. 2002; 81 (14):1859-1869. ISSN: 0016-2361.

Gu, Man Bock; Chang, Suk Tai. **Soil biosensor for the detection of PAH toxicity using an immobilized recombinant bacterium and a biosurfactant.** *Biosensors & Bioelectronics*. 2001; 16 (9-12):667-674. ISSN: 0956-5663.

Guieysse, Benôit; Cirne, M. D. T. G.; Mattiasson, Bo. **Microbial degradation of phenanthrene and pyrene in a two-liquid phase-partitioning bioreactor.** *Applied Microbiology and Biotechnology*. 2001; 56 (5-6):796-802. ISSN: 0175-7598.
Pyrene and phenanthrene were used in experiments to determine the effectiveness of biodegradation by microbes in biphasic reactors. The reactors assisted in the complete degradation of phenanthrene, but only aided the removal of pyrene in small amounts when in the presence of the phenanthrene.

Guieysse, Benoît; Wikström, Per; Forsman, Mats; Mattiasson, Bo. **Biomonitoring of continuous microbial community adaptation towards more efficient phenol-degradation in a fed-batch bioreactor.** *Applied Microbiology and Biotechnology*. 2001; 56 (5-6):780-787. ISSN: 0175-7598.
Researchers compared randomly amplified polymorphic DNS (RAPD) and terminal fragment length polymorphism (T-RFLP) in experiments involving the anaerobic degradation of phenol by a bacterial culture. Faster degradation rates were accomplished with repeated substrate amendments of phenol, while RAPD was determined to be a better technique for observing shifts in the microbial community structure.

Guiraud, P.; Villemain, D.; Kadri, M.; Bordjiba, O.; Steiman, R. **Biodegradation capability of *Absidia fusca* Linnemann towards environmental pollutants.** *Chemosphere*. 2003; 52 (4):663-671. ISSN: 0045-6535.
Two strains of a fungus were tested on a variety of xenobiotics, including PAHs. One strain that was isolated from polluted soil effectively degraded most of the contaminants. The other strain was found to degrade pollutants at very low levels.

Gunther, T.; Kirsche, B.; Fritsche, W. **Potential of plant-microbe interactions for *in situ* bioremediation of hydrocarbon-contaminated soils.** *In* Wise, D. L.; Trantolo, D. J.; Cichon, H. I.; Stottmeister, U. (Eds.) *Bioremediation of Contaminated Soils (Environmental Science and Pollution Control Series, v.22)*. New York: Marcel Dekker; 2000; p. 285-293. ISBN: 0-8247-0333-2.

Gürgey, Kadir. **Correlation, alteration, and origin of hydrocarbons in the GCA, Bahar, and Gum Adasi fields, western South Caspian Basin: geochemical and multivariate statistical assessments.** *Marine and Petroleum Geology*. 2004; 20 (10):1119-1139. ISSN: 0264-8172.
The author investigated 20 crude oil samples with geochemical and multivariate statistical analysis, and compared results to available source-rock data from the area to determine the maturity of reservoirs in the South Caspian Basin.

Guthrie-Nichols, Elizabeth et al. **The effect of aging on pyrene transformation in sediments.** *Environmental Toxicology and Chemistry*. 2003; 22 (1):40-49. ISSN: 0730-7268.
Synthetically-aged sediments were amended with pyrene and aerated to compare the fate of pyrene with spiked, nonaged sediments. Aging did not influence the enhancement of pyrene sequestration, but did reduce the toxicity of sediment humin fractions.

Haeberle, Frederick R. **Reservoir property analysis can guide Texas Gulf Coast exploration.** *Oil & Gas Journal*. 2003; 101 (7):38-43. ISSN: 0030-1388.
To understand changes that influence reservoir properties, 11 categories of properties were identified and data was gathered in a study area comprising 133 reservoirs in 110 fields. All reservoirs consisted of sandstones, and reservoir ages ranged from the Cretaceous, Paleocene, Eocene, and Oligocene.

Hagestuen, Erik Donald. **Development of Solid Phase Extraction-Room Temperature Phosphorimetry for the Analysis of Polycyclic Aromatic Hydrocarbons in Water Samples.** Thesis (Ph. D.): North Dakota State University; 1999;161 leaves.

Hagestuen, Erik Donald; Arruda, A. F.; Campiglia, Andres D. **On the improvement of solid-phase extraction room-temperature phosphorimetry for the analysis of polycyclic aromatic hydrocarbons in water samples.** *Talanta*. 2000; 52 (4):727-737. ISSN: 0039-9140.
The methodology of solid-phase extraction room-temperature phosphorimetry for PAHs has improved recently. This report describes advances by use of more efficient laboratory techniques and reduced analysis time.

Hamada, G. M. **Factor identifies hydrocarbon recoverability, type.** *Oil & Gas Journal*. 2004; 102 (16):49-53. ISSN: 0030-1388.
Petrophysicists are testing a new application that incorporates resistivity logs in order to evaluate hydrocarbon mobility, identify well recovery factor and determine if fluid flow has been flushed towards the welbore.

Hamer, G.; Al-Awadhi, N. **Biotechnological applications in the oil industry.** *Acta Biotechnologica*. 2000; 20 (3-4):335-350. ISSN: 0138-4988.
Authors note that the oil industry has distanced itself from biotechnical research, and in the future, the industry will need to forge closer links, especially as more is learned about bioremediation.

Hamlat, M. S.; Kadi, H.; Djeffal, S.; Brahimi, H. **Radon concentrations in Algerian oil and gas industry.** *Applied Radiation and Isotopes*. 2003; 58 (1):125-130. ISSN: 0969-8043.
Radon concentrations were measured in crude oil, natural gas and natural gas liquids, and produced water in Algeria and then compared with measurements taken in other countries.

Hansen, Asger B.; Christensen, Jan H.; Avnskjold, J.; Andersen, I.; Rasmussen, C. A. **Identification of oil spills by GC/MS finger-printing in relation to the Danish maritime oil spill response.** *In* Rodriguez, G. R.; Brebbia, C. A. (Eds.) *Oil and Hydrocarbon Spills, Modelling, Analysis and Control II*. Billerica, Ma.: Computational Mechanics Inc.; 2000; p. 199-207. ISBN: 1-85312-828-7.
In 1998, the Admiral Danish Fleet enhanced surveillance and sampling of observed oil spills in the Danish maritime authority. GC/FID and GC/MS fingerprinting are now used on samples to identify ships responsible for illegally discharging oil.

Hansen, Lance D.; Nestler, Cathy; Ringelberg, Dave; Bajpai, Rakesh. **Extended bioremediation of PAH/PCP contaminated soils from the POPILE wood treatment facility.** *Chemosphere*. 2004; 54 (10):1481-1493. ISSN: 0045-6535.
A bioremediation experiment involving an initial intensive treatment phase comparing two landfarming techniques, traditional practice versus gas-phase composition cultivation strategy, was followed by a two year less-intensive treatment. Although different microbial communities developed in each intensive treatment site, PAH removals were deemed efficient for each site.

Hao, Ruixia; Lu, Anhuai; Wang, Guanyu. **Crude-oil-degrading thermophilic bacterium isolated from an oil field.** *Canadian Journal of Microbiology*. 2004; 50 (3):175-182. ISSN: 0008-4166.
A bacterial strain was grown at temperatures of 83° C and identified as belonging to the genus *Thermus*. After monitoring its growth on different crude oils, researchers found decreases in aromatics, resins, and asphaltenes.

Hara, Akihiro; Syutsubo, Kazuaki; Harayama, Shigeaki. ***Alcanivorax* which prevails in oil-contaminated seawater exhibits broad substrate specificity for alkane degradation.** *Environmental Microbiology*. 2003; 5 (9):746-753. ISSN: 1462-2912.
Alcanivorax became the predominant microbial species in crude oil-polluted seawater experiments when nitrogen and phosphorus were added to samples. Researchers believe the efficiency of the species to degrade alkanes allows it to out-compete other types of bacteria.

Harney, Alexander. **Bacteria improve oil extraction.** *Financial Times (London)*. Financial Times Ltd.; February 15, 2001;p. 13.
Statoil has patented a new method of improving oil recovery with the aid of bacteria. Results from pilot projects suggest that when bacteria are supplied with oxygen, they thin out oil close to the walls of reservoirs, enabling more oil to be recovered.

Hart, Alan. **Numerous play types evident in Taranaki basin.** *Oil & Gas Journal*. 2001; 99 (30):40-43. ISSN: 0030-1388.
This article describes the Taranaki basin located along the central west coast of New Zealand's North Island and its complex geology. Currently, all hydrocarbons produced are derived from terrestrial source rocks with shallow marine influences of Cretaceous-Eocene age.

Harvey, P. J. et al. **Phytoremediation of polyaromatic hydrocarbons, anilines and phenols.** *Environmental Science and Pollution Research*. 2002; 9 (1):29-47. ISSN: 0944-1344.

Havenga, W. J.; Rohwer, E. R. **The use of SPME and GC-MS for the chemical characterization and assessment of PAH pollution in aqueous environmental samples.** *International Journal of Environmental Analytical Chemistry*. 2000; 78 (3-4):205-221. ISSN: 0306-7319.

Hawthorne, Steven B.; Poppendieck, Dustin G.; Grabanski, Carol B.; Loehr, Raymond C. **PAH release during water desorption, supercritical carbon dioxide extraction, and field bioremediation.** *Environmental Science & Technology*. 2001; 35 (22):4577-4583. ISSN: 0013-936X.
PAH-contaminated soil from a manufactured gas plant was used in experiments to judge the effectiveness of supercritical carbon dioxide extraction (SFE) in the removal of hydrocarbons. PAH removal rates were compared between SFE and water desorption for amounts and concentrations of PAHs over time.

Hayakawa, K. et al. **Contamination of aromatic hydrocarbons in environmental samples after the *Nakhodka* oil spill.** *In* Garcia-Martinez, R.; Brebbia, C. A. (Eds.). *Oil and Hydrocarbon Spills, Modelling, Analysis and Control*. Billerica, Ma.: Computational Mechanics, Inc.; p. 231-237. ISBN: 1-85312-526-1.
Concentrations of various aromatic hydrocarbons were tracked over time by the authors following a spill in the Sea of Japan.

Hayes, L. A.; Lovley, D. R. **Specific 16S rDNA sequences associated with naphthalene degradation under sulfate-reducing conditions in harbor sediments.** *Microbial Ecology*. 2002; 43 (1):134-145. ISSN: 0095-3628.
Microorganisms that were able to mineralize contaminated marine harbor sediment from San Diego Bay were found to be closely related to NaphS2, a specific sulfate-reducing culture isolated from sediments in Germany.

Head, Ian M.; Jones, D. Martin; Larter, Steve R. **Biological activity in the deep subsurface and the origin of heavy oil.** *Nature*. 2003; 426 (6964):344-352. ISSN: 0028-0836.
This review summarizes current understanding about the composition of heavily biodegraded oils, factors influencing their structure, and the roles that biological and geological factors play in the creation of petroleum systems.

Hedlund, Brian Paul. **Diversity of Marine Polycyclic Aromatic Hydrocarbon Degrading Bacteria and Their Dioxygenases.** Thesis (Ph. D.): University of Washington; 2000; 139 leaves.

Hedlund, Brian Paul; Staley, J. T. ***Vibrio cyclotrophicus* sp. nov., a polycyclic aromatic hydrocarbon (PAH)-degrading marine bacterium.** *International Journal of Systematic Bacteriology*. 2001; 51 (1):61-66. ISSN: 0020-7713.

Hegazi, A. H.; Andersson, J. T.; Abu-Elgheit, M. A.; El-Gayar, M. Sh. **Source diagnostic and weathering indicators of tar balls utilizing acyclic, polycyclic and S-heterocyclic components.** *Chemosphere*. 2004; 55 (7):1053-1065. ISSN: 0045-6535.
GC/FID, GC/AED and GC/MS analysis of tar balls found on beaches in Alexandria, Egypt determined the sources as Egyptian crude and Bunker C fuel oil, possibly deposited from tank washings or ballast discharge.

Hernán, Palma-Fleming; Asencio P., Adalberto J.; Gutierrez, Elena. **Polycyclic aromatic hydrocarbons in sediments and mussels of Corral Bay, south central Chile.** *Journal of Environmental Monitoring*. 2004; 6 (3):229-233. ISSN: 1464-0325.
PAH values were measured in sediments and mussels and divided into low and high molecular weight PAHs to establish higher concentration values according to exposure rates.

Hill, Alex J.; Ghoshal, Subhasis. **Micellar solubilization of naphthalene and phenanthrene from nonaqueous-phase liquids.** *Environmental Science & Technology*. 2002; 36 (18):3901-3907. ISSN: 0013-936X.
In this study, five nonionic surfactants were evaluated to determine solubilization rates of naphthalene, phenanthrene and hexadecane from nonaqueous-phase liquids.

Hinga, K. R. **Degradation rates of low molecular weight PAH correlate with sediment TOC in marine subtidal sediments.** *Marine Pollution Bulletin*. 2003; 46 (4):466-474. ISSN: 0025-326X.
The author compared the percentages of total organic carbon (TOC) from several sites between three and five months' time and degradation rates for low molecular weight PAHs. It is believed that sediment TOC can be a useful tool in estimating degradation rates for a number of sediment types and for different kinds of PAHs.

Hirano, Shin-ichi et al. **Isolation and characterization of *Xanthobacter polyaromaticivorans* sp. nov. 127W that degrades polycyclic and heterocyclic aromatic compounds under extremely low oxygen conditions.** *Bioscience Biotechnology and Biochemistry*. 2004; 68 (3):557-564. ISSN: 0916-8451.
Two strains isolated from anoxic crude oil tank sludge were found to degrade various hydrocarbons. Further analysis discovered that the strains were species of two genuses, *Xanthobacter* and *Pseudomonas*.

Hoflich, G.; Gunther, T. **Effect of plant-rhizosphere microorganism-associations on the degradation of polycyclic aromatic hydrocarbons in soil.** *Die Bodenkultur: Austrian Journal of Agricultural Research*. 2000; 51 (2):91-97. ISSN: 0006-5471.

Höhener, Patrick et al. **Biodegradation of petroleum hydrocarbon vapors: laboratory studies on rates and kinetics in unsaturated alluvial sand.** *Journal of Contaminant Hydrology*. 2003; 66 (1-2):93-115. ISSN: 0169-7722.
Laboratory column experiments were found to accurately determine biodegradation rate parameters for a number of PAHs.

Hokstad, J. N.; Daling, P. S.; Johnsen, S.; Buffagni, M. **Chemical and toxicological characterization of water accomodated fractions relevant for oil spill situations.** *In* Garcia-Martinez, R.; Brebbia, C. A. (Eds.). *Oil and Hydrocarbon Spills, Modelling, Analysis and Control*. Billerica, Ma.: Computational Mechanics, Inc.; 1998; p. 145-154. ISBN: 1-85312-526-1.
Two types of North Sea Crude were tested and found to have large variations in chemical composition, depending on type of crude, seawater to oil ratio, and weathering degree of the oils.

Hollender, Juliane; Althoff, Katrin; Mundt, Matthias; Dott, Wolfgang. **Assessing the microbial activity of soil samples, its nutrient limitation and toxic effects of contaminants using a simple respiration test.** *Chemosphere*. 2003; 53 (3):269-275. ISSN: 0045-6535.
A fast respirometric method was successfully used to determine oxygen consumption and carbon dioxide production by microbes. This method is suggested as a quick way of assessing the need for detailed biodegradation studies.

Hollender, Juliane; Kock, Burkhardt; Lutermann, Christoph; Dott, Wolfgang. **Efficiency of different methods and solvents for the extraction of polycyclic aromatic hydrocarbons from soils.** *International Journal of Environmental Analytical Chemistry*. 2003; 83 (1):21-32. ISSN: 0306-7319.
Researchers compare results of different extraction methods on recover rates of various PAHs. For this investigation, supercritical fluid extraction, accelerated solvent extraction, Soxhlet, and ultrasonic extraction were used.

Holman, H. Y. N. et al. **Catalysis of PAH biodegradation by humic acid shown in synchrotron infrared studies.** *Environmental Science & Technology*. 2002; 36 (6):1276-1280. ISSN: 0013-936X.

Holowenko, Fervone M.; MacKinnon, Michael D.; Fedorak, Phillip M. **Naphthenic acids and surrogate naphthenic acids in methanogenic microcosms.** *Water Research*. 2001; 35 (11):2595-2606. ISSN: 0043-1354.
Naphthenic acid (NA) mixtures were not found to be the direct source of methane production by microbial communities. However, methanogenic populations were found to be able to adapt to high concentrations of NAs, with adjustment time relative to the concentration of NAs.

Homel, E. L.; Allen, H. C. **The air-liquid interface of benzene, toluene, m-xylene, and mesitylene: a sum frequency, Raman, and infrared spectroscopic study.** *Analyst*. 2003; 128 (6):750-755. ISSN: 0003-2654.

Hori, K.; Matsuzaki, Y.; Tanji, Y.; Unno, H. **Effect of dispersing oil phase on the biodegradability of a solid alkane dissolved in non-biodegradable oil.** *Applied Microbiology and Biotechnology*. 2002; 59 (4-5):574-579. ISSN: 0175-7598.
By increasing the specific surface area of oil phase, researchers discovered that degradation rates declined in dominant microbes utilizing substrate uptake in oil by direct contact. It is recommended that researchers should determine the substrate uptake mechanism in a degrading species before applying a surfactant.

Horvath-Szabo, G.; Masliyah, J. H.; Czarnecki, J. **Emulsion stability based on phase behavior in sodium naphthenates containing systems: gels with a high organic solvent content.** *Journal of Colloid and Interface Science*. 2003; 257 (2):299-309. ISSN: 0021-9797.
This article describes the stability of emulsions with the addition of heptane over a range of temperatures.

Hostettler, Frances. D.; Rosenbauer, R. J.; Kvenvolden, K. A. **PAH refractory index as a source discriminant of hydrocarbon input from crude oil and coal in Prince William Sound, Alaska - response.** *Organic Chemistry*. 2000; 31 (9):939-943. ISSN: 0146-6380.

Hou, Li; Lee, Hian Kee. **Application of static and dynamic liquid-phase microextraction in the determination of polycyclic aromatic hydrocarbons.** *Journal of Chromatography A*. 2002; 976 (1-2):377-385. ISSN: 0021-9673.
This study investigated the factors influencing the efficiency of PAH analysis in aqueous solution for two different types of liquid-phase microextraction used in combination with HPLC.

Howerton, Samuel B.; Goodpaster, John V.; McGuffin, Victoria L. **Characterization of polycyclic aromatic hydrocarbons in environmental samples by selective fluorescence quenching.** *Analytica Chimica Acta*. 2002; 459 (1):61-74. ISSN: 0003-2670.
Complimentary data can be gathered from using fluorescence and by applying nitromethane to selective fluorescence quenching in the process of identifying specific PAHs. This method of identification can be used to identify the source of PAHs in environmental samples.

Hsieh, Ming-Mu; Kuo, Yui-Chun; Tsai, Pei-Ling; Chang, Huan-Tsung. **Optimizing separation conditions for polycyclic aromatic hydrocarbons in micellar electrokinetic chromatography.** *Journal of Chromatography A*. 2001; 924 (1-2):397-405. ISSN: 0021-9673.
A stepwise technique was developed to separate 10 selected PAHs. Authors suggest that capillary electrophoresis (CE) is a useful tool for monitoring biological and environmental samples.

Hsu, C. S.; Drinkwater, D. **Gas chromatography-mass spectrometry in the petroleum industry.** *In* Niessen, W. M. A. (Ed.) *Current Practice of Gas Chromatography - Mass Spectrometry (Series: Chromatographic Science Series, v.86)*. New York, NY: Marcel Dekker; 2001; p. 55-94. ISBN: 0-8247-0473-8.
Authors describe specialized techniques, which have been developed in the analysis of petroleum **products, and applications such as analyzing biomarkers and specific types of hydrocarbons.**

Hu, Yuting; Ren, Fenghua; Zhou, Peijin; Xia, Min; Liu, Shuangjiang. **Degradation of pyrene and characterization of *Saccharothrix* sp PYX-6 from the oligotrophic Tianchi Lake in Xinjiang Uygur Autonomous Region, China.** *Chinese Science Bulletin*. 2003; 48 (20):2210-2215. ISSN: 1001-6538.
A strain of bacteria capable of degrading anthracene, phenanthrene, and pyrene was isolated and characterized based on morphological, physiological and biochemical properties.

Hua, Zhaozhe; Chen, Jian; Lun, Shiyi; Wang, Xiaorong. **Influence of biosurfactants produced by *Candida antarctica* on surface properties of microorganism and biodegradation of *n*-alkanes.** *Water Research*. 2003; 37 (17):4143-4150. ISSN: 0043-1354.
The biosurfactant BS-UC influenced the emulsification and biodegradation of *n*-alkane substrates by a species of microbe, and its presence made it easier for the microbe cell to attach to hydrophobic substrate by changing the zeta potential of the cell.

Hua, Zhaozhe; Chen, Yan; Du, Guocheng; Chen, Jian. **Effects of biosurfactants produced by *Candida antarctica* on the biodegradation of petroleum compounds.** *World Journal of Microbiology & Biotechnology*. 2004; 20 (1):25-29. ISSN: 0959-3993.
A biosurfactant produced by a microbial species as it grew on *n*-undecane was found to improve the biodegradation rate of some *n*-alkanes in flask culture. In addition, when applied to simulated wastewater contaminated with kerosene, the biosurfactant improved the emulsification and biodegradation rate of the pollutant.

Huang, Baojia; Xiao, Xianming; Li, Xuxuan. **Geochemistry and origins of natural gases in the Yinggehai and Qiongdongnan basins, offshore South China Sea.** *Organic Geochemistry*. 2003; 34 (7):1009-1025. ISSN: 0146-6380.
Data from the isotopic analysis of four offshore gas fields indicates that there are three genetic groups of gases in the Yinggehai and Qiongdongnan basins. Authors surmise origin and migration scenarios for each reservoir.

Huang, Baojia; Xiao, Xianming; Zhang, Mingqiang. **Geochemistry, grouping and origins of crude oils in the Western Pearl River Mouth Basin, offshore South China Sea.** *Organic Geochemistry*. 2003; 34 (7):993-1008. ISSN: 0146-6380.
Detailed analysis of crude oils and source rocks indicates that the oils trapped under the Western Pearl River Mouth Basin underwent short distance oil migration, suggestive of strong source facies controls on geographic dispersal.

Huang, Haiping; Jin, Guangxi; Lin, Changsong; Zheng, Yabin. **Origin of an unusual heavy oil from the Baiyinchagan depression, Erlian basin, northern China.** *Marine and Petroleum Geology*. 2003; 20 (1):1-12. ISSN: 0264-8172.
Six oil samples, collected from shallow reservoirs and ranging from normal to extremely heavy oil, went through organic geochemical analysis to establish their origins. Heavy oil samples showed negligible evidence of biodegradation, leading researchers to conclude that water-washing was the main process leading to the formation of the hydrocarbons.

Huang, Haiping; Larter, Steve R.; Bernard, F. J.; Oldenburg, Thomas B. P. **A dynamic biodegradation model suggested by petroleum compositional gradients within reservoir columns from the Liaohe basin, NE China**. *Organic Geochemistry*. 2004; 35 (3):299-316. ISSN: 0146-6380.
Researchers recorded and observed systematic changes at the gradient in two biodegraded oil columns to analyze the effects and controls of biodegration on petroleum composition.

Huang, Hsiao-Lin; Lee, Whei-May Grace. **Enhanced naphthalene solubility in the presence of sodium dodecyl sulfate: effect of critical micelle concentration.** *Chemosphere*. 2001; 44 (5):963-972. ISSN: 0045-6535.
GC and photon ionization detector analyzed vapor phase naphthalene in experiments to determine the feasibility of using anionic surfactants in the removal of vapor phase PAHs from gases.

Huang, Hsiao-Lin; Lee, Whei-May Grace. **Simultaneous removal of naphthalene and sulfur dioxide using surfactant.** *Journal of Environmental Engineering - ASCE*. 2002; 128 (1):60-67. ISSN: 0733-9372.

Hubert, A.; Popp, P.; Wenzel, K.-D.; Engewald, W.; Schüürmann, G. **One-step cleanup for PAH residue analysis in plant matrices using size-exclusion chromatography.** *Analytical and Bioanalytical Chemistry*. 2003; 376 (1):53-60. ISSN: 1618-2642.
This study describes a rapid and simple cleanup procedure for a number of extraction techniques, including accelerated solvent extraction, Soxhlet extraction, and ultrasonic extraction.

Huesemann, Michael H.; Hausmann, Tom S.; Fortman, Tim J. **Assessment of bioavailability limitations during slurry biodegradation of petroleum hydrocarbons in aged soils.** *Environmental Toxicology and Chemistry*. 2003; 22 (12):2853-2860. ISSN: 0730-7268.
PAH biodegradation was not slowed down by limitations of bioavailability, but rather from microbial factors such as cometabolic substrates or the lack of specific PAH-degrading bacteria. Because of this, researchers believe that microbially recalcitrant PAHs could be a greater environmental risk than currently thought.

Hutchinson, S. Lewis.; Banks, M. K.; Schwab, A. P. **Phytoremediation of aged petroleum sludge: effect of inorganic fertilizer.** *Journal of Environmental Quality*. 2001; 30 (2):395-403. ISSN: 0047-2425.
In experiments lasting one year, two common grasses were tested and found to have aided in the degradation of hydrocarbons. Authors propose a 100:2:0.2 C to N to P ratio for ideal fertilizer addition to promote the highest amount of remediation.

Hutchinson, S. Lewis.; Schwab, A. P.; Banks, M. K. **Biodegradation of petroleum hydrocarbons in the rhizosphere.** *In* McCutcheon, S. C.; Schnoor, J. L. (Eds.) *Phytoremediation (Series: Environmental Science & Technology: a Wiley Interscience Series of Text and Monographs)*. New York: John Wiley & Sons; 2003; p. 355-386. ISBN: 0-471-39435-1.

Hutchinson, S. Lewis; Schwab, A. P.; Banks, M. K. **Phytoremediation of aged petroleum sludge: effect of irrigation techniques and scheduling.** *Journal of Environmental Quality*. 2001; 30 (5):1516-1522. ISSN: 0047-2425.
Subsurface irrigation, performed on a daily schedule, was found to increase root growth and biomass. This, in turn, increased the depth of soil structure conducive to phytoremediation.

Huybrechts, Tom; Dewulf, Jo; Van Langenhove, Herman. **State-of-the-art of gas chromatography-based methods for analysis of anthropogenic volatile organic compounds in estuarine waters, illustrated with the river Scheldt as an example.** *Journal of Chromatography A*. 2003; 1000 (1-2):283-297. ISSN: 0021-9673.
This review concentrates on the procedural steps in VOC analysis, including the comparison of different sample preparation techniques, as well as issues of quality assurance, quality control, and statistical data analysis. In addition, data is presented from the results of a 3-year monitoring study.

Hwang, Sangchul.; Cutright, Teresa. J. **Statistical impact of the extent of desorption, compound aging, and bacteria inoculation on polycyclic aromatic hydrocarbon biodegradation.** *Polycyclic Aromatic Compounds*. 2002; 22 (5):1057-1074. ISSN: 1040-6638.

Hwang, Sangchul; Cutright, Teresa J. **Biodegradability of aged pyrene and phenanthrene in a natural soil.** *Chemosphere*. 2002; 47 (9):891-899. ISSN: 0045-6535.
Authors studied the effects of biostimulation and bioaugumentation on the biodegradability of PAHs. They warn that bioavailability of an aged soil can be greatly underestimated, if investigators rely on a microbial population determined from a solution and used as the sole agent.

Hwang, Sangchul; Cutright, Teresa J. **Effect of expandable clays and cometabolism on PAH biodegradability.** *Environmental Science and Pollution Research - International*. 2003; 10 (5):277-280. ISSN: 0944-1344.
In slurry experiments, biodegradation rates were lower for soil samples that included expandable clays. This was possibly due to mass transfer limitation after pyrene sorption to clays.

Hwang, Sangchul; Cutright, Teresa J. **Preliminary exploration of the relationships between soil characteristics and PAH desorption and biodegradation.** *Environment International*. 2004; 29 (7):887-894. ISSN: 0160-4120.
Results of experiments found that increased levels of expandable clays decreased the levels of desorption and rates of biodegradation of pyrene. Researchers recommend that the contribution of expandable clays to PAH bioavailability should be considered when predicting rates of bioremediation.

Ijah, U. J. J.; Antai, S. P. **Removal of Nigerian light crude oil in soil over a 12-month period.** *International Biodeterioration & Biodegradation*. 2003; 51 (2):93-99. ISSN: 0964-8305.
This study examined the biodegradation of different concentrations of crude oil in soil by various species of bacteria. Authors identified microorganisms as belonging to species of *Bacillus*, *Pseudomonas*, *Vibrio*, *Micrococcus*, and *Alcaligenes*, and found that the quantity and age of crude oil in the soil influenced the rate and extent of hydrocarbon removal.

Ilori, M. O.; Amund, D.; Robinson, C. K. **Ultrastructure of two oil-degrading bacteria isolated from the tropical soil environment.** *Folia Microbiologica*. 2000; 45 (3):259-262. ISSN: 0015-5632.

in der Wiesche, Carsten. *An Investigation into the Remediation of Soils Contaminated by PAH Using White-Rot Fungi*. Braunschweig: Bundesforschungsanstalt fur Landwirtschaft Braunschweig-Volkenrode; 2000;136 pp. ISBN: 3933140412.

Isikhuemhen, Omoanghe S.; Anoliefo, Geoffrey O.; Oghale, Okelezo I. **Bioremediation of crude oil polluted soil by the white rot fungus, *Pleurotus tuberregium* (Fr.) Sing.** *Environmental Science and Pollution Research*. 2003; 10 (2):109-112. ISSN: 0944-1344.
Vigna unguiculata was planted in crude oil-contaminated soil following 0, 7, and 14 days post-treatment. The success of white rot fungus growing in proximity to the plant seedlings was determined by observing community growth rates and levels of remediation in the different treatments of soil.

Iwabuchi, Noriyuki et al. **Extracellular polysaccharides of *Rhodococcus rhodochrous* S-2 stimulate the degradation of aromatic components in crude oil by indigenous marine bacteria.** *Applied & Environmental Microbiology*. 2002; 68 (5):2337-2343. ISSN: 0099-2240.
Extracellular polysaccharides produced by *R. Rhodocrous* acted as a surfactant for indigenous marine bacteria, aiding in the degradation of PAHs.

Jager, Michael J.; McClintic, Daniel P.; Tilotta, David C. **Measurement of petroleum fuel contamination in water by solid-phase microextraction with direct Raman spectroscopic detection.** *Applied Spectroscopy*. 2000; 54 (11):1617-1623. ISSN: 0003-7028.
A new method for determining petroleum fuel contamination in water is discussed in this article.

Jager, Tjalling et al. **Bioavailability of polycyclic aromatic hydrocarbons to earthworms (*Eisenia andrei*, Oligochaeta) in field-polluted soils and soil-sediment mixtures.** *Environmental Toxicology and Chemistry*. 2003; 22 (4):767-775. ISSN: 0730-7268.
Results of bioavailability, sorption and uptake investigations suggest that dredge spoil deposited on soil may lead to enhanced bioavailability of low-molecular-weight PAHs in compost worms.

Janikowski, T. B. et al. **Use of a two-phase partitioning bioreactor for degrading polycyclic aromatic hydrocarbons by a *Sphingomonas* sp.** *Applied Microbiology and Biotechnology*. 2002; 59 (2-3):368-376. ISSN: 0175-7598.
Rapid biodegradation of PAHs was accomplished by using a two-phase partitioning bioreactor and solvent in combination with the bacterium *S. aromaticivorans*. Substantial improvement in degradation rates can be achieved by the limitation of oxygen during the process.

Jirasripongpun, K. **The characterization of oil-degrading microorganisms from lubricating oil contaminated (scale) soil.** *Letters in Applied Microbiology*. 2002; 35 (4):296-300. ISSN: 0266-8254.

Johnsen, Anders R.; Bendixen, Karen; Karlson, Ulrich. **Detection of microbial growth on polycyclic aromatic hydrocarbons in microliter plates by using the respiration indicator WST-1.** *Applied & Environmental Microbiology*. 2002; 68 (6):2683-2689. ISSN: 0099-2240.
A water-soluble respiration indicator was used with a microliter plate assay to screen bacterial isolates which can degrade PAHs.

Johnsen, Anders. R.; Karlson, Ulrich. **Evaluation of bacterial strategies to promote the bioavailability of polycyclic aromatic hydrocarbons.** *Applied Microbiology and Biotechnology*. 2004; 63 (4):452-459. ISSN: 0175-7598.
Researchers analyzed byproducts of degradation, such as biosurfactants, extracellular polymeric substances, and biofilms, in liquid shaken cultures to find ways to increase the bioavailability of PAHs by bacteria.

Johnson, D. L.; Jones, K. C.; Langdon, C. J.; Piearce, T. G.; Semple, K. T. **Temporal changes in earthworm availability and extractability of polycyclic aromatic hydrocarbons in soil.** *Soil Biology & Biochemistry*. 2002; 34 (9):1363-1370. ISSN: 0038-0717.
The ability to extract chemical compounds from contaminants is not an accurate predictor of bioavailability in a given organism. *E. fetida*, commonly used in the screening of contaminated soils, may not accurately reflect true rates of toxicity or accumulation potential.

Johnson, D. L.; Maguire, K. L.; Anderson, D. R.; McGrath, S. P. **Enhanced dissipation of chrysene in planted soil: the impact of a rhizobial inoculum.** *Soil Biology & Biochemistry*. 2004; 36 (1):33-38. ISSN: 0038-0717.
A rhizobial inoculum was introduced to root mass of clover, which was then planted along with ryegrass into soils contaminated with a PAH. Researchers did not detect significant direct uptake or degradation of the PAH by the plants.

Joner, Erik J. et al. **Priming effects on PAH degradation and ecotoxicity during a phytoremediation experiment.** *Environmental Pollution*. 2004; 128 (3):429-435. ISSN: 0269-7491.
Higher degradation rates of PAHs were obtained by a priming effect of soil than phytoremediation of contaminated soil.

Joner, Erik J. et al. **Rhizosphere effects on microbial community structure and dissipation and toxicity of polycyclic aromatic hydrocarbons (PAHs) in spiked soil.** *Environmental Science & Technology*. 2001; 35 (13):2773-2777. ISSN: 0013-936X.
Experiments were undertaken to determine whether mycorrhiza play a role in the remediation of hydrocarbons. Results indicated that PAHs were reduced in soil by mycorrhiza, and that toxicity of the soil was lowered.

Joner, Erik J.; Leyval, Corinne. **Rhizosphere gradients of polycyclic aromatic hydrocarbon (PAH) dissipation in two industrial soils and the impact of arbuscular mycorrhiza.** *Environmental Science & Technology*. 2003; 37 (11):2371-2375. ISSN: 0013-936X.
Phytoremediation rates were greatest in plots containing plants inoculated with mycorrhiza, although amounts differed between two types of PAH-spiked industrial soil.

Joye, Samantha B. **The anaerobic oxidation of methane and sulfate reduction in sediments from Gulf of Mexico cold seeps.** *Chemical Geology*. 2004; 205 (3-4):219-238. ISSN: 0009-2541.
Rates of anaerobic oxidation of methane and sulfate reduction near gas hydrate mounds were determined by means of radiotracer techniques. Results show that sulfate reduction rates were in excess of methane oxidation, but both processes were loosely coupled.

Juhasz, A. L.; Stanley, G. A.; Britz, M. L. **Metabolite repression inhibits degradation of benzo[a]pyrene and dibenz[a,h]anthracene by *Stenotrophomonas maltophilia* VUN 10,003.** *Journal of Industrial Microbiology & Biotechnology*. 2002; 28 (2):88-96. ISSN: 1367-5435.
Soil spiked with pyrene failed to restart B(a)P or dibenzo(a,h)anthracene degradation by *S. maltophilia* in laboratory experiments. Metabolite or by-product repression was responsible for the failure of the bacteria to continue degrading the hydrocarbons.

Juteau, P. et al. **Improving the biotreatment of hydrocarbons-contaminated soils by addition of activated sludge taken from the wastewater treatment facilities of an oil refinery.** *Biodegradation*. 2003; 14 (1):31-40. ISSN: 0923-9820.
The addition of activated sludge from oil refinery wastewater caused greater biodegradation rates of PAHs in soil-based experiments using biopiles, bioreactors and microcosm mediums.

Kamath, Roopa; Schnoor, Jerald L.; Alvarez, Pedro J. J. **Effect of root-derived substrates on the expression of *nah-lux* genes in *Pseudomonas fluorescens* HK44: implications for PAH biodegradation in the rhizosphere.** *Environmental Science & Technology*. 2004; 38 (6):1740-1745. ISSN: 0013-936X.
Root material from several plants and root-derived substrates were tested to assess their ability to manipulate genes responsible for naphthalene dioxygenase expression, in order to amplify microbial degradation of PAHs in the rhizosphere.

Kanaly, Robert A.; Harayama, Shigeaki. **Biodegradation of high-molecular-weight polycyclic aromatic hydrocarbons by bacteria.** *Journal of Bacteriology*. 2000; 182 (8):2059-2067. ISSN: 0021-9193.
In this review, several strains of bacteria capable of degrading high-molecular-weight hydrocarbons are identified.

Kanaly, Robert A.; Harayama, Shigeaki; Watanabe, Kazuya. ***Rhodanobacter* sp strain BPC1 in a benzo[a]pyrene-mineralizing bacterial consortium.** *Applied & Environmental Microbiology*. 2002; 68 (12):5826-5833. ISSN: 0099-2240.
A strain of bacteria in a benzo[a]pyrene-degrading consortium was found to specialize by growing on B(a)P metabolites produced by other bacteria, consequently increasing the bioavailability of the material.

Kanaly, Robert A.; Watanabe, Kazuya. **Multiple mechanisms contribute to the biodegradation of benzo[a]pyrene by petroleum-derived multicomponent nonaqueous-phase liquids.** *Environmental Toxicology and Chemistry*. 2004; 23 (4):850-856. ISSN: 0730-7268.
A diesel fuel distillate was used as a multicomponent nonaqueous-phase liquid (NAPL) in the presence of B(a)P to study its effect on rates of biodegradation by a bacterial consortium. A multimechanistic effect was noted in that the NAPL acted as a cosolvent for degradation, as a substrate to allow for other metabolic pathways, and as an agent to stimulate specific microbial populations in the consortia for rapid and more effective biodegradation.

Kaplan, Isaac R.; Lu, Shan-Tan; Alimi, Hossein M.; MacMurphey, John. **Fingerprinting of high boiling hydrocarbon fuels, asphalts and lubricants.** *Environmental Forensics*. 2001; 2 (3):231-248. ISSN: 1527-5922.
Analysis of "heavy ends" of crude oil with gas chromatography-mass spectrometry in full scan mode revealed the presence and abundance of specific hydrocarbons. Samples of different crude oils, as well as heating oil and lubricating oil, were included in the investigation.

Kar, R. K.; Srivastava, A. K. **Reworked carboniferous palynofossils from panna formation, Bombay offshore basin: clue to hidden target for hydrocarbon exploration.** *Journal of the Geological Society of India*. 2001; 58 (2):179-180. ISSN: 0016-7622.

Kasai, Yuki; Kishira, Hideo; Harayama, Shigeaki. **Bacteria belonging to the genus *Cycloclasticus* play a primary role in the degradation of aromatic hydrocarbons released in a marine environment.** *Applied & Environmental Microbiology*. 2002; 68 (11):5625-5633. ISSN: 0099-2240.
Bacteria that thrived in an enrichment culture were exposed to oil-coated gravel in seawater and found to aerobically degrade hydrocarbons with and without the addition of fertilizers.

Kato, T.; Haruki, M.; Imanaka, T.; Morikawa, M.; Kanaya, S. **Isolation and characterization of long-chain-alkane degrading *Bacillus thermoleovorans* from deep subterranean petroleum reservoirs.** *Journal of Bioscience & Bioengineering*. 2001; 91 (1):64-70. ISSN: 1389-1723.
Thermophilic bacterial strains were isolated from subterranean petroleum reservoirs and identified as *Bacillus thermoleovorans*. They were found to effectively degrade *n*-alkanes, possibly by a terminal oxidation pathway.

Katz, Barry Jay. **Lacustrine basin hydrocarbon exploration - current thoughts.** *Journal of Paleolimnology*. 2001; 26 (2):161-179. ISSN: 0921-2728.
This paper discusses factors controlling the development of lacustrine source rocks and the nature of lacustrine reservoirs, based on depositional models.

Katz, Barry. Jay. **Hydrocarbon shows and source rocks in scientific ocean drilling.** *International Journal of Coal Geology*. 2003; 54 (SI 1-2):139-154. ISSN: 0166-5162.
In this paper, the author argues that data from the results of the Ocean Drilling Program and Deep Sea Drilling Project can be applied to hydrocarbon exploration worldwide.

Kawasaki, Mikio; Kuriss, Anabel; Fukushima, Masami; Sawada, Akira; Tats, Kenji. **Effects of pH and organic co-solvents on the oxidation of naphthalene with peroxosulfate catalyzed by iron(III) tetrakis(p-sulfonatophenyl)porphyrin.** *Journal of Porphyrins and Phthalocyanines*. 2003; 7 (9-10):645-650. ISSN: 1088-4246.

Kawata, Kuniaki et al. **Determination of semivolatile organic compounds in environmental samples by gas chromatography/mass spectrometry after extraction by cyclic steam distillation.** *Journal of AOAC International*. 2003; 86 (2):246-256. ISSN: 1060-3271.
Authors report on a successful method of making multiple determinations of semivolatile compounds, including PAHs, from sediment, soil, groundwater, river water and seawater by isolating compounds with an essential oil distillator.

Ke, L.; Wang, W. Q.; Wong, Teresa W. Y.; Wong, Yuk-shan; Tam, Nora Fung-yee. **Removal of pyrene from contaminated sediments by mangrove microcosms.** *Chemosphere*. 2003; 51 (1):25-34. ISSN: 0045-6535.
Authors report that while pyrene was effectively removed from samples in a study, the role of root accumulation and uptake by two species of mangrove was inconsequential.

Ke, L.; Wong, Teresa W. Y.; Wong, A. H. Y.; Wong, Yuk-shan; Tam, Nora Fung-yee. **Negative effects of humic acid addition on phytoremediation of pyrene-contaminated sediments by mangrove seedlings.** *Chemosphere*. 2003; 52 (9):1581-1591. ISSN: 0045-6535.
Microcosms with mangrove seedlings and without vegetation were more efficient at removing pyrene from soil than similar microcosms amended with 6.7% concentrations of humic acid.

Ke, L.; Wong, Teresa W. Y.; Wong, Yuk-shan; Tam, Nora Fung-yee. **Fate of polycyclic aromatic hydrocarbon (PAH) contamination in a mangrove swamp in Hong Kong following an oil spill.** *Marine Pollution Bulletin*. 2002; 45 (1-12):339-347. ISSN: 0025-326X.
Researchers examined a mangrove swamp to record the fate of PAHs between 30 and 126 days after an oil spill. Tidal washing and photo-oxidation were responsible for most of the weathering of crude in the observed time.

Kepkay, P. E.; Bugden, J. B. C.; Lee, Kenneth; Stoffyn-Egli, Patricia. **Application of ultraviolet fluorescence spectroscopy to monitor oil-mineral aggregate formation.** *Spill Science & Technology Bulletin*. 2002; 8 (1):101-108. ISSN: 1353-2561.
In situ oil-mineral aggregates (OMA) found in sediment samples were analyzed by researchers using UVF spectroscopy to predict and monitor OMA formation.

Kerman, Kagan et al. **Electrochemical DNA biosensor for the determination of benzo[a]pyrene-DNA adducts.** *Analytica Chimica Acta*. 2001; 450 (1-2):45-52. ISSN: 0003-2670.
Electrochemical DNA biosensors were used in the detection of adduct creation when DNA was exposed to B(a)P. Electrochemical DNA biosensors are fast, inexpensive, easy to use, and hold great promise for use in future environmental and clinical monitoring situations.

Kessinger, Walter. **Curved-ray time migration can improve seismic imaging.** *Oil & Gas Journal*. 2002; 100 (41):34-41. ISSN: 0030-1388.
Curved-ray prestack Kirchhoff time migration creates more accurate images of steep dip and fault planes than previous seismic time migration methods. Migration velocities derived using this application provide better estimates of subsurface seismic properties.

Khain, V. E.; Polyakova, I. D. **Geodynamic environments of oil and gas generation on continental slopes of deep-water basins.** *Geologiya I Geofizika*. 2004; 45 (1):3-11. ISSN: 0016-7886.
An analysis of major geological events influencing the development of offshore basins leads authors to speculate on likely deepwater sources of petroleum off Russia's coasts.

Kim, H. Y.; Song, H. G. **Transformation and mineralization of 2,4,6-trinitrotoluene by the white rot fungus *Irpex lacteus*.** *Applied Microbiology and Biotechnology*. 2003; 61 (2):150-156. ISSN: 0175-7598.
Two different transformation pathways were discovered in the initial degradation of a specific hydrocarbon by white rot fungus. Researchers identified the more favorable denitration pathway and the nitro group pathway as specific options of mineralization.

Kim, Han S.; Weber, Walter J., Jr. **Bioaccumulation and toxic potencies of polychlorinated biphenyls and polycyclic aromatic hydrocarbons in tidal flat and coastal ecosystems of the Ariake Sea, Japan.** *Environmental Science & Technology*. 2003; 37 (16):3574-3580. ISSN: 0013-936X.
Excess doses of surfactants caused bacteria to utilize the surfactant as the primary carbon source. This, in turn, affected an associated release of phenanthrene, which reverted to a crystallized form.

Kim, In S.; Park, Jong-Sup; Kim, Kyoung-Woong. **Enhanced biodegradation of polycyclic aromatic hydrocarbons using nonionic surfactants in soil slurry.** *Applied Geochemistry*. 2001; 16 (11-12):1419-1428. ISSN: 0883-2927.
While investigating nonionic surfactants in the biodegradation process, researchers discovered a linear proportionality between PAH solubility and the concentration of surfactants above critical micelle concentration. This proportionality increased as the hydrophile-lipophile balance value decreased.

Kim, Song-Bae; Hwang, In; Kim, Dong-Ju; Lee, Sangjin; Jury, William A. **Effect of sorption on benzene biodegradation in sandy soil.** *Environmental Toxicology and Chemistry*. 2003; 22 (10):2306-2311. ISSN: 0730-7268.
Experiments on BTEX compounds in sandy soil found a correlation between sorption and amounts of powdered activated carbon added to the sites, resulting in a corresponding reduction in biodegradation levels.

Kim, Song-Bae; Park, Choon-Hwa; Kim, Dong-Ju; Jury, William A. **Kinetics of benzene biodegradation by *Pseudomonas aeruginosa*: parameter estimation.** *Environmental Toxicology and Chemistry*. 2003; 22 (5):1038-1045. ISSN: 0730-7268.
Investigators monitored benzene concentrations over time as the compound was degraded by bacteria in solution and in sandy aquifer materials. Results of biodegradation kinetics were then compared to parameters determined by a Monod-no-growth kinetics model.

Kim, Tae Jung; Lee, Eun Young; Kim, Youn Jung; Cho, Kyung-Suk; Ryu, Hee Wook. **Degradation of polyaromatic hydrocarbons by *Burkholderia cepacia* 2A-12.** *World Journal of Microbiology & Biotechnology*. 2003; 19 (4):411-417. ISSN: 0959-3993.
A bacterial strain was isolated from oil-contaminated soil and tested for its ability to degrade a number of PAHs. The bacterium was able to degrade pyrene with the addition of cosubstrate, and researchers discovered that the microbe thrived when exposed to high concentrations of both pyrene and phenanthrene.

King, Amanda J.; Readman, James W.; Zhou, John L. **The application of solid-phase micro-extraction (SPME) to the analysis of polycyclic aromatic hydrocarbons (PAHs).** *Environmental Geochemistry and Health*. 2003; 25 (1):69-75. ISSN: 0269-4042.
Preliminary investigations confirm that SPME is a useful tool for analyzing PAHs in environmental samples.

Kira, S.; Katsuse, T.; Nogami, Y. **Measurement of benzo[a]pyrene in sea water and in mussels in the Seto Inland Sea, Japan.** *Bulletin of Environmental Contamination and Toxicology*. 2000; 65 (5):631-637. ISSN: 0007-4861.
Blue Rayon, an absorbent selective to compounds having three or more fused rings, has a high affinity to PAHs such as benzo(a)pyrene, and is useful to determine concentrations of PAHs in an aquatic environment. This new material can be transported very easily and is relatively inexpensive.

Klimkiewicz, R.; Grabowska, H.; Syper, L. **Oil industry waste as a basis for synthesis of new type surfactants.** *Polish Journal of Environmental Studies*. 2001; 10 (5):337-339. ISSN: 1230-1485.

Knightes, Christopher D.; Peters, Catherine A. **Aqueous phase biodegradation kinetics of 10 PAH compounds.** *Environmental Engineering Science*. 2003; 20 (3):207-218. ISSN: 1092-8758.
Biodegradation rates for PAHs in an aqueous system were found to be comparable, despite the differences in molecule sizes of the compounds. Researchers believe that the data they compiled from aqueous phase experiments contrasts with data from field studies because biodegradation rates in field samples are influenced by physical-chemical processes.

Ko, Eun-Joung; Kim, Kyoung-Woong; Wachsmuth, U. **Remediation process monitoring of PAH-contaminated soils using laser-induced fluorescence.** *Environmental Monitoring and Assessment*. 2004; 92 (1-3):179-191. ISSN: 0167-6369.
Variations in the intensity of laser-induced fluorescence were investigated, relative to soil properties such as moisture content and soil particle size distribution, with the intent of using the technique for optimal electrokinetic remediation monitoring of PAH-contaminated soils.

Ko, Eun-Joung; Lee, Chul-Kyu; Kim, Y. J.; Kim, Kyoung-Woong. **Monitoring PAH-contaminated soil using laser-induced fluorescence (LIF).** *Environmental Technology*. 2003; 24 (9):1157-1164. ISSN: 0959-3330.
Laser-induced fluorescence was successful in establishing levels of PAH contamination in soils under different conditions, such as soil/sand particle size distribution and moisture content.

Ko, Seok-Oh; Yoo, Hee-Chan. **Enhanced desorption of phenanthrene from soils using hydroxypropyl-ß-cyclodextrin: experimental results and model predictions.** *Journal of Environmental Science and Health Part B - Pesticides Food Contaminants and Agricultural Wastes*. 2003; 38 (6):829-841. ISSN: 0360-1234.
Hydroxypropyl-ß-cyclodextrin (HPCD) was found to remove sorbed phenanthrene from soil, leading investigators to suggest HPCD flushing as an effective method of removing hydrophobic organic pollutants from soils.

Kolwzan, Barbara. **Bacterial preparations for degradation of petroleum products in soil.** *Fresenius Environmental Bulletin*. 2004; 13 (3A):216-219. ISSN: 1018-4619.
The author reports on a three-month *ex situ* method of bioremediation using oil-degrading strains of bacteria. Results showed very high degradation rates of petroleum products as estimated by concentrations within the soil.

Koopmans, Martin P. et al. **Biodegradation and mixing of crude oils in Eocene Es3 reservoirs of the Liaohe basin, northeastern China.** *AAPG Bulletin*. 2002; 86 (10):1833-1843. ISSN: 0149-1423.
A model was used to confirm the effect of geologic controls on the biodegradation and mixing of oils in a single reservoir of oil. The model employed in this study can be used to predict oil viscosity in reservoirs, which is useful data for geologists to have before the production process commences.

Koren, Omry; Knezevic, Vishnia; Ron, Eliora Z.; Rosenberg, Eugene. **Petroleum pollution bioremediation using water-insoluble uric acid as the nitrogen source.** *Applied and Environmental Microbiology*. 2003; 69 (10):6337-6339. ISSN: 0099-2240.
In experiments simulating open systems, uric acid crystals adhered to droplets of crude oil, supplying a strain of *Acinetobacter* with a nitrogen source necessary for degradation of hydrocarbons.

Kornmuller, Anja; Weismann, Udo. **Ozonation of polycyclic aromatic hydrocarbons in oil/water-emulsions: mass transfer and reaction kinetics.** *Water Research*. 2003; 37 (5):1023-1032. ISSN: 0043-1354.
In this study, researchers reveal the mechanisms behind mass transfer and reaction kinetics during the ozonation of five-ring PAHs in three phase systems.

Kosaric, Naim. **Biosurfactants and their application for soil bioremediation.** *Food Technology and Biotechnology*. 2001; 39 (4):295-304. ISSN: 1330-9862.

Kose, Tomohiro; Miyagishi, A.; Mukai, Tetsuo; Takimoto, Kazuto; Okada, Mitsumasa. **Effect of non-aqueous phase liquid on biodegradation of PAHs in spilled oil on tidal flat.** *Water Science and Technology*. 2003; 47 (7-8):243-250. ISSN: 0273-1223.
Authors used model reactors to investigate the relationship between dissolution rates of PAHs and the viscosity of non-aqueous phase liquids during the biodegradation process.

Kose, Tomohiro; Mukai, Tetsuo; Takimoto, Kazuto; Okada, Mitsumasa. **Effect of non-aqueous phase liquid on biodegradation of PAHs in spilled oil on tidal flat.** *Water Research*. 2003; 37 (8):1729-1736. ISSN: 0043-1354.
Model reactors were used to assess the effects of dissolution rates of PAHs on biodegradation efficiency. The rate of decrease of naphthalene was also found to impact PAH biodegradation rates.

Kotha, Y. **Sedimentology and sequence stratigraphy of hydrocarbon-bearing Mandapeta pays: a braided fluvial reservoir, Krishna-Godavari basin.** *Journal of the Geological Society of India*. 2002; 60 (3):249-270. ISSN: 0016-7622.

Kot-Wasik, Agata. **Studies on fluorene stability in different liquid media.** *Analytica Chimica Acta*. 2004; 505 (2):289-299. ISSN: 0003-2670.
Eight organic solvents were assessed to understand the influence of several factors, such as light, bacteria, and type of solvent, on degradation rates of fluorine within each type of storage media.

Kowalewska, Grazyna; Konat, Joanna; Dobrowolska, Swietoslawa. **Why is it easier to determine PAHs than PCBs in marine sediments?** *Chemia Analityczna*. 2002; 47 (2):189-203. ISSN: 0009-2223.
Authors believe that PAHs are easier to identify in marine sediments because the physico-chemical properties are less varied than PCBs, or very different (characteristic spectra in the UV-VIS range) than the relevant properties of PCBs.

Kraaij, Rik H.; Ciarelli, Silvana; Tolls, Johannes; Kater, Belinda J.; Belfroid, Angelique. **Bioavailability of lab-contaminated and native polycyclic aromatic hydrocarbons to the amphipod *Corophium volutator* relates to chemical desorption.** *Environmental Toxicology and Chemistry*. 2001; 20 (8):1716-1724. ISSN: 0730-7268.
Results of experiments on amphipods showed that the biota-to-sediment accumulation factor of PAHs corresponded with rates of desorption of both native and lab-contaminated hydrocarbons in sediment.

Kronholm, Juhani.; Kalpala, J.; Hartonen, Kari.; Riekkola, Marja-Liisa. **Pressurized hot water extraction coupled with supercritical water oxidation in remediation of sand and soil containing PAHs.** *Journal of Supercritical Fluids*. 2002; 23 (2):123-134. ISSN: 0896-8446.

Kronholm, Juhani; Desbands, Benjamin; Hartonen, Kari; Riekkola, Marja-Liisa. **Environmentally friendly laboratory-scale remediation of PAH-contaminated soil by using pressurized hot water extraction coupled with pressurized hot water oxidation.** *Green Chemistry*. 2002; 4 (3):213-219. ISSN: 1463-9262.
Pressurized hot water extraction was combined with an oxidant, potassium persulfate, to determine the feasibility of this process in the remediation of contaminated soil. Authors discovered a reduction in the total amount of carbon from this method, although considerable amounts of organics remained in the soil.

Krupcík, Ján; Oswald, Peter; Oktavec, Drahomír; Armstrong, Daniel W. **Calibration of GC-FID and IR spectrometric methods for determination of high boiling petroleum hydrocarbons in environmental samples.** *Water, Air, & Soil Pollution*. 2004; 153 (1-4):329-341. ISSN: 0049-6979.
Authors demonstrate the types and magnitudes of calibration problems that arise from determining certain petroleum hydrocarbons with gas chromatography-flame ionization detection and infrared (IR) spectrometric methods. Following this, they propose calibration of the IR method using empirical equations proposed in DIN 38, 409, Part 18, for determining total petroleum hydrocarbons in waters polluted with high boiled petroleum factors.

Kuhn, Achim; Ballach, Hans-Joachim; Wittig, Rüdiger. **Studies in the biodegradation of 5 PAHs (phenanthrene, pyrene, fluoranthene, chrysene and benzo[a]pyrene) in the presence of rooted poplar cuttings.** *Environmental Science and Pollution Research*. 2004; 11 (1):22-32. ISSN: 0944-1344.

Kuiper, Irene; Bloemberg, Guido V.; Lugtenberg, Ben J. J. **Selection of a plant-bacterium pair as a novel tool for rhizostimulation of polycyclic aromatic hydrocarbon-degrading bacteria.** *Molecular Plant - Microbe Interactions*. 2001; 14 (10):1197-1205. ISSN: 0894-0282.
Due to its root structure, *Lolium multiflorum*, a grass, was chosen to host a rhizobacteria for experiments on the degradation of naphthalene. *Pseudomonas putida* strain PCL1444 successfully colonized the root structure of the grass and was effective in degrading naphthalene.

Kukkonen, J. V. K. et al. **Sediment characteristics affecting desorption kinetics of select PAH and PCB congeners for seven laboratory spiked sediments.** *Environmental Science & Technology*. 2003; 37 (20):4656-4663. ISSN: 0013-936X.
Rapid desorption rates of B(a)P was dependent upon components of sediment consisting of younger organic matter, such as plant pigment, lipids and lignin.

Kuosmanen, K.; Hyötyläinen, Tuulia; Hartonen, Kari; Jönsson, J. Å.; Riekkola, Marja-Liisa. **Analysis of PAH compounds in soil with on-line coupled pressurised hot water extraction-microporous membrane liquid-liquid extraction-gas chromatography.** *Analytical and Bioanalytical Chemistry*. 2003; 375 (5):389-399. ISSN: 1618-2642.
Authors describe the processes in a new method of online analysis of PAH-contaminated soil samples. This method is reliable, accurate, and with small modifications, can be used to detect PAHs in aqueous samples.

Kuyukina, Maria S. et al. **Bioremediation of crude oil-contaminated soil using slurry-phase biological treatment and land farming techniques.** *Soil & Sediment Contamination*. 2003; 12 (1):85-99. ISSN: 1532-0383.
Researchers investigated the decontamination of waste oil-polluted soil with *ex situ* biotechnology involving a PAH-degrading bacteria-based biofertilizer in field-scale experiments. Land farming was found to be a sufficient technique for low levels of pollution, while land farming in conjunction with a soil slurry bioreactor was necessary for heavy oil contamination.

Lalande, T. L. et al. **Phytoremediation of pyrene in a Cecil soil under field conditions.** *International Journal of Phytoremediation*. 2003; 5 (1):1-12. ISSN: 1522-6514.
In this study, the effects of annual ryegrass (*Lolium multiflorum*) and phosphorous concentrations on pyrene degradation in Cecil loamy sand were evaluated. Pyrene removal was not significantly enhanced by the presence of ryegrass or high concentrations of phosphorous.

Lanfranconi, Mariana P.; Alvarez, Héctor M.; Studdert, Claudia A. **A strain isolated from gas oil-contaminated soil displays chemotaxis towards gas oil and hexadecane.** *Environmental Microbiology*. 2003; 5 (10):1002-1008. ISSN: 1462-2912.
Three different chemotaxis methods confirmed that a strain of hydrocarbon-degrading bacteria was chemotactic to gas oil and hexadecane, as well as to a variety of carbon sources that can serve as growth substrates.

LaRiviere, Daniel J.; Autenreith, Robin L.; Bonner, James S. **Redox dynamics during recovery of an oil-impacted estuarine wetland.** *Water Research*. 2003; 37 (14):3307-3318. ISSN: 0043-1354.
Reduced redox potentials were found to correspond with sulfate reduction following treatment of crude oil-impacted sediments at a wetland site. Researchers believe that reduced redox levels were due to biological oxidation by alkane- and PAH-degrading organisms.

Larter, Steve et al. **The controls on the composition of biodegraded oils in the deep subsurface - part 1: biodegradation rates in petroleum reservoirs.** *Organic Geochemistry*. 2003; 34 (4):601-613. ISSN: 0146-6380.
This study projects the rate of biodegradation in oilfields based upon data from a combination of sources, including whole oil-column minimum rate estimates, diffusion-controlled oil column compositional gradient modeling and mixed oil kinetic models.

Lattuati, A.; Metzger, P.; Acquaviva, M.; Bertrand, J. C.; Largeau, C. ***n*-alkane degradation by *Marinobacter hydrocarbonoclasticus* strain SP 17: long chain β-hydroxy acids as indicators of bacterial activity.** *Organic Geochemistry*. 2002; 33 (1):37-45. ISSN: 0146-6380.

Lau, K. L.; Tsang, Y. Y.; Chiu, S. W. **Use of spent mushroom compost to bioremediate PAH-contaminated samples.** *Chemosphere*. 2003; 52 (9):1539-1546. ISSN: 0045-6535.
The addition of spent mushroom compost to sandy loam soil significantly reduced PAH toxicity. GC/MS analysis of derivative products confirmed the reduction or removal of toxic compounds in the samples.

Laughrey, Zachary; Bear, Erin; Jones, Robert; Tarr, Matthew A. **Aqueous sonolytic decomposition of polycyclic aromatic hydrocarbons in the presence of additional dissolved species.** *Ultrasonics Sonochemistry*. 2001; 8 (4):353-357. ISSN: 1350-4177.
Sonochemistry was used to explore the possibility of degrading PAHs. Anthracene, phenanthrene and pyrene were studied to determine degradation rates in the presence of other compounds, such as humic acid and benzoic acid. Results indicate that oxygen-derived radicals play the most important role in the decomposition of PAHs.

Lavine, B. K.; Brzozowski, D.; Moores, A. J.; Davidson, C. E.; Mayfield, H. T. **Genetic algorithm for fuel spill identification.** *Analytica Chimica Acta*. 2001; 437 (2):233-246. ISSN: 0003-2670.
Authors argue that pattern recognition analysis of gas chromatography data is less subjective in the identification of fuel spills. A genetic algorithm is then suggested for applying pattern recognition methods to GC spill data.

Lavine, B. K.; Vesanen, A.; Brzozowski, D. M.; Mayfield, H. T. **Authentication of fuel spill standards using gas chromatography/pattern recognition techniques.** *Analytical Letters*. 2001; 34 (2):281-293. ISSN: 0003-2719.

Law, R. J. **The analysis of polycyclic aromatic hydrocarbons in marine samples.** *International Journal of Environmental Pollution*. 2000; 13 (1-6):262-283. ISSN: 0188-4999.

Law, Robin; Kelly, Carole A.; Nicholson, Mike D. **The QUASIMEME laboratory performance study of polycyclic aromatic hydrocarbons (PAHs): assessment for the period 1996-1999.** *Journal of Environmental Monitoring*. 2000; 2 (5):517-523. ISSN: 1464-0325.
Performance criteria for satisfactory results of the determination of PAH in sediments and biota are discussed. Authors note that differences in performance were apparent between gas chromatography and high-performance liquid chromatography. Future methodology will utilize coupled gas-chromatography mass spectrometry.

Lázaro, M. J.; Moliner, R.; Suelves, I.; Domeño, C.; Nerín, C. **Co-pyrolysis of a mineral waste oil/coal slurry in a continuous-mode fluidized bed reactor.** *Journal of Analytical and Applied Pyrolysis*. 2002; 65 (2):239-252. ISSN: 0165-2370.

Le Dréau, Y.; Doumeng, P.; Lamontagne, J.; Kister, J.; Mille, G. **PAHs in sediments contaminated by the *Haven* oil spill (Genoese Bay).** *Polycyclic Aromatic Compounds*. 2000; 20 (1-4):111-122. ISSN: 1040-6638.
Analysis of sediments and tarry residues 40 months after the *Haven* accident revealed the existence of a high level of PAH's, due to partial burning of the crude oil, and little evidence of degradation of hydrocarbon residues.

Leblond, Jeffrey D.; Schlutz, T. Wayne; Sayler, Gary S. **Observations on the preferential biodegradation of selected components of polyaromatic hydrocarbon mixtures.** *Chemosphere*. 2001; 42 (4):333-343. ISSN: 0045-6535.
The naphthaline degrading enzyme system of a half-dozen bacterial strains was tested for the ability to degrade mixtures of PAHs and heterocyclic compounds.

Lee, Byung-Dae; Hosomi, Masaaki. **A hybrid Fenton oxidation-microbial treatment for soil highly contaminated with benz(a)anthracene.** *Chemosphere*. 2001; 43 (8):1127-1132. ISSN: 0045-6535.
Results of experiments on soil contaminated with benz(a)anthracene demonstrate that Fenton oxidation enhances biodegradation. Ethanol, added before the Fenton oxidation process, encourages higher rates of degradation by increasing the solubility of B(a)A.

Lee, Chon-Lin; Kuo, Li-Jung; Wang, Huei-Ling; Hsieh, Ping-Chieh. **Effects of ionic strength on the binding of phenanthrene and pyrene to humic substances: three-stage variation model.** *Water Research*. 2003; 37 (17):4250-4258. ISSN: 0043-1354.
A model was developed to assess the parameters of binding constants associated with ionic strength, and to better understand the mechanisms that influence changes in their affiliation, especially when PAHs are exposed to humic acid in various electrolyte solutions.

Lee, J. Y.; Lee, C. H.; Lee, K. K.; Choi, S. I. **Evaluation of soil vapor extraction and bioventing for a petroleum-contaminated shallow aquifer in Korea.** *Soil & Sediment Contamination*. 2001; 10 (4):439-458. ISSN: 1522-6514.

Lee, Kenneth et al. **Composition and toxicity of residual Bunker C fuel oil in intertidal sediments after 30 years.** *Spill Science & Technology Bulletin*. 2003; 8 (2):187-199. ISSN: 1353-2561.
Researchers examined sediment samples of residual oil taken from a sheltered lagoon in Black Duck Cove along the Nova Scotia coastline 30 years after an oil spill. Researchers also investigated the natural processes that mediate biodegradation and the physical removal of oil from sediments at this site.

Lee, Shi-Hee et al. **Preparation of ceramic membrane and application to the crossflow microfiltration of soluble waste oil.** *Materials Letters*. 2002; 52 (4-5):266-271. ISSN: 0167-577X.
A ceramic membrane was used in experiments to determine its effectiveness in retarding fouling during normal operations and backflushing conditions in the microfiltration of soluble waste oil.

Lehto, Kirsi-Maarit; Lemmetyinen, Helge; Puhakka, Jaakko A. **Biodegradation of photoirradiated polycyclic aromatic hydrocarbon constituents of creosote oil.** *Environmental Technology*. 2000; 21 (8):901-907. ISSN: 0959-3330.

Lehto, Kirsi-Maarit; Puhakka, Jaakko A.; Lemmetyinen, Helge. **Biodegradation of selected UV-irradiated and non-irradiated polycyclic aromatic hydrocarbons (PAHs).** *Biodegradation*. 2003; 14 (4):249-263. ISSN: 0923-9820.
Hydrocarbon-degrading bacterial cultures were used to compare differences in biodegradation rates between UV-irradiated and non-irradiated PAHs. Results indicated that successful UV pretreatment was highly dependent on the specific compounds being treated and on the microbial cultures present.

Lehto, Kirsi-Maarit; Puhakka, Jaakko A.; Lemmetyinen, Helge. **Photodegradation products of polycyclic aromatic hydrocarbons in water and their amenability to biodegradation.** *Polycyclic Aromatic Compounds*. 2003; 23 (4):401-416. ISSN: 1040-6638.
After PAHs were exposed to UV light, photodegradation products were isolated for identification and later studied with their parent hydrocarbon to understand their role in biodegradation lag times.

Lehto, Kirsi-Maarit; Vuorimaa, E.; Lemmetyinen, Helge. **Photolysis of polycyclic aromatic hydrocarbons (PAHs) in dilute aqueous solutions detected by fluorescence.** *Journal of Photochemistry and Photobiology A - Chemistry*. 2000; 136 (1-2):53-60. ISSN: 1010-6030.

Lei, An-ping; Wong, Yuk-shan; Tam, Nora Fung-yee. **Removal of pyrene by different microalgal species.** *Water Science and Technology*. 2002; 46 (11-12):195-201. ISSN: 0273-1223.
Investigators report on the success of seven microalgal species in the removal of pyrene from a solution in experiments ranging from six hours to seven days of exposure. Of the species tested, *Selenastrum capricornutum* was the most efficient at removing pyrene from solution.

Lei, Li; Suidan, Makram T.; Khodadoust, Amid P.; Tabak, Henry H. **Assessing the bioavailability of PAHs in field-contaminated sediment using XAD-2 assisted desorption.** *Environmental Science & Technology*. 2004; 38 (6):1786-1793. ISSN: 0013-936X.
A nonionic polymeric adsorbent accelerated the desorption of PAHs in aged field-contaminated sediment. An adsorbent-assisted desorption assay shows promise in measuring bioavailability and predicting end points of bioremediation of PAHs in sediment.

Lei, T.; Pei, M.; Zhong, J. J. **Impact of the presence of salicylate or glucose on enzyme activity and phenanthrene degradation by *Pseudomonas mendocina*.** *Process Biochemistry*. 2003; 38 (8):1125-1132. ISSN: 0032-9592.

Leifer, Ira; MacDonald, Ian. **Dynamics of the gas flux from shallow gas hydrate deposits: interaction between oily hydrate bubbles and the oceanic environment.** *Earth and Planetary Science Letters*. 2003; 210 (3-4):411-424. ISSN: 0012-821X.
Back illumination imaging was used to analyze the rise speeds, bubble distribution, and mass flux of hydrocarbon bubbles (gas flux) escaping from decomposing methane hydrates along the continental margin. From vertical velocities, researchers were able to conclude that bubbles were contaminated with oil.

Lepo, Joe Eugene; Cripe, C. R. **Development and Application of Protocols for Evaluation of Oil Spill Bioremediation.** Gulf Breeze, Fl.: U.S. Environmental Protection Agency, Research and Development, National Health and Environmental Effects Research Laboratory; 1998;6 pp.
Different types of bioremediation tests were evaluated to give on-site coordinators better information about the effectiveness of commercial oil spill bioremediation agents.

Lepo, Joe Eugene; Cripe, C. R. **Effectiveness and Safety of Strategies for Oil Spill Bioremediation: Potential and Limitation, Laboratory to Field.** Gulf Breeze, Fl.: U.S. Environmental Protection Agency, Research and Development, National Health and Environmental Effects Research Laboratory; 1998; 6 pp.
Various criteria for judging the effectiveness of commercial bioremediation agents are described in this report.

Lepo, Joe. Eugene.; Cripe, C. R.; Kavanaugh, J. L.; Zhang, S.; Norton, G. P. **The effect of amount of crude oil on extent of its biodegradation in open water- and sandy beach-laboratory simulations.** *Environmental Technology*. 2003; 24 (10):1291-1302. ISSN: 0959-3330.
At low doses, North Slope crude oil was effectively biodegraded both in open water and beach microcosms by regular use of marine bacteria. However, at higher doses, biodegradation ceased to be effective in these systems to the point where rates from remediation were statistically indistinguishable between treatment systems and controls.

Levin, L.; Viale, A.; Forchiassin, A. **Degradation of organic pollutants by the white rot basidiomycete *Trametes trogii*.** *International Biodeterioration & Biodegradation*. 2003; 52 (1):1-5. ISSN: 0964-8305.
A fungal species that has already shown promise in the degradation of various organic pollutants was found to remove over 90% of contaminants, including anthracene, in concentrations between 250 and 500 ppm.

Leyval, Corinne; Joner, Erik J.; del Val, C.; Haselwandter, K. **Potential of arbuscular mycorrhizal fungi for bioremediation.** *In* Gianinazzi, S.; Schuepp, H.; Barea, J. M.; Haselwandter, K. (Eds.) *Mycorrhizal Technology in Agriculture: from Genes to Bioproducts*. Basel, Switzerland: Birkhauser Verlag Ag; 2002; p. 175-186. ISBN: 3-7643-6485-8.

Li, Jianfeng; Fuller, Steven; Cattle, Julie; Way, Christopher Pang; Hibbert, D. Brynn. **Matching fluorescence spectra of oil spills with spectra from suspect sources.** *Analytica Chimica Acta*. 2004; 514 (1):51-56. ISSN: 0003-2670.
Fluorescence spectra, either in combination with principal components analysis or direct matching of spectra, can be a quick and effective screening method for matching oil spills with suspected sources.

Li, Mingyuan; Xu, Mingjin; Ma, Yu; Wu, Zhaoling; Christy, Alfred A. **The effect of molecular parameters on the stability of water-in-crude oil emulsions studied by IR and UV spectroscopy.** *Colloids and Surfaces A - Physicochemical and Engineering Aspects*. 2002; 197 (1-3):193-201. ISSN: 0927-7757.
Results of IR and UV spectroscopy of water-in-crude oil emulsions demonstrate that the stability of crude oil fractions in water is due to the combination of a number of factors, including molecular size, aromaticity, aromatic condensation, and carbonyl group concentrations.

Li, Peijun et al. **Field-scale bioremediation of soil contaminated with crude oil.** *Environmental Engineering Science*. 2002; 19 (5):277-289. ISSN: 1092-8758.
Biodegradation of oil-contaminated soil was investigated with experiments using composting biopile windrows technology. Soils were inoculated with indigenous fungi and amended with a combination of chicken excrement and rice husk acting as nutrients and bulking agents.

Li, Qing-Shan; Ogawa, Jun; Schmid, Rolf D.; Shimizu, Sakayu. **Engineering cytochrome P450 BM-3 for oxidation of polycyclic aromatic hydrocarbons.** *Applied & Environmental Microbiology*. 2001; 67 (12):5735-5739. ISSN: 0099-2240.
A P450 enzyme was extracted from *Bacillus magaterium* for use in biodegradation experiments. Research demonstrated that engineering the enzyme resulted in a four-fold improvement in degradation of specific hydrocarbons by the bacteria.

Li, Sumei; Pang, Xiongqi; Li, Maowen; Jin, Zhijun. **Geochemistry of petroleum systems in the Niuzhuang South Slope of Bohai Bay Basin. Part 1: source rock characterization.** *Organic Geochemistry*. 2003; 34 (3):389-412. ISSN: 0146-6380.
Investigators found variations in the distribution and concentrations of hydrocarbon markers in rock extracts as a function of burial depth. It is believed that this might explain the uncertainty in maturity assessment as it relates to defining "immature oils" from data related to biomarker isomerization ratios.

Librando, V.; Hutzinger, O.; Tringali, G.; Aresta, M. **Supercritical fluid extraction of polycyclic aromatic hydrocarbons from marine sediments and soil samples.** *Chemosphere*. 2004; 54 (8):1189-1197. ISSN: 0045-6535.
A certified sample of contaminated marine sediment was characterized by GC-MS. The recovery yield was estimated for 6 PAHs. Analytical conditions taken from the certified sample were applied to a soil sample spiked with 11 PAHs to appraise the best recovery efficiency for soil remediation.

Lichman, E.; Peters, S. W.; Squyres, D. H. **Direct hydrocarbon detection by wavelet energy absorption.** *Oil & Gas Journal*. 2004; 102 (2):34-39. ISSN: 0030-1388.
This article describes the use of a new, reliable method for the direct detection of hydrocarbons from seismic data.

Lindsey, Michael; Xu, Guoxiang; Lu, Jia; Tarr, Matthew A. **Enhanced Fenton degradation of hydrophobic organics by simultaneous iron and pollutant complexation with cyclodextrins.** *Science of the Total Environment*. 2003; 307 (1-3):215-229. ISSN: 0048-9697.
Cyclodextrins were used to increase the efficiency of Fenton degradation in experiments involving contaminants, including PAHs. Authors believe that specific derivatives of cyclodextrins may increase degradation rates for specific compounds.

Lindstrom, Jon E.; Braddock, Joan F. **Biodegradation of petroleum hydrocarbons at low temperature in the presence of the dispersant Corexit 9500.** *Marine Pollution Bulletin*. 2002; 44 (8):739-747. ISSN: 0025-326X.
In cold weather conditions, addition of a dispersant may inhibit the biodegradation of hydrocarbons. Radiorespirometry data indicates that this inhibition cannot be predicted by the class of hydrocarbon.

Lindström, Kristina et al. **Potential of the Galega *Rhizobium galegae* system for bioremediation of oil-contaminated soil.** *Food Technology and Biotechnology*. 2003; 41 (1):11-16. ISSN: 1330-9862.
Rhizosphere isolates were successfully used to degrade *m*-toluate in oil and BTEX-contaminated soils.

Liste, Hans-Holger; Alexander, Martin. **Butanol extraction to predict bioavailability of PAHs in soil.** *Chemosphere*. 2002; 46 (7):1011-1017. ISSN: 0045-6535.
Researchers found that both *n*-butanol and earthworms were found to remove roughly 70% of pyrene remaining in soil after extensive biodegradation. Butanol extraction may be useful as a means of predicting bioavailability of PAHs in polluted soils.

Litani-Barzilai, Iris; Bulatov, Valery; Gridin, Vladimir V.; Schechter, Israel. **Detector based on time-resolved ion-induced voltage in laser multiphoton ionization and laser-induced fluorescence.** *Analytica Chimica Acta*. 2004; 501 (2):151-156. ISSN: 0003-2670.
This paper describes a method for detecting and quantifying PAH compounds in air by combining data from three separate measurements for improved identification of pollutants in environmental samples.

Liu, Jing-fu; Chi, Yu-guang; Jiang, Gui-bin; Tai, Chao; Hu, Jing-tian. **Use of cotton as a sorbent for on-line precolumn enrichment of polycyclic aromatic hydrocarbons in waters prior to liquid chromatography determination.** *Microchemical Journal*. 2004; 77 (1):19-22. ISSN: 0026-265X.
Cotton was found to be effective in trapping PAHs in water samples for analysis by liquid chromatography with fluorescence detection.

Liu, Yongsheng; Zhang, Jie; Zhang, Zhongze. **Isolation and characterization of polycyclic aromatic hydrocarbons-degrading *Sphingomonas* sp. strain ZL5.** *Biodegradation*. 2004; 15 (3):205-212. ISSN: 0923-9820.
Researchers discuss the kinetics of degradation by an isolate and, more specifically, the enzymatic action that enables the bacteria to degrade phenanthrene but not naphthalene.

Loehr, Raymond C.; Lamar, Michael R.; Poppendieck, Dustin G. **A protocol to estimate the release of anthropogenic hydrocarbons from contaminated soils.** *Environmental Toxicology and Chemistry*. 2003; 22 (9):2202-2208. ISSN: 0730-7268.
Authors devise a batch desorption analysis, conducted for 7 days, that is suitable as a protocol for tier 1 or 2 relative risk evaluations. This procedure works best for two- to four-ring PAHs and diesel range aliphatic hydrocarbons.

Loibner, Andreas P.; Holzer, M.; Gartner, M.; Szolar, Oliver H. J.; Braun, Rudolf. **The use of sequential supercritical fluid extraction for bioavailability investigations of PAH in soil.** *Die Bodenkultur*. 2001; 51 (4):225-233. ISSN: 0006-5471.
Aged and non-aged samples of PAHs were tested to determine the influence of soil organic matter (SOM) on biodegradation. The results were then compared to data from an SSFE method. Researchers concluded that high SOM levels result in reduced degradation.

Lotfabad, S. K.; Gray, M. R. **Kinetics of biodegradation of mixtures of polycyclic aromatic hydrocarbons.** *Applied Microbiology and Biotechnology*. 2002; 60 (3):361-365. ISSN: 0175-7598.
Researchers tracked the process of biodegradation in creosote-contaminated soil, and observed that the presence of phenanthrene caused a lag phase of 4.5 days in the degradation of fluoranthene and 5 days for chrysene.

Lu, X. Y.; Zhang, X.; Li, G. H.; Zhang, W. H. **Production of biosurfactant and its role in the biodegradation of oil hydrocarbons.** *Journal of Environmental Science and Health Part A - Toxic/Hazardous Substances & Environmental Engineering*. 2003; 38 (3):483-492. ISSN: 1093-4529.

Lucach, S. O.; Bowler, B. F. J.; Frewin, N.; Larter, S. R. **Variation in alkylphenol distributions in a homogenous oil suite from the Dhahaban petroleum system of Oman.** *Organic Geochemistry*. 2002; 33 (5):581-594. ISSN: 0146-6380.

Luellen, Drew R.; Shea, Damian. **Calibration and field verification of semipermeable membrane devices for measuring polycyclic aromatic hydrocarbons in water.** *Environmental Science & Technology*. 2002; 36 (8):1791-1797. ISSN: 0013-936X.
In an effort to identify the uptake or sampling rates of PAHs, semipermeable membrane devices (SPMDs) were used to allow quantitative estimations of freely dissolved concentrations of 47 compounds that are commonly used for PAH and petroleum product source fingerprinting.

Lundstedt, Staffan; Haglund, Peter; Öberg, Lars G. **Degradation and formation of polycyclic aromatic compounds during bioslurry treatment of an aged gasworks soil.** *Environmental Toxicology and Chemistry*. 2003; 22 (7):1413-1420. ISSN: 0730-7268.
After identifying over one hundred PACs in contaminated soil, researchers monitored biodegradation rates in a bioslurry treatment. Oxy-PAHs were singled out in the study as needing more research to understand the conditions that cause specific examples of these compounds to accumulate.

Lundstedt, Staffan; van Bavel, Bert; Haglund, Peter; Tysklind, Mats ; Öberg, Lars G. **Pressurized liquid extraction of polycyclic aromatic hydrocarbons from contaminated soils.** *Journal of Chromatography A*. 2000; 883 (1-2):151-162. ISSN: 0021-9673.
Using different extraction variables, researchers tested the efficiency of pressurized liquid extraction. Variables included sample load, solvents used, solvent ratios, pressure, temperature, extraction time, and rinse volume. Pressurized liquid extraction was found, in optimal conditions, to be an exhaustive extraction technique for contaminated soils.

Luque-García, J. L.; Luque de Castro, M. Dolores. **Comparison of the static, dynamic and static-dynamic pressurised liquid extraction modes for the removal of nitrated polycyclic aromatic hydrocarbons from soil with on-line filtration-preconcentration.** *Journal of Chromatography A*. 2003; 1010 (2):129-140. ISSN: 0021-9673.
In comparing different operational modes of pressurized liquid extraction, static-dynamic mode was found to be nearly 100% efficient, and extracted hydrocarbons in a shorter amount of time than the other modes tested.

Luque-Garciá, J. L.; Luque de Castro, M. Dolores. **Coupling of pressurized liquid extraction to other steps in environmental analysis.** *TrAC - Trends in Analytical Chemistry*. 2004; 23 (2):102-108. ISSN: 0165-9936.
Potential couplings of pressurized liquid extraction to one or more analytical methods are addressed in this paper. Authors also comment on static and dynamic pressurized liquid extraction techniques and prospective applications to environmental analysis.

Luque-García, J. L.; Luque de Castro, M. Dolores. **Static pressurised liquid extraction of nitrated polycyclic aromatic hydrocarbons from soils with on-line filtration-preconcentration prior to gas chromatography-mass spectrometry detection.** *Analyst*. 2003; 128 (7):980-985. ISSN: 0003-2654.
A time-saving, environmentally friendly method of detecting PAHs in contaminated soils is described in this study. An experimental design methodology was used to optimize extraction variables, such as pressure, extraction time, and temperature.

Luthe, G. M.; Ariese, F.; Brinkman, U. A. T. **Monofluorinated polycyclic aromatic hydrocarbons: standards in environmental chemistry and biochemical applications.** *In* Neilson, A. H. (Ed.) *Organofluorines (Series: Handbook of Environmental Chemistry)*. Berlin: Springer-Verlag; 2002; Vol. 3, Part N; p. 249-275. ISBN: 3-540-42064-9.

Luthe, G.; Brinkman, U. A. T. **Monofluorinated polycyclic aromatic hydrocarbons: characteristics and intended use in environmental analysis.** *Analyst*. 2000; 125 (10):1699-1702. ISSN: 0003-2654.
Eight monofluorinated PAHs were studied and found to be promising for use in analysis of parent PAHs.

Luthe, G.; Ramos, L.; Dalluge, J.; Brinkman, U. A. T. **Monofluorinated analogues of polycyclic aromatic hydrocarbons as internal standards for GC-MS in environmental analysis.** *Chromatographia*. 2003; 57 (5-6):379-383. ISSN: 0009-5893.

Lüthje, Kati; Hyötyläinen, Tuulia; Riekkola, Majra-Liisa. **Comparison of different trapping methods for pressurised hot water extraction.** *Journal of Chromatography A*. 2004; 1025 (1):41-49. ISSN: 0021-9673.
Authors compared four methods of trapping PAHs during pressurized hot water extraction of soil and sediment samples. Each trapping system was assessed for solvent consumption, vitality, and duplication of results by analyzing extracts from each method with GC-MS and size-exclusion chromatography.

Lüthje, Kati; Hyötyläinen, Tuulia; Riekkola, Marje-Liisa. **On-line coupling of microporous membrane liquid-liquid extraction and gas chromatography in the analysis of organic pollutants in water.** *Analytical and Bioanalytical Chemistry*. 2004; 378 (8):1991-1998. ISSN: 1618-2642.

Ma, Wanhong et al. **Efficient degradation of organic pollutants by using dioxygen activated by resin-exchanged Iron(II) bipyridine under visible irradiation.** *Angewandte Chemie - International Edition*. 2003; 42 (9):1029-1032. ISSN: 1433-7851.
This paper introduces an environmentally friendly and simple photocatalytic method for degrading organic pollutants.

MacKay, Scott; Fried, Jonathan; Carvill, Charles. **Water-column changes pose seismic challenges.** *Offshore*. 2003; 60 (5):114-116. ISSN: 0030-0608.
Variations in water velocity during deepwater exploration can cause distortions, leading to false indications during seismic acquisition. 4D seismic measurements are one method of getting reliable geological data during the investigative phase of deepwater exploration.

MacLeod, C. T.; Daugulis, A. J. **Biodegradation of polycyclic aromatic hydrocarbons in a two-phase partitioning bioreactor in the presence of a bioavailable solvent.** *Applied Microbiology and Biotechnology*. 2003; 62 (2-3):291-296. ISSN: 0175-7598.
Bis(ethylhexyl) sebacate was successfully used as a carbon source for biodegradation studies in a two-phase particle bioreactor. Within four days, phenanthrene and pyrene were completely degraded in this experimental system.

Macleod, Christopher J. A.; Semple, Kirk T. **Sequential extraction of low concentrations of pyrene and formation of non-extractable residues in sterile and non-sterile soils.** *Soil Biology & Biochemistry*. 2003; 35 (11):1443-1450. ISSN: 0038-0717.

Macnaughton, Sarah J.; Swannell, Richard; Daniel, Fabien; Bristow, Louise. **Biodegradation of dispersed Forties crude and Alaskan North Slope oils in microcosms under simulated marine conditions.** *Spill Science & Technology Bulletin*. 2003; 8 (2):179-186. ISSN: 1353-2561.
Microbial colonization and biodegradation of Forties crude and Alaskan North Slope oil were investigated in two studies under controlled simulated marine conditions. Authors wished to study the effects of chemical dispersants compared to natural attenuation processes that influence microbial growth rates and biodegradation of oil.

Mahendraker, V.; Viraraghvan, T. **Biodegradability testing of a petroleum refinery wastewater by respirometry.** *Fresenius Environmental Bulletin*. 2001; 10 (2):139-142. ISSN: 1018-4619.

Maier, R. M. **Biosurfactants: evolution and diversity in bacteria.** *In* Laskin, A. I.; Bennett, J. W.; Gadd, G. M. (Eds.) *Advances in Applied Microbiology, v.52*. San Diego, Ca.: Academic Press; 2003; p. 101-121. ISBN: 0-12-002654-6.

Maki, H.; Sasaki, T.; Harayama, S. **Photo-oxidation of biodegraded crude oil and toxicity of the photo-oxidized products.** *Chemosphere*. 2001; 44 (5):1145-1151. ISSN: 0045-6535.
After weeks of photo-oxidation in seawater, biodegraded oil was analyzed and evaluated for toxicity against *Artemia* larvae. Exposure to sunlight lowered the molecular weight of oil compounds and formed oxygenated compounds, which increased the bioavailability of the oil. The water-soluble fraction was found to cause 100% mortality in *Artemia* by 25 days of exposure.

Maki, Hideaki et al. **Crude oil bioremediation field experiment in the Sea of Japan.** *Marine Pollution Bulletin*. 2003; 47 (1-6):74-77. ISSN: 0025-326X.
Investigators found that the addition of synthetic fertilizer enhanced bioremediation only in the early stages of a three-month experiment.

Maki, Hideaki et al. **Intrinsic biodegradation of heavy oil from *Nakhodka* and the effect of exogenous fertilization at a coastal area of the Sea of Japan.** *Water, Air, & Soil Pollution*. 2003; 145 (1-4):123-128. ISSN: 0049-6979.
No significant differences were seen in a number of biodegradation parameters, including microbial community structure, when comparing chemical and biological reactions to fertilized and unfertilized samples of oil-contaminated rocks taken from beaches after a tanker spill.

Makkar, Randhir S.; Rockne, Karl J. **Comparison of synthetic surfactants and biosurfactants in enhancing biodegradation of polycyclic aromatic hydrocarbons.** *Environmental Toxicology and Chemistry*. 2003; 22 (10):2280-2292. ISSN: 0730-7268.
This review focuses on the promise of biosurfactants in aiding bioremediation, with the added benefit of being biodegradable and non-toxic to PAH-degrading bacteria. Further research involving the interplay between biosurfactants and PAHs is needed to produce more effective remediation results.

Maksoud, Judy. **Players change in the North Sea.** *Offshore*. 2003; 63 (5):42-44; 142. ISSN: 0030-0608.
Small oil investors are replacing major oil companies in the North Sea, and are focusing on mature fields believed to still be underdeveloped in hopes of meeting the rising demand for hydrocarbon resources in the region.

Maksoud, Judy. **Southeast Asia gas development gains momentum.** *Offshore*. 2003; 63 (5):40; 148. ISSN: 0030-0608.
Major oil companies are investing billions of dollars into five core areas in and around Southeast Asia. These regions have seen a tremendous boost in discoveries as other areas around the world have experienced a slump.

Maksoud, Judy. **Trinidad still the hottest play.** *Offshore*. 2003; 63 (5):34-36. ISSN: 0030-0608.
With declining activity in portions of the Gulf of Mexico, development and exploration of the Angostura field in the Trinidad and Tobago offshore fields continues to be the focal point for activity in the Americas.

Maliszewska-Kordybach, B.; Smreczak, B. **Changes of soil microbial properties in the course of PAH dissipation in soils artificially contaminated with these compounds.** *Polycyclic Aromatic Compounds*. 2003; 23 (1):1-21. ISSN: 1040-6638.

Mandalakis, Manolis; Gustafsson, Örjan. **Optimization of a preparative capillary gas chromatography-mass spectrometry system for the isolation and harvesting of individual polycyclic aromatic hydrocarbons.** *Journal of Chromatography A*. 2003; 996 (1-2):163-172. ISSN: 0021-9673.
Authors test a method of isolating microgram-levels of specific PAHs from complex mixtures with the use of a gas chromatography system combined with a cooled injection system controller. Results of the study note specific recovery rates and purities of individual PAHs obtained during the investigation.

Mandelbaum, M. M.; Ageenkov, E. V.; Legeido, P. Y.; Pesterev, I. Y.; Ryklinskii, N. I. **Differential-normalized electrical measurements in hydrocarbon exploration: the state of the art and prospects for future.** *Geologiya I Geofizika*. 2002; 43 (12):1137-1143. ISSN: 0016-7886.
Authors describe a method of detecting oil and gas deposits that uses polarization anomalies around rocks altered by the existence of hydrocarbon in pools deep underground.

Mangani, F.; Maione, M.; Palma, P. **GC-MS analysis of halocarbons in the environment.** *In* Brown, P. R.; Grushka, E. (Eds.) *Advances in Chromatography, v. 42*. New York: Marcel Dekker; 2003; p. 149-139. ISBN: 0-8247-0950-0.

Mango, Frank D. **Comment on "Natural gas composition in a geological environment and the implications for the processes of generation and preservation," Lloyd R. Snowdon, 2001, [Organic Geochemistry 32, 913-931].** *Organic Geochemistry*. 2002; 33 (1):81-83. ISSN: 0146-6380.
This comment finds fault with the conclusions made from data presented arguing against catalytic gas in source rocks.

Mansur, Claudia R. E.; Barboza, Sheila P.; González, Gaspar; Lucas, Elizabete F. **PLURONIC x TETRONIC polyols: study of their properties and performance in the destabilization of emulsions formed in the petroleum industry.** *Journal of Colloid and Interface Science*. 2004; 271 (1):232-240. ISSN: 0021-9797.
Data from surface tension and solubility tests of emulsions found in petroleum-related compounds show that the structure of copolymers influences their solubility in water.

Marcaccio, Marco; Spagnoli, Federico; Frascari, Franca. **Drilling mud as tracers of sedimentation and geochemical processes on continental shelves.** *Journal of Coastal Research*. 2003; 19 (1):89-100. ISSN: 0749-0208.
Using sludge discharge from an offshore drilling site, researchers were able to estimate seasonal and multi-year sedimentation, resuspension and redistribution processes of sea bottom sediments.

Marce, R. M.; Borrull, F. **Solid-phase extraction of polycyclic aromatic compounds.** *Journal of Chromatography A*. 2000; 885 (1-2):273-290. ISSN: 0021-9673.
This review highlights different extraction problems of two groups of polyaromatic compounds, PAHs and napthalenesulfonates.

Margesin, Rosa.; Schinner, Franz. **Toxicity and biodegradability of a soil conditioner.** *Die Bodenkultur*. 2001; 51 (4):217-224. ISSN: 0006-5471.
Experiments were carried out on a soil conditioner to determine toxicity, effects on the growth of microorganisms and biodegradability of the material in soil.

Margesin, Rosa.; Walder, G.; Schinner, Franz. **The impact of hydrocarbon remediation (diesel oil and polycyclic aromatic hydrocarbons) on enzyme activities and microbial properties of soil.** *Acta Biotechnologica*. 2000; 20 (3-4):313-333. ISSN: 0138-4988.
Enzyme and microbial properties were analyzed in a ten-week study. Authors conclude that the effectiveness of studying these parameters depends on the concentration and composition of hydrocarbons, such as the age of contamination, as well as factors of soil characteristics, such as pH.

Margesin, Rosa; Gander, Silvia; Zacke, Gabriele; Gounot, Anne Monique; Schinner, Franz. **Hydrocarbon degradation and enzyme activities of cold-adapted bacteria and yeasts.** *Extremophiles*. 2003; 7 (6):451-458. ISSN: 1431-0651.

Margesin, Rosa; Schinner, Franz. **Biodegradation and bioremediation of hydrocarbons in extreme environments.** *Applied Microbiology and Biotechnology*. 2001; 56 (5-6):650-663. ISSN: 0175-7598.
This paper reviews the results of published research on biodegradation experiments using bacteria that are found in hostile environments. Among the types of habitats included are low and high temperature environments, and locations noted for extreme amounts of acidity or alkalinity, high salinity, or pressure (deep-sea).

Margesin, Rosa; Schinner, Franz. **Potential of halotolerant and halophilic microorganisms for biotechnology.** *Extremophiles*. 2001; 5 (2):73-83. ISSN: 1431-0651.
This paper discusses the biotechnological applications of halotolerant or halophilic microorganisms, including their use in the biodegradation of oil-based pollutants.

Márquez-Rocha, F. J.; Hernández-Rodríguez, V.; Lamela, M. T. **Biodegradation of diesel oil in soil by a microbial consortium.** *Water, Air, & Soil Pollution*. 2001; 128 (3-4):313-320. ISSN: 0049-6979.
Diesel oil-degrading bacterial cultures were tested in laboratory and pilot scale experiments, and amounts of degraded oil were measured. Stepwise soil inoculation and nutrient additions were found to enhance microbial activity.

Martínez-Checa, F.; Toledo, F. L.; Vilchez, R.; Quesada, E.; Calvo, C. **Yield production, chemical composition, and functional properties of emulsifier H28 synthesized by *Halomonas eurihalina* strain H-28 in media containing various hydrocarbons.** *Applied Microbiology and Biotechnology*. 2002; 58 (3):358-363. ISSN: 0175-7598.
Halophilic bacteria-produced exopolysaccharides (EPS) were evaluated to determine their utility in bioremediation of hydrocarbon-polluted environments. The synthesis of EPS occurred in differently polluted soils, showing promise for future *in situ* bioremediation treatment.

Maruyama, A. et al. **Dynamics of microbial populations and strong selection for *Cycloclasticus pugetii* following the *Nakhodka* oil spill.** *Microbial Ecology*. 2004; 46 (4):442-453. ISSN: 0095-3628.
Using gene amplification and phylogenetic analysis, researchers were able to identify the predominant oil-degrading microbial species in an area impacted by the *Nakhodka* oil spill. Changes in microbial community structure were monitored, and other hydrocarbon degraders were identified by a combination of oligonucleotide probes, probe wash-off curve estimation, and quantitative fluorescence dot-blot hybridization techniques.

Massias, Delphine; Grossi, Vincent; Bertrand, Jean-Claude. ***In situ* anaerobic degradation of petroleum alkanes in marine sediments: preliminary results.** *Comptes Rendus Geoscience*. 2003; 335 (5):435-439. ISSN: 1631-0713.
Results of a 24-month experiment found that acyclic petroleum hydrocarbons from Arabian light crude oil-contaminated sediment were degraded under natural anaerobic conditions.

Masterson, W. D.; Dzou, L. I. P.; Holba, A. G.; Fincannon, A. L.; Ellis, L. **Evidence for biodegradation and evaporative fractionation in West Sak, Kuparuk and Prudhoe Bay field areas, North Slope, Alaska.** *Organic Geochemistry*. 2001; 32 (3):411-441. ISSN: 0146-6380.

Mazeas, L.; Budzinski, H.; Raymond, N. **Absence of stable carbon isotope fractionation of saturated and polycyclic aromatic hydrocarbons during aerobic bacterial biodegradation.** *Organic Geochemistry*. 2002; 33 (11):1259-1272. ISSN: 0146-6380.
The isotope composition of PAHs remained stable during biodegradation by a marine bacterial community, leading to the possibility of stable carbon isotopic composition as a tool for source identification of *n*-alkanes and other hydrocarbons.

Mazeas, Laurent; Budzinski, Hélèn. **Molecular and stable carbon isotope source identification of oil residues and oiled bird feathers sampled along the Atlantic coast of France after the *Erika* oil spill.** *Environmental Science & Technology*. 2002; 36 (2):130-137. ISSN: 0013-936X.
Oil residue and oiled bird feathers were collected along the north and south Atlantic shoreline of France following the wreck of the *Erika* tanker. Samples were then used to differentiate the initial oil spill effects versus numerous tar balls that occurred after the *Erika* spill.

Mazeas, Laurent; Budzinski, Hélèn. **Polycyclic aromatic hydrocarbon $^{13}C/^{12}C$ ratio measurement in petroleum and marine sediments - application to standard reference materials and a sediment suspected of contamination from the *Erika* oil spill.** *Journal of Chromatography A*. 2001; 923 (1-2):165-176. ISSN: 0021-9673.

Mazeas, Laurent; Budzinski, Hélèn. **Stable carbon isotopic study ($^{12}C/^{13}C$) of the fate of petrogenic PAHs (Methylphenanthrenes) during an *in-situ* oil spill simulation experiment.** *Organic Geochemistry*. 2002; 33 (11):1253-1258. ISSN: 0146-6380.
A three-year study found that introduced petrogenic PAHs had been degraded, but those present in the soil before contamination remained.

Mazeas, Laurent; Budzinski, Hélène. **Improved accuracy of GC-MS quantification of aliphatic and aromatic hydrocarbons in marine sediments and petroleums. Validation on reference matrices and application to the *Erika* oil spill.** *International Journal of Environmental Analytical Chemistry*. 2002; 82 (3):157-173. ISSN: 0306-7319.
This report describes an analytical procedure that speeds up and simplifies the quantification of PAHs in sediments. After validation of the procedure on reference materials, researchers applied it to contaminated marine sediments associated with the *Erika* spill.

McConkey, B. J.; Hewitt, L. M.; Dixon, D. G.; Greenberg, B. M. **Natural sunlight induced photooxidation of naphthalene in aqueous solution.** *Water, Air, & Soil Pollution*. 2002; 136 (1-4):347-359. ISSN: 0049-6979.
Photooxidation of naphthalene was investigated to provide examples of the types of products caused by photoreactions of PAHs in an aqueous solution. Further analyses provide the photooxidation reactions of naphthalene in natural sunlight and identify the photoproducts.

McCormack, P.; Jones, P.; Hetheridge, M. J.; Rowland, S. J. **Analysis of oilfield produced waters and production chemicals by electrospray ionisation multi-stage mass spectrometry (ESI-MS^n).** *Water Research*. 2001; 35 (15):3567-3578. ISSN: 0043-1354.
ESI-MS^n was found to be very powerful for the identification of polar chemicals, such as demulsifiers and corrosion inhibitors found in produced waters.

McLellan, S. L.; Warshawsky, D.; Shann, J. R. **The effect of polycyclic aromatic hydrocarbons on the degradation of benzo[a]pyrene by *Mycobacterium* sp. strain RJGII-135.** *Environmental Toxicology and Chemistry*. 2002; 21 (2):253-259. ISSN: 0730-7268.

Mehrotra, N. C.; Swamy, S. N.; Rawat, R. S. **Reworked carboniferous palynofossils from panna formation, Bombay offshore basin: clue to a hidden target for hydrocarbon exploration.** *Journal of the Geological Society of India*. 2001; 57 (3):239-248. ISSN: 0016-7622.

Melcher, Rebecca J.; Apitz, Sabine E.; Hemmingsen, Barbara B. **Impact of irradiation and polycyclic aromatic hydrocarbon spiking on microbial populations in marine sediment for future aging and biodegradability studies.** *Applied & Environmental Microbiology*. 2002; 68 (6):2858-2868. ISSN: 0099-2240.
Irradiation of spiked sediment killed all species of hydrocarbon-degrading bacteria and prevented their reappearance over a time span of several months. This allowed the aging of PAHs in the sediment, which can be used for future biodegradation experiments.

Meniconi, Maria de Fatima Guadalupe et al. **Brazilian oil spills chemical characterization - case studies.** *Environmental Forensics*. 2002; 3 (3-4):303-321. ISSN: 1527-5922.
Three advanced chemical analytical methods were employed to identify fractions and specific hydrocarbon types in spilled oil and oil in media such as water, sediment, sand, fish, and others.

Meredith, W.; Kelland, S. J.; Jones, D. M. **Influence of biodegradation on crude oil acidity and carboxylic acid composition.** *Organic Geochemistry*. 2000; 31 (11):1059-1073. ISSN: 0146-6380.
Biodegradation was found to be the dominant process in the creation of carboxylic acids in crude oil, although other factors can contribute to the total acid number, or acidity of oil.

Meyer, Susanne; Steinhart, Hans. **Fate of PAHs and hetero-PAHs during biodegradation in a model soil/compost-system: formation of extractable metabolites.** *Water, Air, & Soil Pollution*. 2001; 132 (3-4):215-231. ISSN: 0049-6979.
A study was undertaken to investigate the formation and accumulation of metabolites that occur with PAHs and hetero-PAHs, in separate and combined experiments. Degradation pathways of selected PAHs are discussed.

Miles, Rick A.; Doucette, William J. **Assessing the aerobic biodegradability of 14 hydrocarbons in two soils using a simple microcosm/respiration method.** *Chemosphere*. 2001; 45 (6-7):1085-1090. ISSN: 0045-6535.
The aerobic biodegradation of hydrocarbons was tested by measuring the amount of depleted O_2 in controlled microcosm experiments. This method of assessment was found to be accurate, reliable, and easily reproducible.

Milkov, Alexei V.; Sassen, Roger. **Economic geology of offshore gas hydrate accumulations and provinces.** *Marine and Petroleum Geology*. 2002; 19 (1):1-11. ISSN: 0264-8172.
Authors identify areas where gas hydrate reserves have typically been found, and conclude that certain locations might be economically feasible for hydrate recovery.

Milkov, Alexei V.; Sassen, Roger. **Estimate of gas hydrate resource, northwestern Gulf of Mexico continental slope.** *Marine Geology*. 2001; 179 (1-2):71-83. ISSN: 0025-3227.
In this study, data was compiled to estimate the volume of gas hydrate reservoirs in the northwestern Gulf of Mexico. The authors describe the resource in terms of its relationship to geology, water depth and the gas hydrate stability zone.

Milkov, Alexei V.; Sassen, Roger. **Preliminary assessment of resources and economic potential of individual gas hydrate accumulations in the Gulf of Mexico continental slope.** *Marine and Petroleum Geology*. 2003; 20 (2):111-128. ISSN: 0264-8172.
Hydrate-bound gas accumulations were estimated for the Green and Mississippi Canyons, the Garden Banks, and Atwater Valley in the Gulf of Mexico. Results suggest that the volumes of accumulations are comparable with reserves in very small to major conventional gas fields.

Miller, Jacek S.; Olejnik, Dorota. **Photolysis of polycyclic aromatic hydrocarbons in water.** *Water Research*. 2001; 35 (1):233-243. ISSN: 0043-1354.
Experiments were carried out to test the success of using UV radiation to eliminate PAHs in an aqueous solution. Benzo[a]pyrene, chrysene, and fluorene were tested, with different levels of success. Researchers note that the decomposition of B(a)P and chrysene was by a different mechanism than was for fluorene.

Mills, Marc A.; Bonner, James S.; McDonald, Thomas J.; Page, Cheryl A.; Autenreith, Robin L. **Intrinsic bioremediation of a petroleum-impacted wetland.** *Marine Pollution Bulletin*. 2003; 46 (7):887-899. ISSN: 0025-326X.
Initial biodegradation analysis of an oil-contaminated wetland area found that 95% of petroleum was degraded within one year. It is believed that elevated nutrient levels from flood deposition and aerobic conditions associated with freshly deposited sediment enhanced microbial action.

Miroshnichenko, Margarita L. et al. **Isolation and characterization of *Thermococcus sibiricus* sp. nov. from a Western Siberia high-temperature oil reservoir.** *Extremophiles*. 2001; 5 (2):85-91. ISSN: 1431-0651.
New strains of hyperthermophilic bacteria were isolated from a depth of over 2,000 meters and at temperatures of over 80°C.

Mishra, S.; Jyot, J.; Kuhad, R. C.; Lal, B. **Evaluation of inoculum addition to stimulate *in situ* bioremediation of oily-sludge-contaminated soil.** *Applied & Environmental Microbiology*. 2001; 67 (4):1675-1681. ISSN: 0099-2240.

Miya, Ryan K.; Firestone, Mary K. **Enhanced phenanthrene biodegradation in soil by slender oat root exudates and root debris.** *Journal of Environmental Quality*. 2001; 30 (6):1911-1918. ISSN: 0047-2425.
Researchers found that phenanthrene biodegradation was stimulated by the presence of root exudates. The bacterial population of phenanthrene degraders was further enhanced by the presence of root debris.

Miyata, Naoyuki; Iwahori, Keisuke; Fogh, Julia M.; Gray, Murray R. **Saturable, energy-dependent uptake of phenanthrene in aqueous phase by *Mycobactetium* sp strain RJGII-135.** *Applied & Environmental Microbiology*. 2004; 70 (1):363-369. ISSN: 0099-2240.
In a laboratory experiment, a microbial culture was grown on phenanthrene and examined for bioavailability and mass transfer rates during degradation in aqueous phase. Kinetic data suggests that saturable transport systems and passive diffusion allow the bacteria to utilize the hydrocarbon.

Mmereki, Baagi T.; Chaudhuri, Sri R.; Donaldson, D. J. **Enhanced uptake of PAHs by organic-coated aqueous surfaces.** *Journal of Physical Chemistry A*. 2003; 107 (13):2264-2269. ISSN: 1089-5639.
Researchers used laser-induced fluorescence to measure the uptake of anthracene and pyrene from a gas phase into an air-aqueous interface in the presence of 1-octanol (organic) coating.

Mogensen, A. S.; Dolfing, J.; Haagensen, F.; Ahring, B. K. **Potential for anaerobic conversion of xenobiotics.** *In* Ahring, B. K. (Ed.) *Biomethanation II (Series: Advances in Biochemical Engineering/Biotehnology, v.82)* New York: Springer-Verlag; 2003; p. 69-134. ISBN: 3-540-44321-5.

Mohn, W. W.; Radziminski, C. Z.; Fortin, M. -C.; Reimer, K. J. **On site bioremediation of hydrocarbon-contaminated Arctic tundra soils in inoculated biopiles.** *Applied Microbiology and Biotechnology*. 2001; 57 (1-2):242-247. ISSN: 0175-7598.
Biopiles were used to determine their effectiveness in the biodegradation of fuel oil-contaminated Arctic soils. Investigators determined that biopiles were effective in the remediation process, especially if ammonium chloride and sodium phosphate were added as stimulants.

Moles, A.; Wade, T. L. **Parasitism and phagocytic function among sand lance *Ammodytes hexapterus* Pallas exposed to crude oil-laden sediments.** *Bulletin of Environmental Contamination and Toxicology*. 2001; 66 (4):528-535. ISSN: 0007-4861.
Pacific sand lance, a foraging fish that spends considerable time in sandy sediment, was exposed to low levels of oiled sediment over a 90-day period. Results of this test showed that the fish experienced lower immune levels over time, and higher levels of parasitism by the trematode *Gyrodactylus* sp.

Molnár, M. et al. **Effects of RAMEB on bioremediation of different soils contaminated with hydrocarbons.** *Journal of Inclusion Phenomena and Macrocyclic Chemistry*. 2002; 44 (1-4):447-452. ISSN: 0923-0750.
The addition of randomly methylated cyclodextrin (RAMEB) improved the bioavailability of pollutants and improved rates of biodegradation in experiments involving soils contaminated with diesel and transformer oils.

Montero, Larisse; Popp, Peter; Paschke, Albrecht; Pawliszyn, J. **Polydimethylsiloxane rod extraction, a novel technique for the determination of organic micropollutants in water samples by thermal desorption-capillary gas chromatography-mass spectrometry.** *Journal of Chromatography A*. 2004; 1025 (1):17-26. ISSN: 0021-9673.
This study describes an uncomplicated and economical method for the absorptive extraction of organic pollutants from environmental samples.

Moody, J. D.; Freeman, J. P.; Doerge, D. R.; Cerniglia, C. E. **Degradation of phenanthrene and anthracene by cell suspensions of *Mycobacterium* sp strain PYR-1.** *Applied & Environmental Microbiology*. 2001; 67 (4):1476-1483. ISSN: 0099-2240.

Moody, Joanna D.; Freeman, James P.; Fu, Peter P.; Cerniglia, Carl E. **Degradation of benzo[a]pyrene by *Mycobacterium vanbaalenii* PYR-1.** *Applied & Environmental Microbiology*. 2004; 70 (1):340-345. ISSN: 0099-2240.
HPLC was used to separate metabolites after biodegradation of B(a)P by a microbial strain. The presence of certain substances allowed for researchers to formulate additions to metabolic pathways in the bacteria.

Morales-Muñoz, S.; Luque-García, J. L.; Luque de Castro, M. Dolores. **Static extraction with modified pressurized liquid and on-line fluorescence monitoring - independent matrix approach for the removal of polycyclic aromatic hydrocarbons from environmental solid samples.** *Journal of Chromatography A*. 2002; 978 (1-2):49-57. ISSN: 0021-9673.
Authors propose and describe an improved method for the liquid extraction of PAHs from environmental samples.

Morasch, Barbara; Annweiler, Eva; Warthmann, Rolf J.; Meckenstock, Rainer U. **The use of a solid adsorber resin for enrichment of bacteria with toxic substrates and to identify metabolites: degradation of naphthalene, *o*-, and *m*-xylene by sulfate-reducing bacteria.** *Journal of Microbiological Methods*. 2001; 44 (2):183-191. ISSN: 0167-7012.
Anaerobic bacteria were aided in the breakdown of PAHs by the addition of Amberlite-XAD7, a solid absorber resin. The cultivation of bacteria in XAD7 led to extremely high degradation levels.

Morasch, Barbara; Richnow, Hans H.; Schink, Bernhard; Vieth, Andrea; Meckenstock, Rainer U. **Carbon and hydrogen stable isotope fractionation during aerobic bacterial degradation of aromatic hydrocarbons.** *Applied & Environmental Microbiology*. 2002; 68 (10):5191-5194. ISSN: 0099-2240.
Strains of hydrocarbon-degrading bacteria were grown on toluene, xylene, and naphthalene, while stable isotope fractionation of $^{13}C/^{12}C$ and D/H was determined throughout the biodegradation process.

Morasch, Barbara; Richnow, Hans H.; Vieth, Andrea; Schink, Bernhard; Meckenstock, Rainer U. **Stable isotope fractionation caused by glycyl radical enzymes during bacterial degradation of aromatic compounds.** *Applied and Environmental Microbiology*. 2004; 70 (5):2935-2940. ISSN: 0099-2240.
Authors propose that rough estimates of *in situ* biodegradation can be established by investigating intrinsic enrichment factors associated with stable isotopic fractionation caused by reactions by a glycyl radical enzyme.

More explorers lining up off northwestern Africa. *Oil & Gas Journal*. 2002; 100 (25):38-40. ISSN: 0030-1388.
Morocco has granted licenses to two oil & gas companies to conduct a comprehensive geological and geophysical study along the Atlantic coastline in Northwest Africa, to determine if hydrocarbon reserves exist.

Morelli, Irma Susana; Vecchioli, Graciela Isabel; Del Panno, María Teresa; Painceira, María Teresa. **Effect of petrochemical sludge concentrations on changes in mutagenic activity during soil bioremediation process.** *Environmental Toxicology and Chemistry*. 2001; 20 (10):2179-2183. ISSN: 0730-7268.
Researchers studied mutagenic activity in sludge-soil systems and the persistence of mutagenic activity during a laboratory soil bioremediation process. It is speculated that persistence of direct mutagenic activity is related to sludge concentration.

Mori, T.; Kitano, S.; Kondo, R. **Biodegradation of chloronaphthalenes and polycyclic aromatic hydrocarbons by the white-rot fungus *Phlebia lindtneri*.** *Applied Microbiology and Biotechnology*. 2003; 61 (4):380-383. ISSN: 0175-7598.
A number of compounds, including phenanthrene and naphthalene, were degraded by white-rot fungus while researchers investigated mechanisms behind the removal of the contaminants. Researchers noted the likelihood that initial oxidation of substrates was accomplished by a CYP450 monooxygenase.

Moritis, Guntis. **CO_2 sequestration adds new dimension to oil, gas production.** *Oil & Gas Journal*. 2003; 101 (9):39-44. ISSN: 0030-1388.
The author describes a method of injecting CO_2 into hydrocarbon reservoirs to enhance oil and gas recovery.

Mougin, Christian. **Bioremediation and phytoremediation of industrial PAH-polluted soils.** *Polycyclic Aromatic Compounds*. 2002; 2 (5):1011-1043. ISSN: 1040-6638.
The importance and abilities of microorganisms and plants in the remediation of PAH-contaminated soils are discussed in this paper.

Mrozik, Agnieszka; Piotrowska-Seget, Zofi; Labuzek, Sylwia. **Bacterial degradation and bioremediation of polycyclic aromatic hydrocarbons.** *Polish Journal of Environmental Studies*. 2003; 12 (1):15-25. ISSN: 1230-1485.
This review summarizes the current literature regarding the species of bacteria involved in the biodegradation of PAHs and the metabolic pathway involved in that process.

Mrozik, Agnieszka; Piotrowska-Seget, Zofi; Labuzek, Sylwia. **Changes in whole cell-derived fatty acids induced by naphthalene in bacteria from genus *Pseudomonas*.** *Microbiological Research*. 2004; 159 (1):87-95. ISSN: 0944-5013.

Mukherji, Suparna; Weber, Walter J., Jr. **Erratum: mass transfer effects on microbial uptake of naphthalene from complex NAPLs.** *Biotechnology and Bioengineering*. 2001; 75 (1):130-141. ISSN: 0006-3592.

Mulder, H.; Breure, A. M.; Rulkens, W. H. **Prediction of complete bioremediation periods for PAH soil pollutants in different physical states by mechanistic models.** *Chemosphere*. 2001; 43 (8):1085-1094. ISSN: 0045-6535.
Biodegradation and mass-transfer models were tested on three theoretical physical states of PAH-contaminated soil. Results demonstrated that mass-transfer models could predict the amount of time needed for rates of biodegradation.

Muñoz, J. A. et al. **Growth of moderately halophilic bacteria isolated from sea water using phenol as the sole carbon source.** *Folia Microbiologica*. 2001; 46 (4):297-302. ISSN: 0015-5632.
Halophilic bacteria were isolated and tested in aerobic conditions. Authors demonstrated that phenol utilization occurs by an inducible enzyme system.

Muñoz, R.; Guieysse, Benoît; Mattiasson, Bo. **Phenanthrene biodegradation by an algal-bacterial consortium in two-phase partitioning bioreactors.** *Applied Microbiology and Biotechnology*. 2003; 61 (3):261-267. ISSN: 0175-7598.
A bacterial consortium was found to degrade phenanthrene when dissolved in silicon oil and exposed to a light source.

Muratova, A. et al. **Plant - rhizosphere-microflora association during phytorernediation of PAH-contaminated soil.** *International Journal of Phytoremediation*. 2003; 5 (2):137-151. ISSN: 1522-6514
Authors compared reed (*Phreagmites australis*) and alfalfa (*Medicago sativa*) during phytoremediation experiments, and found that alfalfa stimulated the rhizosphere microflora more effectively, leading to higher degradation rates than reed.

Murthy, N. B. K.; Sherkhane, P. D.; Kale, S. P. **Metabolism of ^{14}C-naphthalene in marine sediments.** *Environmental Technology*. 2002; 23 (11):1271-1273. ISSN: 0959-3330.
After a five-week investigation, metabolism of naphthalene in intertidal marine sediments was found to have been more pronounced in moist (aerobic) conditions than in flooded (anaerobic) conditions.

Murygina, V.; Arinbasarov, M.; Kalyuzhnyi, S. **Bioremediation of oil polluted aquatic systems and soils with novel preparation 'Rhoder'.** *Biodegradation*. 2001; 11 (6):385-389. ISSN: 0923-9820.

Nadalig, T. et al. **Degradation of phenanthrene, methylphenanthrenes and dibenzothiophene by a *Sphingomonas* strain 2mpII.** *Applied Microbiology and Biotechnology*. 2002; 59 (1):79-85. ISSN: 0175-7598.
Several biodegradation experiments were monitored to understand how different hydrocarbon metabolites act as inhibitors or stimulants for other hydrocarbons during the degradation process.

Nadalig, T.; Raymond, N.; Gilewicz, M.; Budzinski, H. **Development of a protocol to study aerobic bacterial degradation of polycyclic aromatic hydrocarbons: application to phenanthrenes.** *Polycyclic Aromatic Compounds*. 2000; 18 (2):177-192. ISSN: 1040-6638.
In this study, methylphenanthrenes were targeted for degradation by a bacterial community. Phenanthrene, 2-methylphenanthrene and 9-methylphenanthrene were used and observed to degrade at different rates.

Nadarajah, Nalina.; et al. **Enhanced transformation of polycyclic aromatic hydrocarbons using a combined Fenton's reagent, microbial treatment and surfactants.** *Applied Microbiology and Biotechnology*. 2002; 59 (4-5):540-544. ISSN: 0175-7598.
A pretreatment of an oxidation solution, followed by the addition of surfactants, was found to increase the ability of bacteria to transform anthracene and benzo[a]pyrene in controlled experiments.

Nadarajah, Nalina; Singh, Ajay; Ward, Owen P. **De-emulsification of petroleum oil emulsion by a mixed bacterial culture.** *Process Biochemistry*. 2002; 37 (10):1135-1141. ISSN: 0032-9592.
The de-emulsification of various field oils by a mixed bacterial culture was monitored with a surfactant-stabilized kerosene-water model system. The mixed culture was found to completely de-emulsify a wide variety of field oil emulsions in within 3 days.

Nail, Robert S. et al. **Early Cretaceous-Miocene potential seen in deepwater Potiguar basin off Brazil.** *Oil & Gas Journal*. 2002; 100 (21):38-43. ISSN: 0030-1388.
Results of a multiclient 3D survey, as well as analysis of public domain data and other information, aided the authors in determining potential oil and gas reserves off the coast of northeastern Brazil.

Nam, Kyoungphile; Alexander, Martin. **Relationship between biodegradation rate and percentage of a compound that becomes sequestered in soil.** *Soil Biology & Biochemistry*. 2001; 33 (6):787-792. ISSN: 0038-0717.
In the biodegradation of phenanthrene, researchers found that the percentage of sequestered material was determined by the initial rate of degradation. Incubation temperature, bacterial culture and soil properties determined the rate of mineralization.

Nam, Kyoungphile; Rodriguez, Wilson; Kukor, Jerome J. **Enhanced degradation of polycyclic aromatic hydrocarbons by biodegradation combined with a modified Fenton reaction.** *Chemosphere*. 2001; 45 (1):11-20. ISSN: 0006-3592.
A bacterial consortium was used to study the possibility to enhance degradation of PAHs in the presence of hydrogen peroxide oxidation of contaminated soil. Over 90% of total PAHs were biodegraded, with higher rates (98%) for 2- and 3-ring hydrocarbons and lower rates (70% and 85%) for 4- and 5-ring compounds.

Namiesnik, Jacek. **Trace analysis - challenges and problems.** *Critical Reviews in Analytical Chemistry*. 2002; 32 (4):271-300. ISSN: 1040-8347.

Namkoong, Wan; Hwang, Eui-Yong; Park, Joon-Seok; Choi, Jung-Yong. **Bioremediation of diesel-contaminated soil with composting.** *Environmental Pollution*. 2002; 119 (1):23-31. ISSN: 0269-7491.
Compost and sewage sludge were combined in differing amounts to find the best combination of these ingredients for the remediation of diesel oil in contaminated soil. Rates of degradation were monitored and compared with CO_2 respiration rates and dehydrogenase activity for the different mixtures of sludge and compost.

Negri, Marco et al. **Solid phase treatment of an aged soil contaminated by polycyclic aromatic hydrocarbons.** *Journal of Environmental Science and Health Part A - Toxic/Hazardous Substances & Environmental Engineering*. 2004; 39 (1):1-17. ISSN: 1093-4529.
Over a 100-day period, three laboratory scale tests were carried out on soil contaminated with high molecular weight PAHs. Wood chips and urea were added to soil in two tests, and of these, one was bioaugmentated with PAH-degrading bacteria. A third test included soil only as control. Results between three tests were compared to determine removal efficiencies and factors controlling the biodegradation process.

N'Guessan, Adeola L.; Carignan, Todd; Nyman, Marianne C. **Optimization of the peroxy acid treatment of α-methyinaphthalene and benzo[a]pyrene in sandy and silty-clay sediments.** *Environmental Science & Technology*. 2004; 38 (5):1554-1560. ISSN: 0013-936X.
A chemical oxidative treatment combining hydrogen peroxide and acetic acid was tested for the most favorable mixture in the degradation of two PAH compounds in two types of sediment.

Nicholson, Carla A.; Fathepure, Babu Z. **Biodegradation of benzene by halophilic and halotolerant bacteria under aerobic conditions.** *Applied & Environmental Microbiology*. 2004; 70 (2):1222-1225. ISSN: 0099-2240.
An enriched halophilic bacterial consortium extracted from oilfield brine was able to rapidly degrade BTEX compounds. Researchers believe that the addition of growth promoting nutrients would further increase biodegradation levels.

Nicodem, David E. et al. **Photochemistry of petroleum.** *Progress in Reaction Kinetics and Mechanisms*. 2001; 26 (2-3):219-238. ISSN: 0079-6743.

Niehus, Brigitte; Popp, Peter; Bauer, Coretta; Peklo, Gisela; Zwanziger, Heinz W. **Comparison of stir bar sorptive extraction and solid phase extraction as enrichment techniques in combination with column liquid chromatography for the determination of polycyclic aromatic hydrocarbons in water samples.** *International Journal of Environmental Analytical Chemistry*. 2002; 82 (10):669-676. ISSN: 0306-7319.
After a series of comparative experiments, the authors discuss the advantages and disadvantages of two methods used to determine PAHs from precipitation water samples.

Nishigima, Fernando Noboru; Weber, Rolf Roland; Bícego, Márcia Caruso. **Aliphatic and aromatic hydrocarbons in sediments of Santos and Cananéia, SP, Brazil.** *Marine Pollution Bulletin*. 2001; 42 (11):1064-1072. ISSN: 0025-326X.
Sediments from two lagoons were analyzed for the presence of hydrocarbons. Analysis of the sediment at Camanéia showed no evidence of oil as the source of PAHs, but the Santos data showed oil contributions from diverse sources.

Nocentini, M.; Pinelli, D.; Fava, F. **Bioremediation of a soil contaminated by hydrocarbon mixtures: the residual concentration problem.** *Chemosphere*. 2000; 41 (8):1115-1123. ISSN: 0045-6535.

Noh, Seung-Lim; Choi, Jung-Min; An, Youn-Joo; Park, Seok-Soon; Cho, Kyung-Suk. **Anaerobic biodegradation of toluene coupled to sulfate reduction in oil-contaminated soils: optimum environmental conditions for field applications.** *Journal of Environmental Science and Health Part A - Toxic/Hazardous Substances & Environmental Engineering*. 2003; 38 (6):1087-1097. ISSN: 1093-4529.
In microcosm experiments, optimal microbial activity occurred with neutral soil pH and temperature ranges between 30-37°C.

Noordman, Wouter H.; Janssen, Dick B. **Rhamnolipid stimulates uptake of hydrophobic compounds by *Pseudomonas aeruginosa*.** *Applied & Environmental Microbiology*. 2002; 68 (9):4502-4508. ISSN: 0099-2240.
After observing the biodegradation of hexadecane by several bacterial strains in the presence or absence of an added surfactant, researchers determine that *P. aeruginosa* degraded the hydrocarbon by the rhamnolipid biosurfactant produced within the same organism.

Noordman, Wouter H.; Wachter, Johan H. J.; de Boer, Geert J.; Janssen, Dick B. **The enhancement by surfactants of hexadecane degradation by *Pseudomonas aeruginosa* varies with substrate availability.** *Journal of Biotechnology*. 2002; 94 (2):195-212. ISSN: 0168-1656.
Rhamnolipid, a surfactant, was observed in experiments to determine its success in biodegradation of hexadecane, when compared to other surfactants. Rhamnolipid was found to enhance degradation of poorly soluble substrates, and possible mechanisms for this process are described.

Nordgård Bolås, Hege Marit; Hermanrud, Christian. **Hydrocarbon leakage processes and trap retention capacities offshore Norway.** *Petroleum Geoscience*. 2004; 9 (4):321-332. ISSN: 1354-0793.
Authors contrast geological processes of two offshore basins to explain leakages at sites with different overpressures. Differences in retention capacities of the two basins were attributed to dissimilar leakage processes.

Norman, R. Sean; Frontera-Suau, Roberto; Morris, Pamela J. **Variability in *Pseudomonas aeruginosa* lipopolysaccharide expression during crude oil degradation.** *Applied & Environmental Microbiology*. 2002; 68 (10):5096-5103. ISSN: 0099-2240.
Researchers used atomic force microscopy, along with biochemical techniques, to characterize differences in the lipopolysaccharide process of two isolates of oil degrading bacteria.

Norton, Dean; Shamsi, Shahab A. **Separation of methylated isomers of benzo[a]pyrene using micellar electrokinetic chromatography.** *Analytica Chimica Acta*. 2003; 496 (1-2):165-176. ISSN: 0003-2670.
A T-type micelle polymer was used to separate 7 of 12 methylated benzo(a)pyrene isomers within 26 minutes, making it a useful pseudostationary phase polymer for micellar electrokinetic chromatographic separation of hydrophobic isomers.

Notar, Marko; Leskovsek, Hermina; Faganeli, Jadran. **Composition, distribution and sources of polycyclic aromatic hydrocarbons in sediments of the Gulf of Trieste, northern Adriatic Sea.** *Marine Pollution Bulletin*. 2001; 42 (1):36-44. ISSN: 0025-326X.
Sediment was sampled at several areas in the northern Adriatic sea to determine PAH concentrations, as well as ratios of different types of PAHs, arranged by number of aromatic rings. Analysis of the data collected showed higher concentrations of contamination close to the shoreline.

Nunn, Jeffrey A.; Meulbroek, Peter. **Kilometer-scale upward migration of hydrocarbons in geopressured sediments by buoyancy-driven propagation of methane filled fractures.** *AAPG Bulletin*. 2002; 86 (5):907-918. ISSN: 0149-1423.
Physical and chemical evidence suggests that buoyancy-driven propagation drives the upward migration of hydrocarbons hundreds of meters per year in the Gulf of Mexico Basin.

Nwachukwu, S. C. U.; James, P.; Gurney, T. R. **Inorganic nutrient utilisation by "adapted" *Pseudomonas putida* strain used in the bioremediation of agricultural soil polluted with crude petroleum.** *Journal of Environmental Biology*. 2001; 22 (3):153-162. ISSN: 0254-8704.

Obiajunwa, E. L.; Pelemo, D. A.; Owolabi, S. A.; Fasasi, M. K.; Johnson-Fatokun, F. O. **Characterisation of heavy metal pollutants of soils and sediments around a crude-oil production terminal using EDXRF.** *Nuclear Instruments & Methods in Physics Research Section B - Beam Interactions with Materials and Atoms*. 2002; 194 (1):61-64. ISSN: 0168-583X.
X-Ray fluorescence analysis of soil, sediments and solid wastes around a crude-oil production terminal documented fourteen different heavy metals in samples, demonstrating a correlation between the environmental pollutants and crude oil production.

Obuekwe, C. O.; Hourani, G.; Radwan, Samir. S. **High-temperature hydrocarbon biodegradation activities in Kuwaiti desert soil samples.** *Folia Microbiologica*. 2001; 46 (6):535-539. ISSN: 0015-5632.

Odden, W.; Barth, T.; Talbot, M. R. **Compound-specific carbon isotope analysis of natural and artificially generated hydrocarbons in source rocks and petroleum fluids from offshore Mid-Norway.** *Organic Geochemistry*. 2002; 33 (1):47-65. ISSN: 0146-6380.
Carbon isotopic analysis was used to determine the composition of *n*-alkanes in the source rocks of the Åre and Spekk formations. From this data, authors were able to identify the influence of specific formations to oils in producing fields.

Ogino, A.; Koshikawa, H.; Nakahara, T.; Uchiyama, H. **Succession of microbial communities during a biostimulation process as evaluated by DGGE and clone library analyses.** *Journal of Applied Microbiology*. 2001; 91 (4):625-635. ISSN: 1364-5072.
Authors traced the changes in the structure of a bacterial community after adding a biostimulation treatment to an area affected by the *Nakhodka* oil spill. Biostimulation initially disrupted the community structure, but immediate recovery occurred at the end of fertilization.

Oh, Young-Sook; Sim, Doo-Seup; Kim, Sang-Jin. **Effects of nutrients on crude oil biodegradation in the upper intertidal zone.** *Marine Pollution Bulletin*. 2001; 42 (12):1367-1372. ISSN: 0025-326X.
Oil-contaminated microcosms, simulating an intertidal zone, were used in experiments investigating the process of enhancing biodegradation with the addition of slow release fertilizer (SRF). SRF had a positive effect on degradation rates, especially in early applications. Pristane, phytane, and nor-hopane were monitored as biomarkers to detect treatment differences in specific cases.

Okieimen, C. O.; Okieimen, F. E. **Effect of natural rubber processing sludge on the degradation of crude oil hydrocarbons in soil.** *Bioresource Technology*. 2002; 82 (1):95-97. ISSN: 0960-8524.

Olejniczak, J.; Staniewski, J.; Szymanowski, J. **Extraction of selected pollutants in open tubular capillary columns.** *Analytica Chimica Acta*. 2003; 497 (1-2):199-207. ISSN: 0003-2670.
A method of extraction and determination of phenols and PAHs in aquatic environments is described. Extraction yields were found to be similar to those obtained from equilibrium solvent extraction.

Oleszczuk, P.; Baran, S. **Degradation of individual polycyclic aromatic hydrocarbons (PAHs) in soil polluted with aircraft fuel.** *Polish Journal of Environmental Studies*. 2003; 12 (4):431-437. ISSN: 1230-1485.
Biodegradation experiments demonstrate that the rate of decomposition of PAHs in soil is directly related to the solubility of hydrocarbons, soil properties, microbial density and community structure, and available nutrients. According to the authors, the rapid degradation of 3-ring hydrocarbons may be a factor in the limitation of 5-ring (and higher) PAH degradation.

Olivera, N. L.; Commendatore, M. G.; Delgado, O.; Esteves, J. L. **Microbial characterization and hydrocarbon biodegradation potential of natural bilge waste microflora.** *Journal of Industrial Microbiology & Biotechnology*. 2003; 30 (9):542-548. ISSN: 1367-5435.
Bilge waste containing PAHs was placed in open lagoons to identify hydrocarbon-degrading microorganisms present in the waste and assess biodegradation potential. After 17 days, significant degradation occurred with acenaphtylene, fluorene, phenanthrene, anthracene, and pyrene. No evidence of extracellular biosurfactant production was found, leading researchers to suggest that the addition of biosurfactants would lead to higher biodegradation rates.

Omari, K.; Revitt, M.; Shutes, B.; Garelick, H. **Hydrocarbon removal in an experimental gravel bed constructed wetland.** *Water Science and Technology*. 2003; 48 (5):275-281. ISSN: 0273-1223.
A subsurface flow bed was filled with pea gravel and planted with Typha seedlings before being treated with aqueous concentrations of diesel oil. Investigators found that hydrocarbon removal rates exceeded 60%, indicating that Typha assisted adsorption of pollutants onto the gravel substrate.

Onwurah, I. N.; Nwuke, C. **Enhanced bioremediation of crude oil-contaminated soil by a *Pseudomonas* species and mutually associated adapted *Azotobacter vinelandii*.** *Journal of Chemical Technology and Biotechnology*. 2004; 79 (5):491-498. ISSN: 0268-2575.
By combining hydrocarbon-degrading with diazotrophic bacteria, researchers were able to achieve high degradation rates of PAHs. Enhanced biodegradation occurred when diazotrophs produced concentrations of fixed nitrogen, thus stimulating growth rates for the PAH degraders.

Ortiz, Irmene; Auria, Richard; Sigoillot, Jean-Claude; Revah, Sergio. **Enhancing phenanthrene biomineralization in a polluted soil using gaseous toluene as a cosubstrate.** *Environmental Science & Technology*. 2003; 37 (4):805-810. ISSN: 0013-936X.
The addition of gaseous toluene reduced the resistance to microbial degradation of phthalic acid, which subsequently allowed for greatly increased mineralization rates of phenanthrene in soil.

Otremba, Zbigniew; Toczek, Henryk. **Degradation of crude oil film on the surface of seawater: the role of luminous, biological and aqutorial factors.** *Polish Journal of Environmental Studies*. 2002; 11 (5):555-559. ISSN: 1230-1485.

Page, Cheryl Ann. **Oil Spill Chemical Countermeasure Use in Near-Shore Environments.** Thesis (Ph. D.): Texas A&M University; 2000;162 leaves.

Page, David S. et al. **A holistic approach to hydrocarbon source allocation in the subtidal sediments of Prince William Sound, Alaska, embayments.** *Environmental Forensics*. 2002; 3 (3-4):331-340. ISSN: 1527-5922.
Researchers identify the sources of hydrocarbons that can be found in the subtidal sediments and embayments of Prince William Sound.

Page, David S. et al. **Hydrocarbon composition and toxicity of sediments following the *Exxon Valdez* oil spill in Prince William Sound, Alaska, USA.** *Environmental Toxicology and Chemistry*. 2002; 21 (7):1438-1450. ISSN: 0730-7268.
Sediment samples taken during the period of 1990 to 1993 following the *Exxon Valdez* oil spill were statistically analyzed to determine the relationship between amphipod mortality, total concentrations of 39 parent and methyl-substituted PAHs and the effect of oil weathering on toxicity. Recovery of shoreline biota observed in this study was consistent with site samples from other impacted areas in Prince William Sound.

Pal, B.; Sharon, M. **Photodegradation of polyaromatic hydrocarbons over thin film of TiO2 nanoparticles; a study of intermediate photoproducts.** *Journal of Molecular Catalysis A - Chemical*. 2000; 160 (2):453-460. ISSN: 1381-1169.
TiO_2, sprayed in a thin film over a glass substrate, effectively caused the photocatalytic degradation of naphthalene and anthracene in an aqueous solution.

Palmroth, Marja R. T.; Pichtel, John; Puhakka, Jaakko A. **Phytoremediation of subarctic soil contaminated with diesel fuel.** *Bioresource Technology*. 2002; 84 (3):221-228. ISSN: 0960-8524.
Selected plant species from northern latitudes were shown to aid in the remediation of diesel fuel in contaminated soil.

Pan, Feng; Yang, Qingxiang; Zhang, Yu; Zhang, Shujun; Yang, Min. **Biodegradation of polycyclic aromatic hydrocarbons by *Pichia anomala*.** *Biotechnology Letters*. 2004; 26 (10):803-806. ISSN: 0141-5492.
Yeast isolated from crude oil-contaminated soil was able to completely degrade naphthalene, phenanthrene and dibenzothiophene within 48 hours. Crysene was degraded when in the presence of naphthalene, although removal took longer than other PAHs.

Pandey, Gunjan; Jain, Rakesh K. **Bacterial chemotaxis toward environmental pollutants: role in bioremediation.** *Applied & Environmental Microbiology*. 2002; 68 (12):5789-5795. ISSN: 0099-2240.
This paper reviews the latest understanding of the role of bacterial chemotaxis in pollution control and the potential for bioremediation applications.

Pang, Xiongqi; Li, Maowen; Li, Sumei; Jin, Zhijuan. **Geochemistry of petroleum systems in the Niuzhuang South Slope of Bohai Bay Basin. Part 2: evidence for significant contribution of mature source rocks to "immature oils" in the Bamianhe field.** *Organic Geochemistry*. 2003; 34 (7):931-950. ISSN: 0146-6380.
Several samples of crude oil and oil sands indicate the existence of a relatively immature oil reservoir. Chemical and biomarker information suggests that oils were formed under conditions of enhanced salinity or stratified water columns.

Pannu, Jasvir K.; Singh, Ajay; Ward, Owen P. **Influence of peanut oil on microbial degradation of polycyclic aromatic hydrocarbons.** *Canadian Journal of Microbiology*. 2003; 49 (8):508-513. ISSN: 0008-4166.
The addition of peanut oil to contaminated weathered soil slurry stimulated biodegradation of hydrocarbons, especially high molecular weight PAHs. The peanut oil amendment also increased biodegradation rates of PAHs sorbed onto activated carbon.

Paquin, Daniel; Ogoshi, Richard; Campbell, Sonia; Li, Qing X. **Bench-scale phytoremediation of polycyclic aromatic hydrocarbon-contaminated marine sediment with tropical plants.** *International Journal of Phytoremediation*. 2002; 4 (4):297-313. ISSN: 1522-6514.
Of 20 plant species tested, researchers identified dwarf hau (*Hibiscus tiliaceus*) and vetiver (*Vetiver zizanoides*) as causing the greatest reduction of PAHs in contaminated sediment plots.

Parales, Rebecca E. **The role of active-site residues in naphthalene dioxygenase.** *Journal of Industrial Microbiology & Biotechnology*. 2003; 30 (5):271-278. ISSN: 1367-5435.
This study describes the three-component naphthalene dioxygenase enzyme system used by *Pseudomonas* sp. strain NCIB 9816-4 in the first step of naphthalene biodegradation.

Parales, Rebecca E.; Harwood, Caroline S. **Bacterial chemotaxis to pollutants and plant-derived aromatic molecules.** *Current Opinion in Microbiology*. 2002; 5 (3):266-273. ISSN: 1369-5274.
This paper describes current knowledge about chemotaxis and its relationship to the role of biodegradation of environmental chemicals by microorganisms.

Park, Jeong-Hun; Zhao, Xianda; Voice, Thomas C. **Biodegradation of non-desorbable naphthalene in soils.** *Environmental Science & Technology*. 2001; 35 (13):2734-2740. ISSN: 0013-936X.
Two types of bacteria, *Pseudomas putida* G7 and NCIB 9816-4, were used to degrade naphthalene. Sorption and degradation rates were tracked by the measurement of naphthalene concentrations in sorbed and dissolved phases. In all studies, non-desorbable naphthalene was degraded.

Parnell, John; Chen, Honghan. **Application of fluid inclusion studies to understanding oil charge, pre-salt succession, offshore Angola.** *In* Arthur, T. J.; Macgregor, D. S.; Cameron, N. R. (Eds.) *Petroleum Geology of Africa: New Themes and Developing Technologies (Series: Geological Society Special Publication)*. Bath, UK: Geological Society Publishing House; 2003; p. 275-283. ISBN: 1-86239-128-9.

Parnell, John; Middleton, David; Chen, Honghan; Hall, Don. **The use of integrated fluid inclusion studies in constraining oil charge history and reservoir compartmentation: examples from the Jeanne d'Arc Basin, offshore Newfoundland.** *Marine and Petroleum Geology*. 2001; 18 (5):535-549. ISSN: 0264-8172.
This paper reports on the contribution of fluid inclusion analysis to the understanding of petroleum geology as it relates to offshore Newfoundland. Authors note that fluid inclusion studies can play an important role in the exploration of 'frontier' areas to the south and east of the Jeanne d'Arc Basin.

Pasteris, G.; Werner, D.; Kaufman, Karin; Höhener, Patrick. **Vapor phase transport and biodegradation of volatile fuel compounds in the unsaturated zone: a large scale lysimeter experiment.** *Environmental Science & Technology*. 2002; 36 (1):30-39. ISSN: 0013-936X.

Pavlova, A.; Papazova, D. **Oil-spill identification by gas chromatography-mass spectrometry.** *Journal of Chromatographic Science*. 2003; 41 (5):271-273. ISSN: 0021-9665.
Authors identify the source of an oil spill by using GC-MS to categorize ion profiles and quantify abundances of ions for different hydrocarbons.

Pavón, José Luis Pérez et al. **A method for the detection of hydrocarbon pollution in soils by headspace mass spectrometry and pattern recognition techniques.** *Analytical Chemistry*. 2003; 75 (9):2034-2041. ISSN: 0003-2700.
Authors report on a fast and simple process of detecting PAH contamination in soils that requires neither prior chromatographic separation nor sample manipulation.

Payne, James R.; Clayton, John R., Jr.; Kirstein, Bruce E. **Oil/suspended particulate material interactions and sedimentation.** *Spill Science & Technology Bulletin*. 2003; 8 (2):201-221. ISSN: 1353-2561.
This study presents a wealth of data collected on a number of oil interaction kinetics, including velocity of particle settling, for a number of sediment types in Alaska. It is hoped that the data presented can be used to augment models designed to predict trajectories, weathering, and impacts related to oil spills.

Peacock, D. C. P. **Propagation, interaction and linkage in normal fault systems.** *Earth - Science Reviews*. 2002; 58 (1-2):121-142. ISSN: 0012-8252.
Interactions between fault lines lead to joining and displacement within the fault zone. This paper describes the steps in which this occurs, as well as the development of geological structures such as relay ramps after the joining and vertical segmentation of faults.

Pearce, P.; Parker, W.; Van Geel, P. **Long term monitoring of hydrocarbon contamination using multi-level vapor phase piezometers.** *Environmental Forensics*. 2002; 3 (2):163-177. ISSN: 1527-5922.
Data collected in this study suggests that there is substantial variability in the concentration of gases released over short periods of time, leading researchers to stress that vapor phase piezometer sampling periods should be shorter when monitoring hydrocarbon contamination.

Pelletier, E.; Delille, D.; Delille, B. **Crude oil bioremediation in sub-Antarctic intertidal sediments: chemistry and toxicity of oiled residues.** *Marine Environmental Research*. 2004; 57 (4):311-327. ISSN: 0141-1136.
Fertilizers were added to crude oil-contaminated sediments while integrated chemical, microbial, and toxicological parameters monitored the biodegradation of PAHs. Results suggest that fertilizer made from fish bones immediately applied to a spill site sped up degradation rates in the first three months after a spill.

Pelz, Oliver; Chatzinotas, Antonis; Zarda-Hess, Annatina; Abraham, Wolf-Rainer; Zeyer, Josef. **Tracing toluene-assimilating sulfate-reducing bacteria using ^{13}C-incorporation in fatty acids and whole-cell hybridization.** *FEMS Microbiology Ecology*. 2001; 38 (2-3):123-131. ISSN: 0168-6496.
A consortia of sulfate-reducing bacteria were analyzed in experiments to determine role of polar lipid-derived fatty acids in the degradation of toluene. Carbon stable isotope analysis was used to trace the flow of carbon from toluene into fatty acids during the degradation process.

Peña-Mendez, E. M.; Astorga-España, M. S.; García-Montelongo, F. J. **Polycyclic aromatic hydrocarbons and *n*-alkanes in the intertidal limpet *Patella crenata* from the coast of Tenerife, Canary Islands.** *Bulletin of Environmental Contamination and Toxicology*. 1999; 63 (5):665-672. ISSN: 0007-4861.
Authors study a species of limpet found around the Canary Islands for exposure to *n*-alkanes, PAHs, and methyl-polycyclic aromatic hydrocarbons to determine whether the species can be considered a sentinel organism.

Peña-Méndez, E. M.; Astorga-España, M. S.; García-Montelongo, F. J. **Chemical fingerprinting applied to the evaluation of marine oil pollution in the coasts of Canary Islands (Spain).** *Environmental Pollution*. 2000; 111 (2):177-187. ISSN: 0269-7491.
Two marine organisms, limpets *P. crenata* and *P. ulyssiponensis aspera*, are used to define the distribution of *n*-alkanes and PAHs from coastal areas of the Canary Islands. Chemical fingerprinting is demonstrated as an excellent technique to characterize oil pollution in coastal areas using marine organisms.

Peressutti, Silvia R.; Alvarez, Héctor M.; Pucci, Oscar H. **Dynamics of hydrocarbon-degrading bacteriocenosis of an experimental oil pollution in Patagonian soil.** *International Biodeterioration & Biodegradation*. 2003; 52 (1):21-30. ISSN: 0964-8305.
The ability of indigenous bacteria to degrade PAHs was investigated by observing changes in amounts of fractions of hydrocarbons and populations of bacterial species in contaminated soil. A shift in populations was noted, from Gram negative bacteria in the first five months of experiments to Gram positive species thereafter.

Perez, S.; Barcelo, D. **Evaluation of anti-pyrene and anti-fluorene immunosorbent clean-up for PAHs from sludge and sediment reference materials followed by liquid chromatography and diode array detection.** *Analyst*. 2000; 125 (7):1273-1279. ISSN: 0003-2654.
Four different immunosorbents (IS) were analyzed using liquid chromatography with diode array detection, and results validated by use of gas chromatography coupled to a mass spectrometer. The extraction recovery of 13 PAHs with the IS was measured. Results were compared to conventional cleanup procedures.

Péréz-Jiménez, J. R.; Young, L. Y.; Kerkhof, L. J. **Molecular characterization of sulfate-reducing bacteria in anaerobic hydrocarbon-degrading consortia and pure cultures using the dissimilatory sulfite reductase (dsrAB) genes.** *FEMS Microbiology Ecology*. 2001; 35 (2):145-150. ISSN: 0168-6496.

Peter, A. et al. **Assessing microbial degradation of *o*-xylene at field-scale from the reduction in mass flow rate combined with compound-specific isotope analyses.** *Journal of Contaminant Hydrology*. 2004; 71 (1-4):127-154. ISSN: 0169-7722.
To quantify the biodegradation of *o*-xylene in field tests, researchers used Integral Groundwater Investigation, compound-specific isotope analysis and a combination to consistently achieve between 98-99% degradation rates.

Petersen, Henrik I.; Nytoft, Hans P.; Nielsen, Lars H. **Characterisation of oil and potential source rocks in the northeastern Song Hong Basin, Vietnam: indications of a lacustrine-coal sourced petroleum system.** *Organic Geochemistry*. 2004; 35 (4):493-515. ISSN: 0146-6380.
Lacustrine and coal-derived geochemical features were noted in oil samples that were analyzed fro a basin located in coastal Vietnam. Mudstones from the area show extensive hydrocarbon generation over a small range of temperature.

Pettersson, Johan; Kloskowski, Adam; Zaniol, Carlo; Roeraade, Johan. **Automated high-capacity sorption probe for extraction of organic compounds in aqueous samples followed by gas chromatographic analysis.** *Journal of Chromatography A*. 2004; 1033 (2):339-347. ISSN: 0021-9673.
Solid-phase microextraction was combined with stir bar sorptive extraction for the creation of an automated sorption instrument to be used for GC analysis of trace pollutants. To evaluate the device, 44 compounds, including PAHs, were combined in a test mixture for detection.

Petzet, Alan. **Africa's reserves, production enter period of steady growth.** *Oil & Gas Journal*. 2003; 101 (8):44-48. ISSN: 0030-1388.
During the past 10 years, Africa's proved oil reserves have steadily risen. Estimates of reserves now nearly equal those of Russia and the eastern FSU and double those of the Asia-Pacific region. With continued discoveries of huge oil reserves offshore and numerous deposits on land, the African continent is turning into a major oil producing territory.

Petzet, Alan. **Newfield groups prepare for drilling on Gulf shelf ultradeep treasure blocks.** *Oil & Gas Journal*. 2004; 102 (21):40-41. ISSN: 0030-1388.
The deepest well on the Gulf of Mexico shelf is estimated to contain several trillion cubic feet of recoverable gas according to one company.

Phelps, C. D.; Young, L. D. **Biodegradation of BTEX under anaerobic conditions: a review.** *Advances in Agronomy*. 2001; 70;329-357. ISSN: 0065-2113.

Philip, R. Paul; Allen, Jon; Kuder, Tomasz. **The use of the isotopic composition of individual compounds for correlating spilled oils and refined products in the environment with suspected sources.** *Environmental Forensics*. 2002; 3 (3-4):341-348. ISSN: 1527-5922.
The authors of this paper propose the use of combined gas chromatography-isotope ratio mass spectrometry in addition to GC and GC-MS for more accurate identification of suspected sources of crude oil in the environment.

Philip, R. Paul; Smallwood, B.; Allen, Jon. **Correlation of weathered and unweathered oil samples using the carbon isotope composition of individual components in the crude oil.** *In* Rodriguez, G. R.; Brebbia, C. A. (Eds.) *Oil and Hydrocarbon Spills, Modelling, Analysis and Control II*. Billerica, Ma.: Computational Mechanics Inc.; 2000; p. 211-219. ISBN: 1-85312-828-7.
Heavily weathered oil from spills is analyzed by using GC-IRMS, a relatively new correlation technique. Authors report that CG-IRMS is a very powerful method for identifying individual components of complex mixtures of biodegraded PAHs.

Pichtel, J.; Liskanen, P. **Degradation of diesel fuel in rhizosphere soil.** *Environmental Engineering Science*. 2001; 18 (3):145-157. ISSN: 1092-8758.

Piehler, Michael F.; Maloney, Julie S.; Paerl, Hans W. **Bacterioplanktonic abundance, productivity and petroleum hydrocarbon biodegradation in marinas and other coastal waters in North Carolina, USA.** *Marine Environmental Research*. 2002; 54 (2):157-168. ISSN: 0141-1136.
Areas with boating traffic were exposed to additional petroleum pollution to determine the effect on bacterioplanktonic communities. Seasonal patterns, community structure and diesel biodegradation rates were not profoundly altered by additional petroleum products in the system.

Pineda-Flores, Gabriel; Boll-Argüello, Gisela. **A microbial consortium isolated from a crude oil sample that uses asphaltenes as a carbon and energy source.** *Biodegradation*. 2004; 15 (3):145-151. ISSN: 0923-9820.
A microbial consortium was extracted from Maya crude oil and tested to assess its ability to mineralize asphaltenes in different aeration, temperature, salinity, and pH conditions. Results suggest that the consortium was capable of degrading asphaltenes at room temperature, with salinity of 100 ppm, and pH of 7.4.

Pino, Verónica; Ayala, Juan H.; Afonso, Ana M.; González, Venerando. **Determination of polycyclic aromatic hydrocarbons in seawater by high-performance liquid chromatography with fluorescence detection following micelle-mediated preconcentration.** *Journal of Chromatography A,*. 2002; 949 (1-2):291-299. ISSN: 0021-9673.
To keep PAHs suspended in water for analysis, polyoxyethylene-10-lauryl ether (POLE), a nonionic surfactant, was added to aqueous solution before extraction and preconcentration experiments. CPE-HPLC and LLE-GC-MS data were compared to analyze specific hydrocarbons suspended in PAH-contaminated seawater.

Pino, Verónica; Ayala, Juan H.; Afonso, Ana M.; González, Venerando. **Ultrasonic micellar extraction of polycyclic aromatic hydrocarbons from marine sediments.** *Talanta*. 2001; 54 (1):15-23. ISSN: 0039-9140.

Pino, Verónica; Ayala, Juan H.; Afonso, Ana M.; González, Venerando. **Micellar microwave-assisted extraction combined with solid-phase microextraction for the determination of polycyclic aromatic hydrocarbons in a certified marine sediment.** *Analytica Chimica Acta*. 2003; 477 (1):81-91. ISSN: 0003-2670.
Authors describe a method of analyzing PAHs, and successfully test the method on contaminated marine sediments by quantifying 10 of 16 PAHs with recovery close to or lower than certified values.

Podzorova, E. A.; Pikaev, A. A.; Buryak, A. K.; Ulyanov, A. V.; Pikaev, A. K. **Radiation-chemical purification of water from petroleum products as studied by gas chromatography-mass spectrometry.** *High Energy Chemistry*. 2001; 35 (2):61-68. ISSN: 0018-1439.
GC-MS was used to analyze results of radiation-chemical purification of water from diesel, motor, and residual fuel oil. A dose of ~25 kGy was found to completely remove organic compounds.

Poindexter, Michael K.; Lindemuth, Paul M. **Applied statistics: crude oil emulsions and demulsifiers.** *Journal of Dispersion Science and Technology*. 2004; 25 (3):311-320. ISSN: 0193-2691.
Field studies were used to better understand how demulsifiers work in the context of crude oil components, and to streamline the demulsification process.

Pond, Kristy L.; Huang, Yongsong; Wang, Yi; Kulpa, Charles F. **Hydrogen isotopic composition of individual *n*-alkanes as an intrinsic tracer for bioremediation and source identification of petroleum contamination.** *Environmental Science & Technology*. 2002; 36 (4):724-728. ISSN: 0013-936X.
Authors describe a new method for monitoring the degradation of lower molecular weight *n*-alkanes by focusing on effects of biodegradation on hydrogen isotopic composition, rather than carbon isotopic values.

Popp, Peter; Bauer, Coretta; Paschke, Albrecht; Montero, Larisse. **Application of a polysiloxane-based extraction method combined with column liquid chromatography to determine polycyclic aromatic hydrocarbons in environmental samples.** *Analytica Chimica Acta*. 2004; 504 (2):307-312. ISSN: 0003-2670.
Silicone rods were used to extract PAHs from water samples at rates comparable to stir bar sorptive extraction. Although this method has a slower extraction time than other processes, the rods are inexpensive and reusable.

Porte, C.; Biosca, X.; Solé, M.; Albaigés, Joan. **The integrated use of chemical analysis, cytochrome P450 and stress proteins in mussels to assess pollution along the Galician coast (NW Spain).** *Environmental Pollution*. 2001; 112 (2):261-268. ISSN: 0269-7491.
Mussels collected in October 1995 were tested for effects from hydrocarbons exposure. The effect of pollution on mussels was shown by the correlation between stress-70 protein levels and four- to six-ring PAHs in mussel tissue.

Potin, Olivier; Rafin, Catherine; Veignie, Etienne. **Bioremediation of an aged polycyclic aromatic hydrocarbons (PAHs)-contaminated soil by filamentous fungi isolated from the soil.** *International Biodeterioration & Biodegradation*. 2004; 54 (1):45-52. ISSN: 0964-8305.
Soil was extracted from a PAH-contaminated gasworks site and 21 fungi were isolated and tested for PAH-degrading abilities in the presence of two inoculation treatments (spore and mycelial inoculum). Results show that fungi, with proper inoculation, can be used to treat aged PAHs in soil.

Potter, Thomas. L.; Duval, Brian. **Cerro Negro bitumen degradation by a consortium of marine benthic microorganisms.** *Environmental Science & Technology*. 2001; 35 (1):76-83. ISSN: 0013-936X.
Bitumen was separated from Orimulsion and incubated in sediments from a petroleum-impacted site and observed for possible bioremediation. Results showed that 40% of the bitumen was bioaccessible, making bioremediation a potential treatment option.

Powell, Eric N. et al. **Taphonomy on the continental shelf and slope: two-year trends - Gulf of Mexico and Bahamas.** *Palaeogeography Palaeoclimatology Palaeoecology*. 2002; 184 (1-2):1-35. ISSN: 0031-0182.

Prabhu, Y.; Phale, P. S. **Biodegradation of phenanthrene by *Psuedomonas* sp strain PP2: novel metabolic pathway, role of biosurfactant and cell surface hydrophobicity in hydrocarbon assimilation.** *Applied Microbiology and Biotechnology*. 2003; 61 (4):342-351. ISSN: 0175-7598.
After identifying the production of growth-dependent extracellular biosurfactant in a hydrocarbon-degrading culture, investigators surmise an interaction between biosurfactant production and cell surface hydrophobicity, and the role the interaction plays in the biodegradation process.

Prak, Dianne J. Luning; Pritchard, Parmely H. **Degradation of polycyclic aromatic hydrocarbons dissolved in Tween 80 surfactant solutions by *Sphingomonas paucimobilis* EPA 505.** *Canadian Journal of Microbiology*. 2002; 48 (2):151-158. ISSN: 0008-4166.
The metabolism of PAH mixtures was analyzed to determine the role surfactants played in the biodegradation process. The results of experiments suggest that the surfactant Tween 80 enhances biodegradation in *S. paucimobilis* by increasing competition among PAHs for the same enzymatic sites.

Prantera, Mônica T.; Drozdowicz. Adam; Leite, Selma Gomes; Rosado, Alexandre Soares. **Degradation of gasoline aromatic hydrocarbons by two N-2-fixing soil bacteria.** *Biotechnology Letters*. 2002; 24 (1):85-89. ISSN: 0141-5492.
Two bacterial strains were extracted from BTX-contaminated soils were tested to determine if they could fix N_2 and simultaneously degrade BTX compounds. SMPE-GC was used to quantify the results, which showed that significant degradation of benzene, toluene and xylene occurred in the experiments.

Prenafeta-Boldú, F. X. et al. **Isolation and characterisation of fungi growing on volatile aromatic hydrocarbons as their sole carbon and energy source.** *Mycological Research*. 2001; 105 (4):477-484. ISSN: 0953-7562.

Prenafeta-Boldú, F. X.; Ballerstedt, H.; Gerritse, J.; Grotenhuis, J. T. C. **Bioremediation of BTEX hydrocarbons: effect of soil inoculation with the toluene-growing fungus.** *Biodegradation*. 2004; 15 (1):59-65. ISSN: 0923-9820.
Investigators introduced a fungal species to soil contaminated by specific PAHs. The fungus was able to degrade toluene, ethylbenzene and xylene. The introduction of the fungus to the spiked soil did not appear to harm the indigenous bacteria.

Prenafeta-Boldú, F. X.; Vervoort, J.; Grotenhuis, J. T. C.; van Groenestijn, J. W. **Substrate interactions during the biodegradation of benzene, toluene, ethylbenzine, and xylene (BTEX) hydrocarbons by the fungus *Cladophialophora* sp. strain T1.** *Applied & Environmental Microbiology*. 2002; 68 (6):2660-2665. ISSN: 0099-2240.

Priego-Capote, F.; Luque-García, U.; Luque de Castro, M. Dolores. **Automated fast extraction of nitrated polycyclic aromatic hydrocarbons from soil by focused microwave-assisted Soxhlet extraction prior to gas chromatography-electron-capture detection.** *Journal of Chromatography A*. 2003; 994 (1-2):159-167. ISSN: 0021-9673.
Authors propose an extraction technique for PAHs that rivals efficiency standards proposed by EPA methods, yet with a much reduced extraction time and involving less organic solvent.

Priego-López, E.; Luque de Castro, M. Dolores. **Ultrasound-assisted extraction of nitropolycyclic aromatic hydrocarbons from soil prior to gas chromatography - mass detection.** *Journal of Chromatography A*. 2003; 1018 (1):1-6. ISSN: 0021-9673.
Researchers report on a novel method of extraction of aromatic hydrocarbons from contaminated soil that is faster and more efficient than the reference EPA method.

Prince, Roger C. et al. **The roles of photooxidation and biodegradation in long-term weathering of crude and heavy fuel oils.** *Spill Science & Technology Bulletin*. 2003; 8 (2):145-156. ISSN: 1353-2561.
Residues from previous oil spills were analyzed to determine photochemical and biodegradation processes behind the transformation of PAHs.

Prince, Roger C.; Owens, Edward H.; Sergy, Gary A. **Weathering of an Arctic oil spill over 20 years: the BIOS experiment revisited.** *Marine Pollution Bulletin*. 2002; 44 (11):1236-1242. ISSN: 0025-326X.
A follow-up investigation of the remains of crude from the Baffin Island Oil Spill shows that biodegradation can be an important factor in the fate of oil, even when biological processes are severely restricted by harsh environments.

Proctor, L. M.; Toy, E.; Lapham, L.; Cherrier, J.; Chanton, J. P. **Enhancement of Orimulsion biodegradation through the addition of natural marine carbon substrates.** *Environmental Science & Technology*. 2001; 35 (7):1420-1424. ISSN: 0013-936X.
Orimulsion, a cheaper alternative to fuel oils, presents different problems if released in marine waters due to its density. Experiments carried out to gauge the success of remediation techniques found that the addition of seagrass and pinfish stimulated the degradation of bitumen in the orimulsion.

Prost, Rene; Yaron, Bruno. **Use of modified clays for controlling soil environmental quality.** *Soil Science*. 2001; 166 (12):880-895. ISSN: 0038-075X.
Modified clays can play an important role in the remediation of polluted soils, as well as in containing various organic contaminants. This paper explores the status of current studies of clay modification. The authors suggest that the focus of future studies should concentrate on the molecular level in the development of nanocomposite clays.

Purwaningsih, I. S.; Hill, G. A.; Headley, J. V. **Mass transfer and bioremediation of naphthalene particles in a roller bioreactor.** *Water Research*. 2004; 38 (8):2027-2034. ISSN: 0043-1354.
In monitoring the remediation of naphthalene particles by microbes in a roller bioreactor, researchers identified the dissolution mass transfer rate as the limiting step for bioremediation. By combining intermediate aeration in sequential batch mode, higher bioremediation rates were achieved.

Quiñones-Aguilar, Evangelina E. et al. **Emergence and growth of maize in a crude oil polluted soil.** *Agrociencia*. 2004; 37 (6):585-594. ISSN: 1405-3195.
Two separate types of maize were grown from seeds collected at different locations and monitored for phytoremediation capabilities at sites with different concentrations of crude oil in soils.

Racey, A. et al. **The petroleum geology of the Early Eocene El Garia Formation, Hasdrubal field, offshore Tunisia.** *Journal of Petroleum Geology*. 2001; 24 (1):29-53. ISSN: 0141-6421.
The El Garia formation, which holds significant volumes of hydrocarbons in Tunisia and Libya, is described in this paper. A new depositional model of the formation is proposed, based upon data gathered from wells drilled in the past.

Radwan, Samir S.; Al-Hasan, R. H.; Salamah, S.; Al-Dabbous, S. **Bioremediation of oily sea water by bacteria immobilized in biofilms coating macroalgae.** *International Biodeterioration & Biodegradation*. 2002; 50 (1):55-59. ISSN: 0964-8305.
Bacteria that were immobilized due to being attached to microalgae were observed consuming significant amounts of low molecular weight PAHs in seawater. Researchers suspect that the predominant microorganisms can also utilize almost all fractions of crude oil.

Radwan, Samir S.; Al-Muteirie, Awatif S. **Vitamin requirements of hydrocarbon-utilizing soil bacteria.** *Microbiological Research*. 2001; 155 (4):301-307. ISSN: 0944-5013.
Two bacterial strains, biovars of *C. flavigena* and *R. erythropolis*, were tested in order to determine if the addition of vitamins in the soil aided in the biodegradation of hydrocarbons. Field experiments confirmed that vitamin fertilization of oil-polluted sand enhanced the process.

Radwan, Samir. S.; Al-Hasan, R. H. **Potential application of coastal biofilm-coated gravel particles for treating oily waste.** *Aquatic Microbial Ecology*. 2001; 23 (2):113-117. ISSN: 0948-3055.
This paper examines natural immobilizing hydrocarbon-degrading microorganisms of the Arabian Gulf coast. Microbial consortiums consisting of cyanobacterial mats have contributed to the self-cleaning of the coasts. Researchers are looking at the potential of applying the bacteria to oily industrial wastes before their disposal in the open environment.

Rafin, Catherine; Potin, Olivier; Veignie, Etienne; Sahraoui, A. L. H.; Sancholle, M. **Degradation of benzo[a]pyrene as sole carbon source by a non white rot fungus, *Fusarium solani*.** *Polycyclic Aromatic Compounds*. 2000; 21 (1-4):311-329. ISSN: 1040-6638.
Spores of *F. solani* germinated and fed off of B(a)P as a sole carbon source. Research indicated that cytochrome P-450 1A was produced during the degradation process.

Raghavan, T. M.; Furtado, T. **Tolerance of an estuarine halophilic archaebacterium to crude oil and constituent hydrocarbons.** *Bulletin of Environmental Contamination and Toxicology*. 2000; 65 (6):725-731. ISSN: 0007-4861.
In this study, *Halobacterium* strain R_1-- isolated from the Mandovi estuary in Goa, India--was incubated and then monitored periodically for its tolerance to toxic hydrocarbons and crude oil under both nutrient rich and limited conditions.

Raghukumar, C.; Vipparty, V.; David, Jason. J.; Chandramohan, D. **Degradation of crude oil by marine cyanobacteria.** *Applied Microbiology and Biotechnology*. 2001; 57 (3):433-436. ISSN: 0175-7598.
Bombay High crude oil was degraded by three species of cyanobacteria in experiments with natural seawater and artificial seawater nutrients. A mixed culture of the three species was found to remove 40% of the crude oil.

Rahman, K. S. et al. **Enhanced bioremediation of *n*-alkane in petroleum sludge using bacterial consortium amended with rhamnolipid and micronutrients.** *Bioresource Technology*. 2003; 90 (2):159-168. ISSN: 0960-8524.
The addition of bacterial consortium, rhamnolipid biosurfactant and a solution consisting of nitrogen, phosphorus and potassium significantly improved the rate of bioremediation of soil contaminated with oil sludge.

Rahman, K. S. M.; Rahman, Thahira J.; Lakshmanaperumalsamy, P.; Banat, Ibrahim M. **Towards efficient crude oil degradation by a mixed bacterial consortium.** *Bioresource Technology*. 2002; 85 (3):257-261. ISSN: 0960-8524.
Researchers investigated the degradation of crude oil using several species of bacteria either separately or in a consortium. The consortium outperformed all separate bacteria species when degrading crude oil in a 1% concentration, but its effectiveness dropped when concentrations of crude were increased to 10%.

Rahman, K. S. M.; Rahman, Thahira J.; Lakshmanaperumalsamy, P.; Marchant, Roger.; Banat, Ibrahim. M. **The potential of bacterial isolates for emulsification with a range of hydrocarbons.** *Acta Biotechnologica*. 2003; 23 (4):335-345. ISSN: 0138-4988.
Investigators isolated 32 species of oil-degrading bacteria from 10 contaminated sites, and from these species, found that 80% of these produced biosurfactants. The range of hydrocarbons emulsified by the isolates included Bombay High crude oil, kerosene, gasoline and diesel fuel.

Rahman, K. S. M.; Rahman, Thahira J.; McLean, Stephen; Marchant, Roger; Banat, Ibrahim M. **Rhamnolipid biosurfactant production by strains of *Pseudomonas aeruginosa* using low-cost raw materials.** *Biotechnology Progress*. 2002; 18 (6):1277-1281. ISSN: 8756-7938.
Rhamnolipid biosurfactant production and emulsification of hydrocarbons by bacteria isolated from diesel and gasoline contaminated soils were augmented by the addition of soybean oil supplements.

Raikar, Mula T.; Raghukumar, Seshagiri; Vani, V.; David, Jason J.; Chandramohan, D. ***Thraustochytrid* protists degrade hydrocarbons.** *Indian Journal of Marine Sciences*. 2001; 30 (3):139-145. ISSN: 0379-5136.
Thraustochytrid, a marine fungus, was tested for hydrocarbon-degrading abilities. It was found to degrade high proportions of weathered oil (tar balls) in sediment.

Raksit, Asit; Johri, Saima. **Determination of dissolved volatile hydrocarbons in environmental aqueous samples by headspace-gas chromatography with flame ionization detection.** *American Laboratory*. 2003; 35 (12):10-13. ISSN: 0044-7749.
Authors describe a simple analytical method for identifying and quantifying dissolved volatile hydrocarbons in environmental aqueous samples. This technique provides improved results on peak shape, resolution, sensitivity and reproducibility of compounds and is recommended for analyzing low-molecular mass aromatic hydrocarbons.

Ramirez, Nubia; Cutright, Teresa; Ju, Lu-Kwang. **Pyrene biodegradation in aqueous solutions and soil slurries by *Mycobacterium* PYR-1 and enriched consortium.** *Chemosphere*. 2001; 44 (5):1079-1086. ISSN: 0045-6535.

Ramón, J. C.; Dzou, L. I.; Hughes, W. B.; Holba, A. G. **Evolution of the Cretaceous organic facies in Colombia: implications for oil composition.** *Journal of South American Earth Sciences*. 2001; 14 (1):31-50. ISSN: 0895-9811.
Cretaceous source rocks in Colombia are characterized by significant variations in organic matter input and depositional environments. Although similar to the oils generated from lower Cretaceous rocks, Upper Cretaceous-derived oils can be distinguished by the presence of oleanane and other angiosperm biomarkers.

Ramos, L.; Kristenson, E. M.; Brinkman, U. A. T. **Current use of pressurised liquid extraction and subcritical water extraction in environmental analysis.** *Journal of Chromatography A*. 2002; 975 (1):3-29. ISSN: 0021-9673.
This paper reviews current information regarding two extraction methods and their advantages in the analysis of organic pollutants from environmental samples.

Ramsay, Juliana A.; Li, Hao; Brown, R. S.; Ramsay, Bruce A. **Naphthalene and anthracene mineralization linked to oxygen, nitrate, Fe(II) and sulphate reduction in a mixed microbial population.** *Biodegradation*. 2003; 14 (5):321-329. ISSN: 0923-9820.
Mineralization of PAHs by a microbial consortium was accomplished by the availability of specific elements or compounds acting as terminal electron acceptors.

Ramsay, Michelle A.; Swannell, Richard P. J.; Shipton, Warren A.; Duke, Norman C.; Hill, Russell T. **Effect of bioremediation on the microbial community in oiled mangrove sediments.** *Marine Pollution Bulletin*. 2000; 41 (7-12):413-419. ISSN: 0025-326X.
Aeration of soil, plus the addition of fertilizer, was found to enhance the growth of biodegrading bacteria in experiments using Gippsland crude oil.

Randazzo, Demetrio et al. **Efficient polycyclic aromatic hydrocarbons dihydroxylation in direct micellar systems.** *Biotechnology and Bioengineering*. 2001; 74 (3):240-248. ISSN: 0006-3592.
Experiments were undertaken to investigate whole-cell bioconversion of certain PAHs by microorganisms with the addition of a nonionic surfactant. In direct microemulsion systems, PAHs were solubilized at high rates, and more efficient substrate bioconversion occurred as a result. However, dihydroxylated products inhibited conversion reactions in anthracene and phenanthrene, and complete turnover of substrates did not occur.

Ravelet, C.; Grosset, C.; Montuelle, B.; Benoit-Guyod, J. L.; Alary, J. **Liquid chromatography study of pyrene degradation by two micromycetes in a freshwater sediment.** *Chemosphere*. 2001; 44 (7):1541-1546. ISSN: 0045-6535.
A quick and efficient method of liquid chromatographic analysis of the degradation of pyrene was achieved in laboratory experiments. Researchers, surprised by very low levels of biodegradation, offer possibilities for the results they observed.

Rawa-Adkonis, Magdalena; Wolska, Lidia; Namiesnik, Jacek. **Modern techniques of extraction of organic analytes from environmental matrices.** *Critical Reviews in Analytical Chemistry*. 2003; 33 (3):199-248. ISSN: 1040-8347.
The authors review the latest developments and applications in extraction techniques for the isolation and determination of trace organic contaminants.

Reddy, Christopher M. et al. **Radiocarbon as a tool to apportion the sources of polycyclic aromatic hydrocarbons and black carbon in environmental samples.** *Environmental Science & Technology*. 2002; 36 (8):1774-1782. ISSN: 0013-936X.
Authors identify and depict two independent analytical methods of determining the relative abundance of ^{14}C in environmental samples.

Reemtsma, Thorsten. **Liquid chromatography-mass spectrometry and strategies for trace-level analysis of polar organic pollutants.** *Journal of Chromatography A*. 2003; 1000 (1-2):477-501. ISSN: 0021-9673.
This paper reviews the use of atmospheric pressure ionization added to LC-MS to increase detection rates of polar pollutants, including PAHs, in water.

Reid, Brian J.; Stokes, Joanna D.; Jones, Kevin C.; Semple, Kirk T. **Influence of hydroxypropyl-β-cyclodextrin on the extraction and biodegradation of phenanthrene in soil.** *Environmental Toxicology and Chemistry*. 2004; 23 (3):550-556. ISSN: 0730-7268.
The application of hydroxypropyl-β-cyclodextrin enhanced phenanthrene degradation in soil, and also made aged phenanthrene less extractable and less available, reducing the risk for residual contamination.

Reid, Brian. J.; Fermor, T. R.; Semple, Kirk. T. **Induction of PAH-catabolism in mushroom compost and its use in the biodegradation of soil-associated phenanthrene.** *Environmental Pollution*. 2001; 118 (1):65-73. ISSN: 0269-7491.

Remediation of oil-contaminated soils, witout problems and environmentally compatible. *Tenside Surfactants Detergents*. 2000; 37 (3):193. ISSN: 0932-3414.

Rentz, Jeremy A.; Alvarez, Pedro J. J.; Schnoor, Jerald L. **Repression of *Pseudomonas putida* phenanthrene-degrading activity by plant root extracts and exudates.** *Environmental Microbiology*. 2004; 6 (6):574-583. ISSN: 1462-2912.

Rentz, Jeremy A.; Chapman, Brad; Alvarez, Pedro J. J.; Schnoor, Jerald L. **Stimulation of hybrid poplar growth in petroleum-contaminated soils through oxygen addition and soil nutrient amendments.** *International Journal of Phytoremediation*. 2003; 5 (1):57-72. ISSN: 1522-6514.
Passive oxygen delivery, as used in a phytoremediation system, is a cost-effective remediation method, as opposed to conventional methods, according to investigators. In addition, passive oxygen delivery can extend remediation efforts to areas with contaminants that have high biochemical oxygen demand.

Resina-Pelfort, Olga; García-Junco, Marta; Ortega-Calvo, José Julio; Comas-Riu, Juame; Vives-Rego, Josep. **Flow cytometry discrimination between bacteria and clay-humic acid particles during growth-linked biodegradation of phenanthrene by *Pseudomonas aeruginosa* 19SJ.** *FEMS Microbiology Ecology*. 2003; 43 (1):55-61. ISSN: 0168-6496.
Authors describe a flow cytometry method that quickly appraises bacterial concentrations and aggregations in soil and sediment samples.

Revil, A.; Cathles, L. M. III. **Fluid transport by solitary waves along growing faults - a field example from the South Eugene Island Basin, Gulf of Mexico.** *Earth and Planetary Science Letters*. 2002; 202 (2):321-335. ISSN: 0012-821X.
This paper describes the migration of hydrocarbons through the Red Fault, an active growth fault system in the Gulf of Mexico.

Rezende, C. E.; Ovalle, A. R. C.; Souza, C. M. M.; Carvalho, C. E. V.; Lacerda, L. D. **Geochemistry and spatial distribution of heavy metals in continental shelf sediments from two offshore oil fields in south-eastern Brazil.** *In* De Lacerda, L. D.; Santelli, R. E.; Duursman, E.; Abrao, J. J. (Eds.) *Environmental Geochemistry in Tropical and Subtropical Environments*. Berlin: Springer-Verlag; 2004; p. 355-364. ISBN: 3-540-42540-3.

Richards, Phil. **Overview of petroleum geology, oil exploration and associated environmental protection around the Falkland Islands.** *Aquatic Conservation-Marine and Freshwater Ecosystems*. 2002; 12 (1):7-14. ISSN: 1052-7613.
The geology of the North Falkland Basin is described, along with the history of drilling in the area and the recent steps taken by both the offshore industry and the Falklands Island government in insuring minimal environmental impact for future exploration.

Richmond, S. A.; Lindstrom, Jon. E.; Braddock, Joan. F. **Effects of chitin on microbial emulsification, mineralization potential, and toxicity of Bunker C fuel oil.** *Marine Pollution Bulletin*. 2001; 42 (9):773-779. ISSN: 0025-326X.
Nutrient and chitin amendments were used to increase both biodegradation and emulsification of hydrophobic petroleum compounds. The addition of chitin to nutrients significantly reduced the toxicity of emulsified oils after incubation times of 4 and 6 weeks.

Richter, Dana L.; Warner, Jennifer I.; Stephens, Aimee L. **A comparison of mycorrhizal and saprotrophic fungus tolerance to creosote *in vitro*.** *International Biodeterioration & Biodegradation*. 2003; 51 (3):195-202. ISSN: 0964-8305.
Thirty-nine isolates of fungal species were grown on agar, tested and then rated according to their tolerance to creosote contamination in doses of 25, 50 and 100 ppm.

Richter, H. et al. **Chemical characterization and bioactivity of polycyclic aromatic hydrocarbons from non-oxidative thermal treatment of pyrene-contaminated soil at 250-1,000° C.** *Environmental Health Perspectives*. 2000; 108 (8):709-717. ISSN: 0091-6765.
Superfund-related soil mixtures were heated at various temperatures to determine if heat could effectively decontaminate the soil. Authors note that at various temperatures, by-products from PAHs are formed.

Riis, Volker; Babel, Wolfgang; Pucci, Oscar Héctor. **Influence of heavy metals on the microbial degradation of diesel fuel.** *Chemosphere*. 2002; 49 (6):559-568. ISSN: 0045-6535.
The toxicity of heavy metals inhibited the degradation of diesel fuel by microbes in liquid cultures, but had no significant effect on the microbial community in soil slurry experiments.

Riis, Volker; Kleinsteuber, Sabine; Babel, Wolfgang. **Influence of high salinities on the degradation of diesel fuel by bacterial consortia.** *Canadian Journal of Microbiology*. 2003; 49 (11):713-721. ISSN: 0008-4166.
Bacterial communities were taken from three separate saline soils and tested for their ability to degrade diesel fuel under salinity conditions ranging from 0% to 25%. Reaction to saline conditions was markedly different among communities, but all showed some biodegradation potential if salinity concentrations were kept lower than 15%.

Rila, Jean-Paul; Eisentraeger, Adolf. **Application of bioassays for risk characterisation and remediation control of soils polluted with nitroaromatics and PAHs.** *Water, Air, & Soil Pollution*. 2003; 148 (1-4):223-242. ISSN: 0049-6979.
The authors reiterate the need for bioassays in addition to routine chemical analyses in order to obtain better assessments of remediated sites.

Rincón, N. et al. **Anaerobic biodegradability of water separated from extracted crude oil.** *Environmental Technology*. 2003; 24 (8):963-970. ISSN: 0959-3330.

Rink, Jörg E.; Boesl, Ulrich. **Mass-selected resonance-enhanced multiphoton ionisation spectra of laser-desorbed molecules for environmental analysis: 16 representative polycyclic aromatic compounds.** *European Journal of Mass Spectrometry*. 2003; 9 (1):23-32. ISSN: 1469-0667.
Authors describe a method of analyzing PAHs by use of a compact laser desorption/laser ionization source that detects the thermal equilibrium of desorbed molecules.

Rios-Hernandez, Luis A.; Gieg, Lisa M.; Suflita, Joseph M. **Biodegradation of an alicyclic hydrocarbon by a sulfate-reducing enrichment from a gas condensate-contaminated aquifer.** *Applied & Environmental Microbiology*. 2003; 69 (1):434-443. ISSN: 0099-2240.
Bacteria were used to degrade ethylcyclopentane (ECP), and researchers noted sulfate reduction coupled to the degradation process in the presence of enrichment.

Ripley, M. B.; Harrison, A. B.; Betts, W. B.; Dart, R. K. **Mechanisms for enhanced biodegradation of petroleum hydrocarbons by a microbe-colonized gas-liquid foam.** *Journal of Applied Microbiology*. 2002; 92 (1):22-31. ISSN: 1364-5072.
Petroleum-contaminated soil was spiked with an application of protein hydrolysate-based oxygenated bioactive foam and studied to determine changes in biodegradation rates. The foam enhanced biodegradation rates, due to improved oxygen availability and transfer, with the protein hydrolysate stimulating *n*-hexadecane removal efficiency in bacteria.

Rivera, Nestor; Sehbi, Baljit; Spivey, John P.; Fairbairn, Jim. **Multilateral, intelligent well completion benefits explored.** *Oil & Gas Journal*. 2003; 101 (15):45-53. ISSN: 0030-1388.
A comprehensive evaluation that compared multilateral well performance with conventional horizontal well performance was used to ascertain specific reservoir characteristics, drilling conditions and economic feasibility.

Rivera-Cruz, María del Carmen et al. **Decontamination of soils polluted with crude petroleum using indigenous microorganisms and Alemán Grass [*Echinochloa polystachya* (H.B.K.) Hitche].** *Agrociencia*. 2004; 38 (1):1-12. ISSN: 1405-3195.
Native populations of rhizospheric bacteria and fungus were used to evaluate the removal of crude oil from contaminated soils.

Rivera-Espinoza, Y.; Dendooven, L. **Dynamics of carbon, nitrogen and hydrocarbons in diesel-contaminated soil amended with biosolids and maize.** *Chemosphere*. 2004; 54 (3):379-386. ISSN: 0045-6535.
In a laboratory experiment, an uncontaminated soil sample containing clay was spiked with diesel fuel and then amended with biosolids and maize. The sample was monitored to evaluate the dynamics of carbon, nitrogen and hydrocarbons for each amendment as the remediation process unfolded in the soil.

Robelo, Carmen Rodríguez; Novoa, Vanesa Zazueta; Zazueta-Sandoval, Roberto. **Effects of carbon source on expression of alcohol oxidase activity and on morphologic pattern of YR-1 strain, a filamentous fungus isolated from petroleum-contaminated soils.** *Applied Biochemistry and Biotechnology*. 2004; 113-116;161-171. ISSN: 0273-2289.
Alcohol oxidase expression in a strain of fungus isolated from petroleum-contaminated soil was due either to hydrocarbon induction or carbon catabolite regulation by glucose. Further tests discounted a regulatory mechanism involving catabolic inhibition of alcohol oxidase.

Robinson, Sandra L.; Novak, John T.; Widdowson, Mark A.; Crosswell, Scott B.; Fetterolf, Glendon J. **Field and laboratory evaluation of the impact of tall fescue on polyaromatic hydrocarbon degradation in an aged creosote-contaminated surface soil.** *Journal of Environmental Engineering - ASCE*. 2003; 129 (3):232-240. ISSN: 0733-9372.
PAHs, with the exception of phenanthrene, were degraded in the presence of fescue. It is suspected that observed degradation was the result of rhizosphere-related bacteria.

Robson, Diana Bizecki; Knight, J. Diane; Farrell, Richard E.; Germida, James J. **Ability of cold-tolerant plants to grow in hydrocarbon-contaminated soil.** *International Journal of Phytoremediation*. 2003; 5 (2):105-123. ISSN: 1522-6514.
Researchers identify *Psoralea esculenta* and *Agropyron pectiniformae* as having promise in phytoremediation of crude oil-contaminated soils, based on tolerance to hydrocarbons and high root biomass production.

Rockne, Karl J.; Strand, Stuart E. **Anaerobic biodegradation of naphthalene, phenanthrene, and biphenyl by a dentrifying enrichment culture.** *Water Research*. 2001; 35 (1):291-299. ISSN: 0043-1354.
Sub-cultures of nitrate-reducing bacteria were found to reduce PAHs after three feedings, ceasing only when nitrogen was depleted, and resuming when nitrogen was re-introduced. Mineralization rates differed by type of PAH, with 96% of phenanthrene biodegradation being the highest recorded.

Rodríguez, E.; Nuero, O.; Guillén, F.; Martínez, A. T.; Martínez, M. J. **Degradation of phenolic and non-phenolic aromatic pollutants by four *Pleurotus* species: the role of laccase and versatile peroxidase.** *Soil Biology & Biochemistry*. 2004; 36 (6):909-916. ISSN: 0038-0717.
Two of four species of fungi tested were able to mineralize B(a)P in liquid cultures. Upon further investigation, lignonolytic enzymes were found to be present, and later experiments showed that either 2,2'-azino-bis-(3-ethylbenzothiazoline-6-sulphonic acid) or 1-hydrobenzotriazole were required as mediators for B(a)P to be degraded.

Rodríguez, J. J. Santana; Sanz, C. Padrón. **Fluorescence techniques for the determination of polycyclic aromatic hydrocarbons in marine environment: an overview.** *Analusis*. 2000; 28 (8):710-717. ISSN: 0365-4877.

Rodriguez, Miguel, Jr.; Klasson, K. Thomas; Davison, Brian H. **Enhancement of the conversion of toluene by *Pseudomonas putida* F-1 using organic cosolvents.** *Applied Biochemistry and Biotechnology Part A: Enzyme Engineering and Biotechnology*. 2001; 91 (3):195-204. ISSN: 0273-2289.

Rogers, Vincent V.; Liber, Karsten; MacKinnon, Michael D. **Isolation and characterization of naphthenic acids from Athabasca oil sands tailings pond water.** *Chemosphere*. 2002; 48 (5):519-527. ISSN: 0045-6535.
A solvent-based procedure was developed to extract naphthenic acids from oil sands tailings pond water for oral toxicity tests in mammals.

Röling, Wilfred F. M. et al. **Bacterial community dynamics and hydrocarbon degradation during a field-scale evaluation of bioremediation on a mudflat beach contaminated with buried oil.** *Applied and Environmental Microbiology*. 2004; 70 (5):2603-2613. ISSN: 0099-2240.
Different fertilized treatments degraded buried oil more rapidly than plots with no fertilizer, although no difference in oil chemistry was seen between types of fertilizer treatment. Community dynamics between oiled fertilized plots and control were roughly similar, but within oiled plots community dynamics showed marked differences over time depending upon type of treatment.

Röling, Wilfred F. M. et al. **Robust hydrocarbon degradation and dynamics of bacterial communities during nutrient-enhanced oil spill bioremediation.** *Applied & Environmental Microbiology*. 2002; 68 (11):5537-5548. ISSN: 0099-2240.
This study examined changes in microbial community structure during the biodegradation process. Investigators also analyzed the effects of nutrient amendments on specific bacterial species and overall community dynamics.

Romero, M. Cristina; Salvioli, Mónica L.; Cazau, M. Cecilia; Arambarri, A. M. **Pyrene degradation by yeasts and filamentous fungi.** *Environmental Pollution*. 2002; 117 (1):159-163. ISSN: 0269-7491.
Authors identified four fungal species that thrived in contaminated sediments found near a petroleum refinery. The fungal types, which are not considered white-rot or brown-rot fungi, were able to metabolize four-ring aromatic hydrocarbons.

Ron, Eliora Z.; Rosenberg, Eugene. **Natural roles of biosurfactants.** *Environmental Microbiology*. 2001; 3 (4):229-236. ISSN: 1462-2912.
This review discusses the types (low- versus high-molecular weight) of surfactants, as well as chemical structures and the natural roles they play (direct versus indirect) in the degradation of pollutants.

Rost, Helmut; Loibner, Andreas P.; Hasinger, Marion; Braun, Rudolf; Szolar, Oliver H. J. **Behavior of PAHs during cold storage of historically contaminated soil samples.** *Chemosphere*. 2002; 49 (10):1239-1246. ISSN: 0045-6535.
The role that cold temperatures have on the fate of PAHs in soils was studied. Researchers identified physical, chemical and biological factors indicative of long-term PAH stability in contaminated soils.

Rothermich, Mary M.; Hayes, Lory A.; Lovley, Derek R. **Anaerobic, sulfate-dependent degradation of polycyclic aromatic hydrocarbons in petroleum-contaminated harbor sediment.** *Environmental Science & Technology*. 2002; 36 (22):4811-4817. ISSN: 0013-936X.
Results of a study reveal significant anaerobic degradation of PAHs in anoxic, sulfate-reducing sediments, suggesting a greater self-purifying capacity than previously thought.

Roy, Subarna; Hens, Dipak; Biswas, Debabrata; Biswas, Dipa; Kumar, Ranajit. **Survey of petroleum-degrading bacteria in coastal waters of Sunderban Biosphere Reserve.** *World Journal of Microbiology & Biotechnology*. 2002; 18 (6):575-581. ISSN: 0959-3993.
Authors identify several species of bacteria thriving in petroleum-contaminated marine sediments. One of the strains is suspected of being able to degrade high molecular weight hydrocarbons.

Ruberto, Lucas; Vazquez, Susana C.; MacCormack, Water P. **Effectiveness of the natural bacterial flora, biostimulation and bioaugumentation on the bioremediation of a hydrocarbon contaminated Antarctic soil.** *International Biodeterioration & Biodegradation*. 2003; 52 (2):115-125. ISSN: 0964-8305.
Investigations into hydrocarbon-contaminated soil discovered that initial exposure to indigenous bacteria inhibited growth and reduced diversity. However, the bacteria were able to degrade an important fraction of the hydrocarbons and bioaugumentation with nitrogen and phosphorus improved biodegradation efficiency.

Ryder, A. G. et al. **Characterization of crude oils using fluorescence lifetime data.** *Spectrochimica Acta. Part A: Molecular and Biomolecular Spectroscopy*. 2002; 58 (5):1025-1037. ISSN: 1386-1425.

Saadoun, I. **Recovery of *Pseudomonas* spp. from chronically fuel oil-polluted soils in Jordan and the study of their capability to degrade short chain alkanes.** *World Journal of Microbiology & Biotechnology*. 2004; 20 (1):43-46. ISSN: 0959-3993.
A number of microbes from the *Pseudomonas* family were examined and identified by species. Biodegradation test revealed five species that could degrade hexane or heptane, and from these, three species that could degrade both compounds.

Sabaté, J.; Viñas, M.; Solanas, A. M. **Laboratory-scale bioremediation experiments on hydrocarbon-contaminated soils.** *International Biodeterioration & Biodegradation*. 2004; 54 (1):19-25. ISSN: 0964-8305.
Authors describe a two-phase protocol for assessing treatment of polluted soils. In the first phase, information gathered indicates whether biological treatment is appropriate for the soil. The second phase is an attempt to identify the best treatment available by evaluating various additives and overall soil conditions.

Sabljic, A. **QSAR models for estimating properties of persistent organic pollutants required in evaluation of their environmental fate and risk.** *Chemosphere*. 2001; 43 (3):363-375. ISSN: 0045-6535.
Noting that molecular connectivity indices (MCIs) have been used in QSAR models for over two decades, the author argues for more wise and critical uses of MCIs in the future.

Sager, William W.; MacDonald, Ian R.; Hou, R. S. **Side-scan sonar imaging of hydrocarbon seeps on the Louisiana continental slope.** *AAPG Bulletin*. 2004; 88 (6):725-746. ISSN: 0149-1423.

Saikia, N.; Bhuyan, J.; Bora, R. **Efficacy of mixed bioformulation on development of neem (*Azadirachta indica*) in crude oil contaminated soil near drill sites.** *Indian Journal of Agricultural Sciences*. 2003; 72 (10):622-624. ISSN: 0019-5022.

Saint'Pierre, Tatiana D. et al. **Determination of Cu, Mn, Ni and Sn in gasoline by electrothermal vaporization inductively coupled plasma mass spectrometry, and emulsion sample introduction.** *Spectrochimica Acta Part B: Atomic Spectroscopy*. 2002; 57 (12):1991-2001. ISSN: 0584-8547.
Authors describe and successfully test a novel method for detecting trace metals in gasoline samples.

Saison, Carine; Perrin-Ganier, Corinne; Amellal, Samira; Morel, Jean-Louis; Schiavon, Michel. **Effect of metals on the adsorption and extractability of ^{14}C-phenanthrene in soils.** *Chemosphere*. 2004; 55 (3):477-485. ISSN: 0045-6535.
To establish the effects of specific co-contaminants on the fate of PAHs, four metals (Cd, Cu, Pb, Zn) were added to phenanthrene-contaminated soil and adsorption and desorption rates were monitored. Compared to rates gathered from phenanthrene-spiked soil with no metals added, adsorption of the PAH was significantly higher, and desorption was not as easily reversed. Researchers believe that future experiments should assess the bioavailability of PAHs in the presence of metals.

Saison, Carine; Perrin-Ganier, Corinne; Schiavon, Michel; Morel, Jean-Louis. **Effect of cropping and tillage on the dissipation of PAH contamination in soil.** *Environmental Pollution*. 2004; 130 (2):275-285. ISSN: 0269-7491.
Under natural attenuation, PAH levels decreased in the first six months, but no significant reductions occurred after that time. Results show that tillage and cropping at the soil surface did not improve PAH reduction rates.

Sakami, T.; Takayanagi, K.; Shiraishi, M. **Acute toxicity of inipol EAP22, an oil spill bioremediation fertilizer, to four marine species.** *Nippon Suisan Gakkaishi*. 2001; 67 (2):302-303. ISSN: 0021-5392**.**

Salanitro, J. P. **Bioremediation of petroleum hydrocarbons in soil.** *Advances in Agronomy*. 2001; v. 72;53-105. ISSN: 0065-2113.

Salcedo, R.; Zaragoza, I. P.; Martínez-Magadán, J. M.; García-Cruz, I. **Electronic structure in different environments for vanadyl porphyrinate molecules present in crude oil.** *Journal of Molecular Structure - Theochem*. 2003; 626;195-201. ISSN: 0166-1280**.**
A theoretical determination of the role of lateral chains in vanadyl porphyrinate was achieved by analyzing the behavior of the molecules in three different solvents, measuring for aromacity, and observing molecular orbital changes and charge behavior.

Salloum, Myrna J.; Dudas, Marvin J.; Fedorak, Phillip M. **Microbial reduction of amended sulfate in anaerobic mature fine tailings from oil sand.** *Waste Management & Research*. 2002; 20 (2):162-171. ISSN: 0734-242X.
Observations of the remediation of mature fine tailings led to the identification of three microbial groups involved in the remediation process.

Salminen, Jani M.; Tuomi, Pirjo M.; Suortti, Anna-Mari; Jørgensen, Kirsten S. **Potential for aerobic and anaerobic biodegradation of petroleum hydrocarbons in boreal subsurface.** *Biodegradation*. 2004; 15 (1):29-39. ISSN: 0923-9820.
Laboratory microcosms were used to assess aerobic and anaerobic biodegradation of PAHs in soils contaminated from diesel fuel and lubrication oil. Results indicate that endogenous microbes are capable of degrading *n*-alkanes in boreal environments.

Samanta, S. K.; Singh, O.V.; Jain, R. K. **Polycyclic aromatic hydrocarbons: environmental pollution and bioremediation.** *Trends in Biotechnology*. 2002; 20 (6):243-248. ISSN: 0167-7799.

Samoilov, N. A.; Khlestkin, R. N.; Osipov, M. I.; Chichirko, O. P. **Formation of consolidated bed by carbon sorbent and oil in removal of spilled oil.** *Russian Journal of Applied Chemistry*. 2004; 77 (2):327-332. ISSN: 1070-4272.
The process of sorption of spilled oil by a carbon sorbent in a consolidated bed was studied for the use in cleaning oil spills on water surfaces.

Santas, Regas.; Santas, Photeinos. **Mesocosm and field assays of oil spill bioremediation.** *In* Wise, D. L.; Trantolo, D. J.; Cichon, H. I.; Stottmeister, U. (Eds.) *Bioremediation of Contaminated Soils (Environmental Science and Pollution Control Series, v.22)*. New York: Marcel Dekker; 2000; p. 383-391. ISBN: 0-8247-0333-2.

Saponaro, Sabrina; Bonomo, Luca; Petruzzelli, Gianniantonio; Romele, Laura; Barbafieri, Meri. **Polycyclic aromatic hydrocarbons (PAHs) slurry phase bioremediation of a manufacturing gas plant (MGP) site aged soil.** *Water, Air, & Soil Pollution*. 2002; 135 (1-4):219-236. ISSN: 0049-6979.
Heavily contaminated soil was used in experiments to determine biodegradation efficiency by use of a slurry system reactor. Investigators report high removal rates for all PAHs after 23 days of treatment.

Sarg, J. F. **Sequence stratigraphy, sedimentology, and economic importance of evaporite-carbonate transitions: a review.** *Sedimentary Geology*. 2001; 140 (1-2):9-42. ISSN: 0037-0738.
The author describes a sequence stratigraphic model that places evaporite deposition into a chronologic and geographic setting. The Gulf of Mexico basin, among others, is used to illustrate an example of evaporate succession in the model described.

Sarma, Priyangshu Manab; Bhattacharya, Dhruva; Krishnan, S.; Lal, Banwari. **Degradation of polycyclic aromatic hydrocarbons by a newly discovered enteric bacterium, *Leclercia adecarboxylata*.** *Applied and Environmental Microbiology*. 2004; 70 (5):3163-3166. ISSN: 0099-2240.
This paper describes the isolation, identification and characterization of an enteric bacterium capable of degrading PAHs.

Sasek, Václav; Bhatt, M.; Cajthaml, Tomás; Malachová, K.; Lednická, D. **Compost-mediated removal of polycyclic aromatic hydrocarbons from contaminated soil.** *Archives of Environmental Contamination and Toxicology*. 2003; 44 (3):336-342. ISSN: 0090-4341.
Mushroom compost containing wheat straw, chicken manure, and gypsum was used in a series of bioremediation experiments. Between 37% and 80% of individual PAHs were removed after 154 days, and chemical analyses and ecotoxicity tests were performed on soil, bacteria, earthworms and plant seed to follow changes in the toxicity of contaminants.

Sassen, Roger; Sweet, Stephen T.; DeFreitas, Debra A.; Morelos, J. Alejadro; Milkov, Alexei V. **Gas hydrate and crude oil from the Mississippi Fan Foldbelt, downdip Gulf of Mexico Salt Basin: significance to petroleum system.** *Organic Geochemistry*. 2001; 32 (8):999-1008. ISSN: 0146-6380.
A study of this site in the eastern Mississippi Fan Foldbelt found termogenic hydrocarbons, confirming the presence of an active petroleum system. The geology of the area is discussed, with recommendations for further study of the geophysical and geochemical properties of the region.

Sawada, Akira; Kanai, K.; Fukushima, Masami. **Preparation of artificially spiked soil with polycyclic aromatic hydrocarbons for soil pollution analysis.** *Analytical Sciences*. 2004; 20 (1):239-241. ISSN: 0910-6340.
Three methods of preparing spiked soil with PAHs were tested to confirm the most suitable method for a standardized procedure. A soil slurry dispersed by rotary evaporator was found to create the most homogeneous distribution of PAHs in the samples.

Schmidt, H.; Kaminsky, W. **Pyrolysis of oil sludge in a fluidised bed reactor.** *Chemosphere*. 2001; 45 (3):285-290. ISSN: 0045-6535.

Schmidt, T. C. et al. **Compound-specific stable isotope analysis of organic contaminants in natural environments: a critical review of the state of the art, prospects, and future challenges.** *Analytical and Bioanalytical Chemistry*. 2004; 378 (2):283-300. ISSN: 1618-2642.
This review of an analytical technique focuses on successful applications in environmental analysis, and suggests future directions concentrating on kinetic isotope effects with the intent of examining chemical and biochemical mechanisms.

Schubert, Patricia; Schantz, Michele M.; Sander, Lane C.; Wise, Stephen A. **Determination of polycyclic aromatic hydrocarbons with molecular weight 300 and 302 in environmental-matrix standard reference materials by gas chromatography/mass spectrometry.** *Analytical Chemistry*. 2003; 75 (2):234-246. ISSN: 0003-2700.
Authors report of the results of a study on the quantitative characterization of PAH isomers at specific molecular weights using GC/MS, a more accurate method of determining specific hydrocarbons than LC-fluorescence.

Schuler, Lance J.; Lydy, Michael J. **Chemical and biological availability of sediment-sorbed benzo[a]pyrene and hexachlorobiphenyl.** *Environmental Toxicology and Chemistry*. 2001; 20 (9):2014-2020. ISSN: 0730-7268.
Sediment spiked with B(a)P and hexachlorobiphenyl was aged for varying amounts of time and used in experiments to demonstrate that there is not necessarily a correlation between bioavailability and chemical availability. Uptake coefficients and feeding rates of these compounds were determined by using the oligochaete *Lumbriculus variegatus*.

Schultz, T. Wayne; Sinks, Glendon D. **Xenoestrogenic gene expressions: structural features of active polycyclic aromatic hydrocarbons.** *Environmental Toxicology and Chemistry*. 2002; 21 (5):783-786. ISSN: 0730-7268.
Researchers investigated phenolic A- and B-ring two-dimensional structural alignments to determine estrogenic gene activation by PAHs.

Seklemova, E.; Pavlova, A.; Kovacheva, K. **Biostimulation-based bioremediation of diesel fuel: field demonstration.** *Biodegradation*. 2001; 12 (5):311-316. ISSN: 0923-9820.
In a study of a diesel fuel-contaminated forest soil, researchers added nutrients to determine the effect on *ex-situ* bioremediation. Results demonstrated that the nutrients had no effect on the decontamination of polluted soil.

Selli, Elena; Zaccaria, Cristina; Sena, Fabrizio; Tomasi, Giorgio; Bidoglio, Giovanni. **Application of multi-way models to the time-resolved fluorescence of polycyclic aromatic hydrocarbons mixtures in water.** *Water Research*. 2004; 38 (9):2269-2276. ISSN: 0043-1354.
This paper describes the application of a 4-way fluorescence data array to resolve complex aqueous mixtures with low levels of PAHs present.

Semple, K. T.; Morriss, A. W. J.; Paton, G. I. **Bioavailability of hydrophobic organic contaminants in soils: fundamental concepts and techniques for analysis.** *European Journal of Soil Science*. 2003; 54 (4):809-818. ISSN: 1351-0754.
This review describes the behavior of contaminants in soil by looking at mechanisms behind soil/contaminant interactions and microbe/contaminant interactions during biodegradation. Also, the authors compare chemical and biological techniques used to assess bioavailability, and urge the need for chemical techniques in quantifying bioavailability.

Sepic, Ester; Bricelj, Mihael; Leskovsek, Hermina. **Toxicity of fluoranthene and its biodegradation metabolites to aquatic organisms.** *Chemosphere*. 2003; 52 (7):1125-1133. ISSN: 0045-6535.
Growth inhibition and immobility tests were performed on algae, bacteria and crustaceans by exposing them to fluoranthene and typical metabolites resulting from normal biodegradation of the PAH. Tests on *Scenedesmus subspicatus* found that most metabolites were between 37 and 3000 times less toxic to the algal species than fluoranthene.

Sharaf, Lobna M. **Source rock evaluation and geochemistry of condensates and natural gases, offshore Nile Delta, Egypt.** *Journal of Petroleum Geology*. 2003; 26 (2):189-209. ISSN: 0141-6421.
Author reports that results of geochemical research of the offshore Nile Delta suggest that some areas of the region have potential to generate hydrocarbons.

Sharma, S. L.; Pant, A. **Biodegradation and conversion of alkanes and crude oil by a marine *Rhodococcus* sp.** *Biodegradation*. 2000; 11 (5):289-294. ISSN: 0923-9820.
Rhodococcus sp. was found to degrade up to 50% of the aliphatic faction of Assam crude oil in seawater with small additions of nitrogen and phosphorus. Further analysis showed a correspondence between major fatty acids and the chain length of hydrocarbons in the oil.

Sharma, S. L.; Pant, A. **Crude oil degradation by a marine actinomycete *Rhodococcus* sp.** *Indian Journal of Marine Sciences*. 2001; 30 (3):146-150. ISSN: 0379-5136.
An organism found in a chronically oil-polluted area was isolated and found to be able to degrade certain fractions of three different crude oils in both distilled and sea waters. Authors speculate that the addition of nitrogen to oil-polluted ecosystems would speed the degradation process.

Shatkin, Jo Anne; Wagle, Mandeera; Kent, Sean; Menzie, Charles A. **Development of a biokinetic model to evaluate dermal absorption of polycyclic aromatic hydrocarbons from soil.** *Human and Ecological Risk Assessment*. 2002; 8 (4):713-734. ISSN: 1080-7039.
A fugacity-based model incorporates data on desorption kinetics to predict dermal uptake of chemicals associated with PAHs, in order to better understand health risk of workers exposed to soil contaminants.

Shaw, L. J.; Burns, R. G. **Biodegradation of organic pollutants in the rhizosphere.** *In* Laskin, A. I.; Bennett, J. W.; Gadd, G. M. (Eds.) *Advances in Applied Microbiology, v.53*. San Diego, Ca.: Academic Press; 2003; p. 1-60. ISBN: 0-12-002655-4.

Shi, T.; Fredrickson, J. K.; Balkwill, D. L. **Biodegradation of polycyclic aromatic hydrocarbons by *Sphingomonas* strains isolated from the terrestrial subsurface.** *Journal of Industrial Microbiology & Biotechnology*. 2001; 26 (5):283-289. ISSN: 1367-5435.
Five bacterial strains were tested for their ability to biodegrade different types of polycyclic aromatic hydrocarbons. *Sphingomonas aromaticivorans* strain B0695 was able to degrade acenaphthene, anthracene, phenanthrene, 2,3-benzofluorene, 2-methylnaphthalene 2,3-dimethlynaphthalene, and fluoranthene with the aid of Tween 80.

Shin, W. S.; Pardue, J. H. **Oxygen dynamics in crude oil contaminated salt marshes: I. Aerobic respiration model.** *Environmental Technology*. 2001; 22 (7):845-854. ISSN: 0959-3330.

Shin, W. S.; Pardue, J. H.; Choi, S. J. **Oxygen dynamics in crude oil contaminated salt marshes: II. Carbonaceous sediment oxygen demand model.** *Environmental Technology*. 2001; 22 (7):855-867. ISSN: 0959-3330.

Shin, W. S.; Pardue, J. H.; Jackson, W. A.; Choi, S. J. **Nutrient enhanced biodegradation of crude oil in tropical salt marshes.** *Water, Air, & Soil Pollution*. 2001; 131 (1-4):135-152. ISSN: 0049-6979.
This study investigated both intrinsic and nutrient enhanced rates of crude oil degradation in core studies. In addition, loading rates of nitrogen and optimal porewater nitrogen concentrations were determined.

Shor, Leslie M.; Liang, Wenhsin; Rockne, Karl J.; Young, L. Y.; Taghon, Gary L. and Kosson, David S. **Intra-Aggregate Mass Transport-Limited Bioavailability of Polycyclic Aromatic Hydrocarbons to *Mycobacterium* Strain PC01.** *Environmental Science & Technology*. 2003; 37 (8):1545-1552. ISSN: 0013-936X.
Biodegradation rates for a species of bacteria were controlled more by intra-aggregate mass transport limitations than PAH utilization capacity. A mathematical model was then developed by the authors to accurately predict biodegradation kinetics.

Shor, Leslie M.; Rockne, Karl J.; Taghon, Gary L.; Young, L. Y.; Kosson, David S. **Desorption kinetics for field-aged polycyclic aromatic hydrocarbons from sediments.** *Environmental Science & Technology*. 2003; 37 (8):1535-1544. ISSN: 0013-936X.
A study of the mass transfer of PAHs in estuarine sediments found that desorption of PAHs is influenced by aging history, physical and chemical properties of sediment. Authors propose a conceptual framework for PAH desorption from sediment.

Short, Jeffrey W. **Oil identification based on a goodness-of-fit metric applied to hydrocarbon analysis results.** *Environmental Forensics*. 2002; 3 (3/4):349-355. ISSN: 1527-5922.
This paper discusses using first-order loss-rate kinetics in combination with weathering-invariant analytes for more accurate hydrocarbon source recognition methods.

Shu, Youn Yuen; Lai, Teh Long; Lin, Huann-shyang; Yang, Thomas C.; Chang, Chi-Peng. **Study of factors affecting on the extraction efficiency of polycyclic aromatic hydrocarbons from soils using open-vessel focused microwave-assisted extraction.** *Chemosphere*. 2003; 52 (10):1667-1676. ISSN: 0045-6535
Focused microwave-assisted extraction was used to analyze the extraction of PAHs from contaminated soil. Extraction efficiency was enhanced by soil moisture in most cases, but specific solvent types used did not significantly influence extraction rates.

Siciliano, Steven; Germida, James J.; Banks, Kathy; Greer, Charles W. **Changes in microbial community composition and function during a polyaromatic hydrocarbon phytoremediation field trial.** *Applied & Environmental Microbiology*. 2003; 69 (1):483-489. ISSN: 0099-2240.
Investigators used tall fescue (*Festuca arundinacea*) and rose clover (*Trifolium hirtum*) to study how phytoremediation promotes degradation of PAHs, by monitoring the composition and degrading ability of bulk soil during experiments.

Siddiqui, Samina; Adams, W. A.; Schollion, John. **The phytotoxicity and degradation of diesel hydrocarbons in soil.** *Journal of Plant Nutrition and Soil Science - Zeitschrift Fur Pflanzenernahrung und Bodenkunde*. 2001; 164 (6):631-635. ISSN: 1436-87.
Soil was spiked with different concentrations of diesel fuel and incubated for varying amounts of time to determine the effects of phototoxicity on the germination of ryegrass. Lag times in the germination process were linked to the percentages of diesel contamination in the soil.

Singh, Varsha; McLachlan, Ian. **South Africa's east coast frontier offers untested mid to deepwater potential.** *Oil & Gas Journal*. 2003; 101 (22):40-44. ISSN: 0030-1388.
Authors report on a reappraisal of geological data from the southern area of the Mozambique basin.

Skrbic, B.; Miljevic, N. **An evaluation of residues at an oil refinery site following fires.** *Journal of Environmental Science and Health Part A - Toxic/Hazardous Substances & Environmental Engineering*. 2002; 37 (6):1029-1039. ISSN: 1093-4529.
Analysis of soil samples taken around a site where crude oil had spilled and burned resulted in the identification of PAHs, heavy and inorganic metals, and PCBs. There is a threat that the pollution will migrate into groundwater supplies.

Slater, G. F. **Stable isotope forensics - when isotopes work.** *Environmental Forensics*. 2003; 4 (1):13-23. ISSN: 1527-5922.
This paper presents principles, issues, abilities and limitations related to stable carbon isotopic analysis of volatile organic contaminants by focusing on work done related to groundwater contamination.

Smith, Emma; Wraige, Emma; Donkin, Peter; Rowland, Steven. **Hydrocarbon humps in the marine environment: synthesis, toxicity, and aqueous solubility of monoaromatic compounds.** *Environmental Toxicology and Chemistry*. 2001; 20 (11):2428-2432. ISSN: 0730-7268.
Researchers studied elements comprising unresolved complex mixture (UCM) hydrocarbons in an effort to understand the impact of monoaromatic compounds on the mussel *Mytilus edulis*. Results suggest that constituent parts of the monoaromatic hydrocarbons are toxic to the mussel.

Smith, Roger M. **Extractions with superheated water.** *Journal of Chromatography A*. 2002; 975 (1):31-46. ISSN: 0021-9673.
This review describes the superheated water extraction process as a method of separating natural products from environmental samples.

Snowdon, Lloyd R. **Reply to comment on "Natural gas composition in a geological environment and the implications for the processes of generation and preservation".** *Organic Geochemistry*. 2002; 33 (1):85-88. ISSN: 0146-6380.
The author finds fault with arguments made in commentary to his original article on gas composition in geological structures.

So, Chi Ming; Young, Lilly Y. **Anaerobic biodegradation of alkanes by enriched consortia under four different reducing conditions.** *Environmental Toxicology and Chemistry*. 2001; 20 (3):473-478. ISSN: 0730-7268.
Contaminated, anoxic estuarine sediment was used to test alkane-degrading bacteria under sulfate-reducing, denitrifying, iron-reducing, and methanogenic conditions. Under each condition, the bacterial community was able to mineralize alkanes.

Somoza, L. et al. **Seabed morphology and hydrocarbon seepage in the Gulf of Cádiz mud volcano area: acoustic imagery, multibeam and ultra-high resolution seismic data.** *Marine Geology*. 2003; 195 (1-4):153-176. ISSN: 0025-3227.
Authors describe the unique seabed topography in the Gulf of Cádiz, as well as the possible geologic forces that led to the shallow fluid venting responsible for the undersea features.

Sonderkamp, Silke; Vomberg, Anja; Schmitz, Christoph; Faßbender, Ulrich; Klinner, Ulrich. **Interactions between bacterial populations during degradation of a lubricant base oil.** *FEMS Microbiology Ecology*. 2001; 38 (2-3):97-104. ISSN: 0168-6496.
Researchers observed changes in microbial community structure during degradation of TMPO, a biodegradable base oil of lubricants. Surprisingly, the predominating bacteria species were not hydrocarbon degraders.

Southam, G.; Whitney, M.; Knickerbocker, C. **Structural characterization of the hydrocarbon degrading bacteria-oil interface: implications for bioremediation.** *International Biodeterioration & Biodegradation*. 2001; 47 (4):197-201. ISSN: 0964-8305.
Transmission electron microscopy was employed to observe the degradation of hydrocarbons by bacteria. Researchers propose that the assimilation of oil by bacteria may occur by the fusion of tens of nanometer-sized droplets of oil on the outer membrane of gram-negative microbes.

Specht, A. A.; Blades, M. W. **Direct determination of polycyclic aromatic hydrocarbons in solid matrices using laser desorption/laser photoionization ion trap mass spectrometry.** *Journal of the American Society for Mass Spectrometry*. 2003; 14 (6):562-570. ISSN: 1044-0305.
Authors report on the development and application of a new instrument that uses infrared laser desorption followed by UV laser-photo-ionization in the analysis of solid samples with no pre-treatment.

Spencer, A. M.; MacTiernan, B. **Petroleum systems offshore western Ireland in an Atlantic margin context.** *In* Shannon, P. M.; Haughton, P. D. W.; Corcoran, D. V. (Eds.) *Petroleum Exploration of Irelands Offshore Basins (Series: Geological Society Special Publication 188)*. London: Geological Society of London; 2001; p. 9-29. ISBN: 1-86239-087-8.
The petroleum geology of the Irish Atlantic basins is analyzed from a petroleum systems point of view of the entire Atlantic margin. Authors concentrate on the Rockall, Slyne, Erris and Porcupine basins in this paper.

Spieker, P. Matthew; Gawrys, Keith L.; Trail, Chad B.; Kilpatrick, Peter K. **Effects of petroleum resins on asphaltene aggregation and water-in-oil emulsion formation.** *Colloids and Surfaces A - Physicochemical and Engineering Aspects*. 2003; 220 (1-3):9-27. ISSN: 0927-7757.
Small-angle neutron scattering was used to analyze the effect of petroleum resins on aggregate sizes of asphaltene. The addition of resins increased aggregate sizes and the solubility of asphaltene.

Steffan, S.; Tantucci, P.; Bardi, L.; Marzona, M. **Effects of cyclodextrins on dodecane biodegradation.** *Journal of Inclusion Phenomena and Macrocyclic Chemistry*. 2002; 44 (1-4):407-411. ISSN: 0923-0750.
Cyclodextrins have been found to enhance biodegradation by increasing the solubility of hydrocarbons. A series of experiments were undertaken to further understand the role of cyclodextrins by investigating the influence that types and concentrations of cyclodextrins, soil temperature, and microbial populations had on rates of biodegradation.

Steinbach, Alfred; Seifert, Richard; Annweiler, Eva; Michaelis, Walter. **Hydrogen and carbon isotope fractionation during anaerobic biodegradation of aromatic hydrocarbons - a field study.** *Environmental Science & Technology*. 2004; 38 (2):609-616. ISSN: 0013-936X.
Researchers were able to monitor separate transformations of hydrocarbons and mechanisms of biodegradation in a complex contaminated system with the use of hydrogen and carbon isotope fractionation.

Stella, Anna et al. **Principal component analysis application in polycyclic aromatic hydrocarbons "mussel watch" analyses for source identification.** *Analytica Chimica Acta*. 2002; 461 (2):201-213. ISSN: 0003-2670.
This paper describes the application of the chemometric technique of principal component analysis to data collected during the 1999 Ligurian mussel watch, in order to identify source types of PAH pollutants.

Stencel, J. R.; Jaffe, P. R. **Trace metal analysis using ion chromatography in water partitioned from crude-oil spills.** *In* Garcia-Martinez, R.; Brebbia, C. A. (Eds.). *Oil and Hydrocarbon Spills, Modelling, Analysis and Control*. Billerica, Ma.: Computational Mechanics, Inc.; 1998; p. 223-230. ISBN: 1-85312-526-1.
Authors believe that using ion chromatography to identify ratios of nickel to vanadium is a cost-effective method of determining the origin of crude oil spills.

Stojanovic, K. et al. **Maturity assessment of oils from the Sakhalin oil fields in Russia: phenanthrene content as a tool.** *Organic Geochemistry*. 2001; 32 (5):721-731. ISSN: 0146-6380.
Crude oil samples taken from nine oil fields on Sakhalin Island (Russia) were assessed and classified into three categories for their maturation on the basis of the distribution and abundance of tricyclic aromatic hydrocarbons than the more biodegraded alkane-type biological markers.

Stone, Ralph A.; LeRoy, Samuel D. **Deepwater basin confirmed far off western Madagascar.** *Oil & Gas Journal*. 2003; 101 (9):35-38. ISSN: 0030-1388.
Data compiled from various sources suggests that part of the Mozambique Channel in Madagascar territorial waters should be a target for future deepwater hydrocarbon exploration.

Stone, Ralph A.; LeRoy, Samuel D. **How new seismic data show basin off western Madagascar.** *Oil & Gas Journal*. 2003; 101 (10):42-45. ISSN: 0030-1388.
Results of a deepwater seismic survey taken in late 2001 off Madagascar identified large structures and stratigraphic zonation in the west Morondava basin, confirming sufficient size and frequency for continuing exploration.

Story, S. P.; Parker, S. H.; Hayasaka, S. S.; Riley, M. B.; Kline, E. L. **Convergent and divergent points in catabolic pathways involved in utilization of fluoranthene, naphthalene, anthracene, and phenanthrene by *Sphingomonas paucimobilis* var. EPA505.** *Journal of Industrial Microbiology & Biotechnology*. 2001; 26 (6):369-382. ISSN: 1367-5435.
Authors describe the biochemical characterization of intermediate catabolites accumulated by the bacteria during the degradation of polycyclic aromatic hydrocarbons.

Stover, S. Chereé; Ge, Shemin; Weimer, Paul; McBride, Barry C. **The effects of salt evolution, structural development, and fault propagation on Late Mesozoic-Cenozoic oil migration: a two-dimensional fluid-flow study along a megaregional profile in the northern Gulf of Mexico Basin.** *AAPG Bulletin*. 2001; 85 (11):1945-1966. ISSN: 0149-1423.
Oil migration patterns were explored using sequential forward modeling. Authors note that migrating patterns were greatly impacted by salt evolution and geological structure, with differing results of migration in the southern, central, and northern parts of the study area.

Straube, W. L. et al. **Remediation of polyaromatic hydrocarbons (PAHs) through landfarming with biostimulation and bioaugmentation.** *Acta Biotechnologica*. 2003; 23 (2-3):179-196. ISSN: 0138-4988.
Researchers monitored remediation of high molecular weight PAH-contaminated soil at 5, 11, and 17 months under conditions that included biostimulation and/or bioaugmentation. Increasing native bacteria and using slow-release nitrogen fertilizer with bulking agent are two recommendations for improving biodegradation via landfarming.

Sugaya, Kazuo et al. **Biodegradation of quinoline in crude oil.** *Journal of Chemical Technology and Biotechnology*. 2001; 76 (6):603-611. ISSN: 0268-2575.
Researchers used *Comamonas* sp to successfully degrade a nitrogen compound in crude oil. A centrifuge was then used to separate water and cell mass from the crude oil.

Sullivan, Elise R.; Zhang, Xiaoming; Phelps, Craig; Young, L. Y. **Anaerobic mineralization of stable-isotope-labeled 2-methylnaphthalene.** *Applied & Environmental Microbiology*. 2001; 67 (9):4353-4357. ISSN: 0099-2240.
After studying the mineralization of 2-methylnapthalene (2-MNAP) by sulfate-reducing consortia, the authors demonstrate a proposed pathway of biodegradation of 2-MNAP to carbon dioxide.

Sumrow, Mike. **Industry funded project investigates jack up rig spudcan, footprint interactions.** *Oil & Gas Journal*. 2002; 100 (44):56-58. ISSN: 0030-1388.
A survey was distributed to gather information on prevention methods and procedures for controlling spudcan-footprint interaction problems. A best practices guideline document will be produced, based on data collected from the survey.

Synovec, R. E.; Prazen, B. J.; Johnson, K. J.; Fraga, C. G.; Bruckner, C. A. **Chemometric analysis of comprehensive two-dimensional separations.** *In* Brown, P. R.; Grushka, E. (Eds.) *Advances in Chromatography, v. 42*. New York: Marcel Dekker; 2003; p. 1-42. ISBN: 0-8247-0950-0.

Szewczyk, Rafal; Bernat, Przemyslaw; Milczarek, Krystyna; Dlugonski, Jerzy. **Application of microscopic fungi isolated from polluted industrial areas for polycyclic aromatic hydrocarbons and pentachlorophenol reduction.** *Biodegradation*. 2003; 14 (1):1-8. ISSN: 0923-9820.
Authors isolated 15 fungal strains capable of degrading a number of contaminants, including crude and waste oils. Two strains were able to transform phenanthrene into a derivative compound.

Szolar, Oliver H. J. et al. **Sequential supercritical fluid extraction (SSFE) for estimating the availability of high molecular weight polycyclic aromatic hydrocarbons in historically polluted soils.** *Journal of Environmental Quality*. 2004; 33 (1):80-88. ISSN: 0047-2425.
Sequential supercritical fluid extraction was used to analyze eight PAH-contaminated soils to help researchers understand sorption-desorption behavior related to high molecular weight hydrocarbons. Particle size and organic dry mass of the soils did not seem to influence sorption-desorption actions of PAHs.

Tabak, Henry H. et al. **Studies on bioremediation of polycyclic aromatic hydrocarbon-contaminated sediments: bioavailability, biodegradability, and toxicity issues.** *Environmental Toxicology and Chemistry*. 2003; 22 (3):473-482. ISSN: 0730-7268.
After establishing baseline toxicity levels of PAH-contaminated sediments, five sediment treatments were used find the cause of toxicity. The bioavailability of individual hydrocarbons was assessed along with an appraisal of the biodegradability of contaminants in the sediments, to understand how one influences the other during the bioremediation process.

Tajuddin, R.; Smith, Roger. M. **On-line coupled superheated water extraction (SWE) and superheated water chromatography (SWC).** *Analyst*. 2002; 127 (7):883-885. ISSN: 0003-2654.

Talley, Jeffrey W.; Ghosh, Upal; Tucker, Samuel G.; Furey, John S.; Luthy, Richard G. **Particle-scale understanding of the bioavailability of PAHs in sediment.** *Environmental Science & Technology*. 2002; 36 (3):477-483. ISSN: 0013-936X.
A study of PAH bioaccumulation in earthworms demonstrated that worms ingested PAHs from the clay/silt fraction of sediments. PAHs associated with the clay/silt fraction of sediments are more mobile and biodegradable than coal-derived PAHs, and should be the cause for greatest concern.

Tam, Nora Fung-yee; Guo, C. L.; Yau, C.; Ke, L.; Wong, Yuk-shan. **Biodegradation of polycyclic aromatic hydrocarbons (PAHs) by microbial consortia enriched from mangrove sediments.** *Water Science and Technology*. 2003; 48 (8):177-183. ISSN: 0273-1223**.**
Two separate microbial consortia were extracted from different PAH-impacted mangrove swamps near Hong Kong and assessed for their abilities to biodegrade phenanthrene, pyrene and fluoranthene under salinity conditions of 0 and 10 ppt.

Tam, Nora Fung-yee; Guo, C. L.; Yau, W. Y.; Wong, Yuk-shan. **Preliminary study on biodegradation of phenanthrene by bacteria isolated from mangrove sediments in Hong Kong.** *Marine Pollution Bulletin*. 2002; 45 (1-12):316-324. ISSN: 0025-326X.
Researchers assessed the effects of salinity, phenanthrene concentrations, and addition of glucose on biodegradation rates of bacteria found among sediments in a mangrove swamp. High salinity inhibited degradation ability, but the addition of glucose reduced the negative impact of salinity.

Tang, Chung-Shih; Sun, Wenhao; Toma, Marisa; Robert, Françoise; Jones, Ryan. **Evaluation of agriculture-based phytoremediation in pacific island ecosystems using trisector planters.** *International Journal of Phytoremediation*. 2004; 6 (1):17-33. ISSN: 1522-6514.
Greenhouse and laboratory experiments using milo, kou and false sandalwood were undertaken to evaluate the effectiveness of these plants in phytoremediation of contaminants entrenched in deep soil layers.

Taylor, P.; Bennett, B.; Jones, M.; Larter, S. **Effect of biodegradation and water washing on the occurrence of alkylphenols in crude oils.** *Organic Geochemistry*. 2001; 32 (2):341-358. ISSN: 0146-6380.

Teige, Gunn M. G.; Hermanrud, Christian. **Seismic characteristics of fluid leakage from an underfilled and overpressured Jurassic fault trap in the Norwegian North Sea.** *Petroleum Geoscience*. 2004; 10 (1):35-42. ISSN: 1354-0793.
Authors report on an investigation that used seismic information to locate a leakage zone in the area where a fault exists, for possible oil and gas exploration in the North Sea.

Thomassin-Lacroix, Eric J. M. et al. **DNA-based and culture-based characterization of a hydrocarbon-degrading consortium enriched from Arctic soil.** *Canadian Journal of Microbiology*. 2001; 47 (12):1107-1115. ISSN: 0008-4166.
A bacterial consortium was monitored as it biodegraded fuel in contaminated soil. Results indicate that individual species within a microbial consortium can be quantitatively monitored, allowing for the targeting of the more successful degraders in the community.

Thomassin-Lacroix, Eric. J. M.; Eriksson, Mikael.; Reimer, K. R.; Mohn, William. W. **Biostimulation and bioaugmentation for on-site treatment of weathered diesel fuel in Arctic soil.** *Applied Microbiology and Biotechnology*. 2002; 59 (4-5):551-556. ISSN: 0175-7598.
The addition of an inoculation of organisms into contaminated soil did not cause biostimulation or increase biodegradation in field or laboratory microcosm experiments. Possible reasons for this are discussed.

Tian, Lee; Ma, Pei; Zhong, Jian-Jiang **Kinetics and key enzyme activities of phenanthrene degradation by *Pseudomonas mendocina*.** *Process Biochemistry*. 2002; 37 (12):1431-1437. ISSN: 0032-9592.
Investigation of *P. mendocina* revealed the activities of PAH dioxygenase and catechol-2,3-oxygenase, two enzymes involved in the biodegradation of phenanthrene.

Tien, Truong Hong; Katayama, Arata. **Biodegradation kinetics of volatile hydrophobic organic compounds in cultures with variable fractional volumes.** *Biotechnology and Bioengineering*. 2004; 85 (6):580-588. ISSN: 0006-3592.
This paper describes research undertaken as an extension to previous models that describe phenanthrene biodegradation kinetics by using a sampling procedure to quantify phenanthrene sorption. Results demonstrate that models were able to considerably reduce the amount of experimental work necessary for estimating kinetic parameters.

Tobajas, Monserrat; Siegel, Marc H.; Apitz, Sabine E. **Influence of geometry and solids concentration on the hydrodynamics and mass transfer of a rectangular airlift reactor for marine sediment and soil bioremediation.** *Canadian Journal of Chemical Engineering*. 1999; 77 (4):660-9. ISSN: 0008-4034.
Airlift reactors were analyzed for their efficiency as gas-liquid-solid mixers. Based upon results of experiments presented in this article, the authors believe that the airlift reactors could be an effective tool in the bioremediation process for both soils and marine sediments.

Todd, Sarah J.; Cain, Ronald B.; Schmidt, Stefan. **Biotransformation of naphthalene and diaryl ethers by green microalgae.** *Biodegradation*. 2002; 13 (4):229-238. ISSN: 0923-9820.
In this study, three types of green algae were found to transform fat soluble hydrocarbons into water soluble metabolites.

Tolls, Johannes et al. **Aqueous solubility-molecular size relationships: a mechanistic case study using ^{10}C to ^{19}C alkanes.** *Journal of Physical Chemistry A*. 2002; 106 (11):2760-2765. ISSN: 1089-5639.
In studying alkanes, research demonstrated that molecular size mostly determines solubility in water. Increased molecular size results in less water solubility.

Toren, Amir; Gefen, Yuval; Ron, Eliora Z.; Rosenberg, Eugene. **Solubilization of phenanthrene by recombinant protein bioemulsans.** *Biochemical Engineering Journal*. 2003; 16 (2):169-174. ISSN: 1369-703X.
Researchers identified the sequences needed for protein AlnA and its derivatives to solubilize phenanthrene by identifying amino acids in hydrophobic portions of the protein that increase emulsifying activity.

Torkian, Ayoob; Dehghanzadeh, Reza; Hakimjavadi, M. **Biodegradation of aromatic hydrocarbons in a compost biofilter.** *Journal of Chemical Technology and Biotechnology*. 2003; 78 (7):795-801. ISSN: 0268-2575.
Results of biofilter experiments show that maintaining specific organic loading rates can efficiently remove over 90% of toluene and xylene when initial concentrations do not exceed 20 ppm for toluene and 70 ppm for xylene.

Torres, Eduardo; Bustos-Jaimes, Ismael; Le Borgne, Sylvie. **Potential use of oxidative enzymes for the detoxification of organic pollutants.** *Applied Catalysis B - Environmental*. 2003; 46 (1):1-15. ISSN: 0926-3373.
Authors review the literature regarding the ability of peroxidases and laccases enzymes in diminishing PAH toxicity, the negative effect that organic solvents have on these enzymes, and propose strategies to surmount these and other limitations in order to make them available for commercial use.

Townsend, G. Todd; Prince, Roger C.; Suflita, Joseph M. **Anaerobic oxidation of crude oil hydrocarbons by the resident microorganisms of a contaminated anoxic aquifer.** *Environmental Science & Technology*. 2003; 37 (22):5213-5218. ISSN: 0013-936X.
Anaerobic biodegradation of two types of crude oil showed alkane-degrading metabolic processes involving methanogenic, rather than sulfate-reducing activities.

Trefry, John H.; Rember, Robert D.; Trocine, Robert P.; Brown, John S. **Trace metals in sediments near offshore oil exploration and production sites in the Alaskan Arctic.** *Environmental Geology*. 2003; 45 (2):149-160. ISSN: 0943-0105.
As industrial activity begins to move offshore the coast of the Beaufort Sea, researchers analyze trace metals as selected indicators, to help evaluate the cumulative impact from oil development in the Alaskan Arctic.

Troquet, Julien; Larroche, Christian; Dussap, Claude-Gilles. **Evidence for the occurrence of an oxygen limitation during soil bioremediation by solid-state fermentation.** *Biochemical Engineering Journal*. 2003; 13 (SI 2-3):103-112. ISSN: 1369-703X.
Investigators studied parameters and physical limiting factors influencing the biodegradation process by manipulating different components of biodegradation with the use of fixed bed column reactors and a rotating fermentor.

Tsvetkova, T.; Nevinsky, I.; Nevinsky, V.; Paniyshkina, A. **Experience of working with SSNTDs in Caucasus: a survey.** *Radiation Measurements*. 2004; 38 (3):263-269. ISSN: 1350-4487.
Radon surveys were carried out at geological sites and petroleum storehouses. Authors believe that combining SSNTDs with hydrogen surveys could lead to locating petroleum reserves without drilling.

Tzing, Shin-Hwa et al. **A simple and rapid method for identifying the source of spilled oil using an electronic nose: confirmation by gas chromatography with mass spectrometry.** *Rapid Communications in Mass Spectrometry*. 2003; 17 (16):1873-1880. ISSN: 0951-4198.
An electronic nose consisting of a sensory array was tested alongside an electronic nose using fast gas chromatography in determining the source of spilled oil. This fast and simple method of detection was successful, as confirmed by results of GC/MS analysis.

Udosen, E. D.; Essien, J. P.; Ubom, R. M. **Bioamendment of petroleum contaminated ultisol: effect on oil content, heavy metals and pH of tropical soil.** *Journal of Environmental Sciences - China*. 2001; 13 (1):92-98. ISSN: 1001-0742.

Ulfig, K. et al. **Keratinolytic fungi as indicators of hydrocarbon contamination and bioremediation progress in a petroleum refinery.** *Polish Journal of Environmental Studies*. 2003; 12 (2):245-250. ISSN: 1230-1485.
During a 39-month assessment of bioremediation progress at a PAH-contaminated biopile, researchers noted the frequent presence of fungal species. Growth of the fungi was found to be dependent on concentrations of PAHs and their polar derivatives in the soil mixture.

Vallejo, Begoña A.; Izquierdo, Andrés; Blasco, Rafael; del Campo, Pedro Pérez; Luque de Castro, M. Dolores. **Bioremediation of an area contaminated by a fuel spill.** *Journal of Environmental Monitoring*. 2001; 3 (3):274-280. ISSN: 1464-0325.
Nutrients, in addition to oxygenation of contaminated soil (bioventing), led to successful *in situ* bioremediation of a large area contaminated with fuel oil. A hydraulic barrier was also used to keep the contaminants from migrating out of the affected area.

van den Huevel, Henny; van Noort, Paul C. M. **Competition for adsorption between added phenanthrene and *in situ* PAHs in two sediments.** *Chemosphere*. 2003; 53 (9):1097-1103. ISSN: 0045-6535.
Significant amounts of phenanthrene were added to slowly desorbing and very slowly desorbing PAH-contaminated sediments and removal rates of the PAHs were monitored. Removal rates of PAHs in the very slowly desorbing domain were as expected, but the addition of phenanthrene in the slowly desorbing domain did not result in PAH removal.

van Gestel, Cornelis A. M. et al. **The use of acute and chronic bioassays to determine the ecological risk and bioremediation efficiency of oil-polluted soils.** *Environmental Toxicology and Chemistry*. 2001; 20 (7):1438-1449. ISSN: 0730-7268.
Acute bioassays were found to be useful for an initial quick screening of polluted soils. However, chronic bioassays using sublethal endpoints are needed for an accurate assessment of long-term effects of pollution in sediments.

Van Gestel, Kristen; Mergaert, Joris; Swings, Jean; Coosemans, Jozef; Ryckeboer, Jaak. **Bioremediation of diesel oil-contaminated soil by composting with biowaste.** *Environmental Pollution*. 2003; 125 (3):361-368. ISSN: 0269-7491.
Biowaste was mixed with oil-contaminated soil at a ratio of 10:1 and degradation levels were monitored to compare the effects of room temperature versus composting temperature on biodegradation efficiency.

Van Hamme, Jonathan D.; Ward, Owen P. **Physical and metabolic interactions of *Pseudomonas* sp. strain JA5-B45 and *Rhodococcus* sp. strain F9-D79 during growth on crude oil and effect of a chemical surfactant on them.** *Applied & Environmental Microbiology*. 2001; 67 (10):4874-4879. ISSN: 0099-2240.
Bacterial cultures were tested separately and in combination, and also with the addition of a nonionic surfactant, (Igepal CO-630), to determine rates and amounts of biodegradation of crude oil. Authors suggest a dual role of the surfactant in the coculture part of the experiment, which increased the availability of oil to one of the bacterial strains.

Van Hamme, Jonathan D.; Ward, Owen P. **Volatile hydrocarbon biodegradation by a mixed-bacterial culture during growth on crude oil.** *Journal of Industrial Microbiology & Biotechnology*. 2001; 26 (6):356-362. ISSN: 1367-5435.

Van Hamme, Jonathan. D.; Ward, Owen. P. **Development of a method for the application of solid-phase microextraction to monitor biodegradation of volatile hydrocarbons during bacterial growth on crude oil.** *Journal of Industrial Microbiology and Biotechnology*. 2000; 25 (3):155-162. ISSN: 1367-5435.
SPME-GC-FID was used to analyze the biodegradation of volatile hydrocarbons using different bacteria cultures. Authors found that a mixed culture was more effective than pure cultures in degrading specific types of hydrocarbons.

van Herwijnen, René et al. **Influence of phenanthrene and fluoranthene on the degradation of fluorene and glucose by *Sphingomonas* sp strain LB126 in chemostat cultures.** *FEMS Microbiology Ecology*. 2003; 46 (1):105-111. ISSN: 0168-6496.
The presence of fluoranthene and phenanthrene hindered the removal of fluorene, possibly due to competitive inhibition, but did not influence the growth of bacteria in biodegradation experiments. Over time, removal rates for fluorene, fluoranthene and phenanthrene reached approximately 95%.

Vasudevan, N.; Rajaram, P. **Bioremediation of oil sludge-contaminated soil.** *Environment International*. 2001; 26 (5-6):409-411. ISSN: 0160-4120.
After a series of bioremediation experiments, scientists found better results when the soil was tilled and when wheat bran was added as a bulking agent.

Vazquez, M. M. et al. **Application of programmed-temperature split/splitless injection to the trace analysis of aliphatic hydrocarbons by gas chromatography.** *Journal of Chromatography A*. 2001; 919 (2):363-371. ISSN: 0021-9673.

Veignie, Etienne; Rafin, Catherine.; Woisel, Patrice.; Lounes-Hadj Sahraoui, A.; Cazier, Fabrice. **Metabolization of the polycyclic aromatic hydrocarbon benzo(a)pyrene by a non-white rot fungus (*Fusarium solani*) in a batch reactor.** *Polycyclic Aromatic Compounds*. 2002; 22 (1):87-97. ISSN: 1040-6638.
F. solani was observed to degrade B(a)P in experiments. Cytochrome P-450 levels were monitored while B(a)P was mineralized by the fungus.

Veignie, Etienne; Rafin, Catherine; Woisel, Patrice; Cazier, Fabrice. **Preliminary evidence of the role of hydrogen peroxide in the degradation of benzo[a]pyrene by a non-white rot fungus *Fusarium solani*.** *Environmental Pollution*. 2004; 129 (1):1-4. ISSN: 0269-7491.
Using enzyme inhibitors, researchers discovered that a bacterium could degrade PAHs by use of an alternative metabolic pathway.

Vennin, E. et al. **A 3D outcrop analogue model for Ypresian nummulitic carbonate reservoirs: Jebel Ousselat, northern Tunisia.** *Petroleum Geoscience*. 2003; 9 (2):145-161. ISSN: 1354-0793.
This study summarizes six years of geological research into carbonate reservoirs and petroleum reserves extending to offshore North Africa.

Venosa, Albert D.; Zhu, Xueqing. **Biodegradation of crude oil contaminating marine shorelines and freshwater wetlands.** *Spill Science & Technology Bulletin*. 2003; 8 (2):163-178. ISSN: 1353-2561.
Researchers investigate the factors that influence natural attenuation in biodegradation as a weathering process in high-energy marine shorelines compared to a low-energy shoreline environment including a freshwater wetland.

Ventura, Karel; Adam, Martin; Dostálek, Jaromír. **Comparison of modern extraction techniques in analysis of soil contaminated with fuel and crude oil spills.** *Journal of Liquid Chromatography & Related Technologies*. 2003; 26 (2):247-259. ISSN: 1082-6076.
The extraction of total petroleum hydrocarbons was evaluated between supercritical fluid extraction with CO_2 and pressurized fluid extraction methods.

Verbruggen, Eric M. J.; Hermens, Joop L. M.; Tolls, Johannes. **Physicochemical properties of higher nonaromatic hydrocarbons: a literature study.** *Journal of Physical and Chemical Reference Data*. 2000; 29 (6):1435-1446. ISSN: 0047-2689.
A literature study was carried out on the behavior of higher aliphatic hydrocarbons in the environment and especially in relation to hydrophobicity.

Verdin, Anthony; Sahraoui, Anissa Lounès-Hadj; Durand, Roger. **Degradation of benzo[a]pyrene by mitosporic fungi and extracellular oxidative enzymes.** *International Biodeterioration & Biodegradation*. 2004; 53 (2):65-70. ISSN: 0964-8305.
Using three fungal strains, researchers studied the contribution of three extracellular oxidative enzymes in the degradation of B(a)P. Results of data did not show a correlation between production of enzymes and degradation levels of B(a)P.

Vervaeke, P. et al. **Phytoremediation prospects of willow stands on contaminated sediment: a field trial.** *Environmental Pollution*. 2003; 126 (2):275-282. ISSN: 0269-7491.
Willow stands were grown in dredged sediments containing a number of contaminants, including PAHs. Analysis showed that the presence of willows did not reduce the amount of PAHs when compared to soil plots left fallow.

Verweij, J. M.; Simmelink, H. J.; Van Balen, R. T.; David, P. **History of petroleum systems in the southern part of the Broad Fourteens Basin.** *Netherlands Journal of Geosciences - Geologie en Mijnbouw*. 2003; 82 (1):71-90. ISSN: 0016-7746.
Authors used 2D basin modelling to determine the migration and maturation of petroleum, as well as to predict oil and gas accumulations in sections of the southern part of the Broad Fourteens Basin.

Villatoro-Monzón, W. R.; Mesta-Howard, A. M.; Razo-Flores, E. **Anaerobic biodegradation of BTEX using Mn(IV) and Fe(III) as alternative electron acceptors.** *Water Science and Technology*. 2003; 48 (6):125-131. ISSN: 0273-1223.
BTEX compounds were degraded, while researchers noted reductions of Fe(III) and Mn(IV) to Fe(II) and Mn(II). It is believed that using a solid metal oxide as a final electron acceptor has potential and is a cost-effective way for approaching bioremediation for fuel-contaminated sites.

Viñas, M.; Grifoll, M.; Sabaté, J.; Solanas, A.M. **Biodegradation of a crude oil by three microbial consortia of different origins and metabolic capabilities.** *Journal of Industrial Microbiology & Biotechnology*. 2002; 28 (5):252-260. ISSN: 1367-5435.

Viraraghavan, T.; Moazed, H. **Removal of oil from water by bentonite.** *Fresenius Environmental Bulletin*. 2003; 12 (9):1092-1097. ISSN: 1018-4619.
Na-bentonite effectively removed oil from different oil-in-water emulsions and wastewaters, and batch kinetic studies confirmed that various models accurately described the kinetics of sorption of oil by bentonite.

Volke-Sepúlveda, T. L.; Gutiérrez-Rojas, M.; Favela-Torres, E. **Biodegradation of hexadecane in liquid and solid-state fermentations by *Aspergillus niger*.** *Bioresource Technology*. 2003; 87 (1):81-86. ISSN: 0960-8524.
Submerged fermentation and solid-state fermentation (SSF) methods were compared in the degradation of a PAH. The rate of hexadecane consumption was three times higher, and a PAH-degrading fungus grew 30 times faster in experiments utilizing SSF.

Voutsas, E. C.; Abatzi, E. V.; Tassios, D. P. **Application of the equilibrium partitioning theory for the prediction of the bioaccumulation of organic pollutants in aquatic biota.** *Fresenius Environmental Bulletin*. 2001; 10 (5):480-483. ISSN: 1018-4619.

Wagner, M.; Nicell, J. A. **Peroxidase-catalyzed removal of phenols from a petroleum refinery wastewater.** *Water Science and Technology*. 2001; 43 (2):253-260. ISSN: 0273-1223.
The application of horseradish peroxidase and hydrogen peroxide was found to effectively remove the phenol content from refinery wastewater. Investigators also reported a 95% reduction in toxicity of the wastewater.

Walczak, M.; Donderski, W.; Mudryk, Z.; Skorczewski, P. **Aromatic hydrocarbon decomposition by neustonic bacteria - Part II. Polycyclic aromatic hydrocarbon biodegradation.** *Polish Journal of Environmental Studies*. 2001; 10 (1):33-36. ISSN: 1230-1485.

Walczak, M.; Donderski, W.; Mudryk, Z.; Skorczewski, P. **Aromatic hydrocarbon decomposition by neustonic bacteria - Part I. Single-ring hydrocarbon biodegradation.** *Polish Journal of Environmental Studies*. 2000; 9 (6):471-474. ISSN: 1230-1485.

Wan, C. K.; Wong, J. W. C.; Fang, M.; Ye, D. Y. **Effect of organic waste amendments on degradation of PAHS in soil using thermophillic composting.** *Environmental Technology*. 2003; 24 (1):23-30. ISSN: 0959-3330.
Pig manure was found to be effective as an additive in compost-related PAH remediation experiments.

Wang, T. G. et al. **High molecular weight (C-35(+)) *n*-alkanes of Neogene heavily biodegraded oil in the Qianmlqiao region, North China.** *Chinese Science Bulletin*. 2002; 471 (16):1402-1407. ISSN: 1001-6538.

Wang, Xu-Chen; Chen, Robert F.; Whelan, Jean; Eglinton, Lorraine. **Contribution of "old" carbon from natural marine hydrocarbon seeps to sedimentary and dissolved organic carbon pools in the Gulf of Mexico.** *Geophysical Research Letters*. 2001; 28 (17):3313-3316. ISSN: 0094-8276.
Carbon abundance was measured in sediment and water around hydrocarbon seeps in the Green Canyon, Northern Gulf of Mexico. The amounts of "old" carbon led researchers to suggest that natural seepage could contribute a significant amount of that carbon to the marine environment.

Wang, Yi; Huang, Yongsong. **Hydrogen isotopic fractionation of petroleum hydrocarbons during vaporization: implications for assessing artificial and natural remediation of petroleum contamination.** *Applied Geochemistry*. 2003; 18 (10):1641-1651. ISSN: 0883-2927.
Researchers established hydrocarbon (H) isotope fractionation for C_{10}-C_{14} *n*-alkanes, MTBE and BTEX during progressive vaporization, and found that H isotope fractionation increased with *n*-alkane chain length.

Wang, Zhendi et al. **Characterization and identification of the Detroit River mystery oil spill (2002).** *Journal of Chromatography A*. 2004; 1038 (1-2):201-214. ISSN: 0021-9673.
Oil fingerprinting techniques were used to identify the type of spilled oil in the Detroit River. Results show that samples were mostly lube oil, and some samples were more weathered than others.

Wang, Zhendi; Fingas, Merv F.; Owens, Edward H.; Sigouin, L.; Brown, C. E. **Long-term fate and persistence of the spilled *Metula* oil in a marine salt marsh environment - degradation of petroleum biomarkers.** *Journal of Chromatography A*. 2001; 926 (2):275-290. ISSN: 0021-9673.

Wang, Zhendi; Fingas, Merv F.; Sigouin, L. **Characterization and identification of a "mystery" oil spill from Quebec (1999).** *Journal of Chromatography A*. 2001; 909 (2):155-169. ISSN: 0021-9673.
Using GC-MS and GC-Flame ionization, researchers identified "source specific marker" compounds and diagnostic ratios of a sample of spilled oil. The spill was then traced to the responsible company.

Wang, Zhendi; Fingas, Merv F.; Sigouin, L. **Characterization and source identification of an unknown spilled oil using fingerprinting techniques by GC-MS and GC-FID.** *LCGC North America: The Magazine of Separation Science*. 2000; 18 (10):1058-1067. ISSN: 1527-5949.
Gas chromatography-mass spectrometry and gas chromatography-flame ionization detection were successful in tracing the origin of a diesel fuel spill in Quebec, Canada.

Wang, Zhendi; Fingas, Merv; Sigouin, L. **Using multiple criteria for fingerprinting unknown oil samples having very similar chemical composition.** *Environmental Forensics*. 2002; 3 (3-4):251-262. ISSN: 1527-5922.
Gas chromatography with a flame ionization detector and gas chromatography with mass spectrometry were used in an attempt to identify oil samples of unknown origin.

Wang, Zhendi; Fingas, Mervin F. **Development of oil hydrocarbon fingerprinting and identification techniques.** *Marine Pollution Bulletin*. 2003; 47 (9-12):423-452. ISSN: 0025-326X.
Authors review various chemical analysis methodologies in current techniques used to fingerprint and characterize oil sources in environmental forensic investigations.

Wang, Zhenyu; Ashraf-Khorassani, Mehdi; Taylor, Larry T. **Design for on-line coupling of supercritical fluid extraction with liquid chromatography: quantitative analysis of polynuclear aromatic hydrocarbons in a solid matrix.** *Analytical Chemistry*. 2003; 75 (16):3979-3985. ISSN: 0003-2700.
Supercritical fluid extraction coupled with liquid chromatography successfully extracted and quantified PAHs in contaminated soil. This method was determined to be precise and a faster technique than Soxhlet extraction with GC/MS analysis.

Ward, Owen; Singh, Ajay; Van Hamme, Jonathan. **Accelerated biodegradation of petroleum hydrocarbon waste.** *Journal of Industrial Microbiology & Biotechnology*. 2003; 30 (5):260-270. ISSN: 1367-5435.
Authors describe a new process for the bioremediation of petroleum waste sludge over a 10-12 day period using a mixed culture capable of high rates of biodegradation. This process is capable of degrading up to 99% of total petroleum hydrocarbons.

Warne, M. A.; Ebbels, T. M. D.; Lindon, J. C.; Nicholson, J. K. **Semiempirical molecular-orbital properties of some polycyclic aromatic hydrocarbons and correlation with environmental toxic equivalency factors.** *Polycyclic Aromatic Compounds*. 2003; 23 (1):23-47. ISSN: 1040-6638.

Watanabe, H.; Seong, D. J. **The thermal conductivity and thermal diffusivity of liquid *n*-alkanes: CnH2n+2 (N=5 to 10) and toluene.** *International Journal of Thermophysics*. 2002; 23 (2):337-356. ISSN: 0195-928X.

Watson, J. S.; Jones, D. M.; Swannell, R. P. J.; van Duin, A. C. T. **Formation of carboxylic acids during aerobic biodegradation of crude oil and evidence of microbial oxidation of hopanes.** *Organic Geochemistry*. 2002; 33 (10):1153-1169. ISSN: 0146-6380.
Authors report on the presence of hopanoic acids as a by-product of *n*-alkane removal during the biodegradation of crude oil.

Weber, Walter J., Jr.; Huang, Qingguo. **Inclusion of persistent organic pollutants in humification processes: direct chemical incorporation of phenanthrene via oxidative coupling.** *Environmental Science & Technology*. 2003; 37 (18):4221-4227. ISSN: 0013-936X.
In aqueous phase, phenanthrene was found to bond with reaction products either by sorption or chemical bonding. Researchers believe this offers insight to potential roles of natural humification in the fate of PAHs.

Webster, J.; Webster, K.; Nelson, P.; Waterhouse, E. **The behaviour of residual contaminants at a former station site, Antarctica.** *Environmental Pollution*. 2003; 123 (2):163-179. ISSN: 0269-7491.

Webster, L. et al. **The polycyclic aromatic hydrocarbon and geochemical biomarker composition of sediments from sea lochs on the west coast of Scotland.** *Journal of Environmental Monitoring*. 2004; 6 (3):219-228. ISSN: 1464-0325.
Sediments were collected at random from individual lochs on the west coast of Scotland and analyzed for parent and branched PAHs.

Wei, Qu-fu; Mather, R. R.; Fotheringham, A. F.; Yang, R. D. **Characterization of water-in-crude oil emulsions in oil spill response.** *Journal of Environmental Sciences - China*. 2003; 15 (4):506-509. ISSN: 1001-0742.
In this study, environmental scanning election microscopy was used to analyze density, viscosity, distribution and droplet sizes of water-in-crude-oil emulsions.

Wenger, Lloyd M.; Isaksen, Gary H. **Control of hydrocarbon seepage intensity on level of biodegradation in sea bottom sediments.** *Organic Geochemistry*. 2002; 33 (12):1277-1292. ISSN: 0146-6380.
A lack of 25-norphane series of hydrocarbons at deepwater seeps suggests that biodegradation pathways differ between surface and deepwater bacterial communities. Authors propose reasons why extensive biodegradation occurs at some seeps, yet other sites have no evidence of hydrocarbon utilization by bacteria.

Wennrich, Luise; Vrana, Branislav; Popp, Peter; Lorenz, Wilhelm. **Development of an integrative passive sampler for the monitoring of organic water pollutants.** *Journal of Environmental Monitoring*. 2003; 5 (5):813-822. ISSN: 1464-0325.
This study describes the development of a monitor consisting of a simple PDMS tube with a polyethylene membrane that collects pollutants for direct analysis by thermodesorption-GC/MS methods.

Whelan, Jean K.; Whelan, Lorraine; Kennicutt, Mahlon C., II; Qian, Yaorong. **Short-time-scale (year) variations of petroleum fluids from the U.S. Gulf Coast.** *Geochimica et Cosmochimica Acta*. 2001; 65 (20):3529-3555. ISSN: 0016-7037.
The authors present evidence indicating a rapid vertical migration of hydrocarbons that has changed the fluid composition of the Eugene Island Block 330 (EI-330) reservoir in the last eight years. Possible reasons for the short-term migration are proposed. Evidence also suggests that a similar process is occurring over a much wider area than the EI-330 reservoir.

White, G. J.; Rood, A. S. **Radon emanation from NORM-contaminated pipe scale and soil at petroleum industry sites.** *Journal of Environmental Radioactivity*. 2001; 54 (3):401-413. ISSN: 0265-931X.
A study was undertaken to determine whether radon emanation associated with petroleum production was similar to that of uranium mill tailings. Although radium concentrations from pipe scale samples were consistent with mill tailings, radon emanation fractions were lower, possibly due to the physical structure of the pipe scale restricting the rate of released radon.

White, P. M.; Wolf, D. C. ; Thoma, G. J. ; Reynolds, C. M. **Influence of organic and inorganic soil amendments on plant growth in crude oil-contaminated soil.** *International Journal of Phytoremediation*. 2003; 5 (4):381-397. ISSN: 1522-6514.
Plants with fibrous roots were exposed to various soil amendments in crude oil-contaminated soil to evaluate phytoremediation as an alternative remediation technique.

Whyte, L. G. et al. **Gene cloning and characterization of multiple alkane hydroxylase systems in *Rhodococcus* strains Q15 and NRRL B-16531.** *Applied & Environmental Microbiology*. 2002; 68 (12):5933-5942. ISSN: 0099-2240.
This paper is the first published study of a detailed genetic characterization of alkane hydroxylase systems in strains of bacteria known for their ability to degrade aliphatic hydrocarbons.

Wick, Lokas Y.; Pasche, Natacha; Bernasconi, Stefano M.; Pelz, Oliver; Harms, Hauke. **Characterization of multiple-substrate utilization by anthracene-degrading *Mycobacterium frederiksbergense* LB501T.** *Applied & Environmental Microbiology*. 2003; 69 (10):6133-6142. ISSN: 0099-2240.
Microbes were exposed to anthracene in the presence of dissolved glucose as researchers monitored the utilization of carbon sources in the biodegradation process. Analysis of ^{13}C suggests that the microbes initially degraded the PAH and formed biomass in preference to the more bioavailable dissolved glucose. Enhanced substrate utilization occurred from the utilization of additional sources of carbon from dissolved glucose, indicating that more efficient biodegradation can be achieved by carbon supplements.

Widada, J.; Nojiri, H.; Omori, T. **Recent developments in molecular techniques for identification and monitoring of xenobiotic-degrading bacteria and their catabolic genes in bioremediation.** *Applied Microbiology and Biotechnology*. 2002; 60 (1-2): 45-59. ISSN: 0175-7598.
In this review, the authors discuss current developments in techniques and applications of molecular biology as applied to the bioremediation of xenobiotics.

Wilhelms, A. et al. **Biodegradation of oil in uplifted basins prevented by deep-burial sterilization.** *Nature*. 2001; 411 (6841):1034-1037. ISSN: 0028-0836.
The authors propose that biodegradation does not occur in some basins because petroleum reservoirs were once heated to around 80-90° C deep underground. After upwelling, and being filled with oil, the sterilized sediments were not recolonized by the types of bacteria which degrade oil.

Wilkes, Heinz et al. **Formation of *n*-alkane- and cycloalkane-derived organic acids during anaerobic growth of a denitrifying bacterium with crude oil.** *Organic Geochemistry*. 2003; 34 (9):1313-1323. ISSN: 0146-6380.
Researchers used GC-MS to detect a number of metabolites formed during the biodegradation of PAHs in crude oil by a strain of anaerobic bacteria.

Williamson, Kelly S.; Petty, Jimmie D.; Huckins, James M.; Lebo, Jon A.; Kaiser, Edwin A. **HPLC-PFD determination of priority pollutant PAHs in water, sediment, and semipermeable membrane devices.** *Chemosphere*. 2002; 49 (7):703-715. ISSN: 0045-6535.
HPLC-PFD was used to gain a better understanding of the enrichment techniques and analytical methodologies that can be successfully used to isolate, characterize, and quantify priority pollutant PAHs in environmental samples.

Williamson, Kelly S.; Petty, Jimmie D.; Huckins, James M.; Lebo, Jon A.; Kaiser, Edwin A. **Sequestration of priority pollutant PAHs from sediment pore water employing semipermeable membrane devices.** *Chemosphere*. 2002; 49 (7):717-729. ISSN: 0045-6535.
SPMDs were used to sequester PAHs from sediment samples, and recovery rates for hydrocarbon compounds were established. Researchers found that PAH uptake was dependent on physical factors, such as water solubility, microbial activity, UV radiation, and temperature.

Wine, Gary et al. **Trujillo basin off Peru contains numerous promising structures.** *Oil & Gas Journal*. 2004; 102 (20):31-37. ISSN: 0030-1388.
The complex Trujillo basin located offshore northwestern Peru was explored to determine remaining undiscovered hydrocarbons and to evaluate reserves for economic return.

Wise, Stephen A. **Standard Reference Materials (SRMs) for the determination of polycyclic aromatic compounds - twenty years of progress.** *Polycyclic Aromatic Compounds*. 2002; 22 (3-4):197-230. ISSN: 1040-6638.
This paper reflects on technological advances over the past two decades that led to the certification of more than twenty-five Standard Reference Materials used for verification purposes in the testing of polycyclic aromatic hydrocarbons in environmental mediums.

Wise, Stephen. A. et al. **Recent developments in NIST Standard Reference Materials for polycyclic aromatic hydrocarbons in environmental matrices.** *Polycyclic Aromatic Compounds*. 2000; 19 (1-4):297-313. ISSN: 1040-6638.
Standard Reference Materials for Organics in Marine Sediment (SRM 1941a) and Organics in Mussel Tissue (SRM 1974a), collected in 1994 and 1995, respectively, had run out by the end of 1999. Replacement material, SRM 1941b, was collected in Baltimore harbor, while SRM 1974b was to be collected from Boston harbor in late 1999.

Witt, Gesine. **Occurrence and transport of polycyclic aromatic hydrocarbons in the water bodies of the Baltic Sea.** *Marine Chemistry*. 2002; 79 (2):49-66. ISSN: 0304-4203.
Seasonal and spatial patterns were observed for specific PAHs in different areas of the Baltic Sea. After data collection, PAH concentrations in the Baltic Sea were compared with other major sea areas.

Wolska, Lidia. **Miniaturised analytical procedure of determining polycyclic aromatic hydrocarbons and polychlorinated biphenyls in bottom sediments.** *Journal of Chromatography A*. 2002; 959 (1-2):173-180. ISSN: 0021-9673.

Wong, J. W. C.; Wan, C. K.; Fang, M. **Pig manure as a co-composting material for biodegradation of PAH-contaminated soil.** *Environmental Technology*. 2002; 23 (1):15-26. ISSN: 0959-3330.
Biodegradation of PAHs in a compost heap was significantly enhanced with an amendment of pig manure. Researchers note that amendments of between 12.5% and 15% were most effective in causing increases in bacterial populations.

Woo, Seung H.; Lee, Min W.; Park, Jong M. **Biodegradation of phenanthrene in soil-slurry systems with different mass transfer regimes and soil contents.** *Journal of Biotechnology*. 2004; 110 (3):235-250. ISSN: 0168-1656.
Phenanthrene degradation rates were established in experiments using low and high soil contents for slurry systems, flask and roller-bottle tests.

Woo, Seung H.; Park, Jong M.; Rittmann, B. E. **Evaluation of the interaction between biodegradation and sorption of phenanthrene in soil-slurry systems.** *Biotechnology and Bioengineering*. 2001; 73 (1):12-24. ISSN: 0006-3592.

Wu, Chih-Cheng; Lee, Whei-May Grace. **Control of vaporous naphthalene by scrubbing with surfactants.** *Journal of Environmental Engineering - ASCE*. 2004; 130 (3):276-281. ISSN: 0733-9372.
One anionic and two nonionic surfactants were added to scrubbing liquid in batch and continuous experiments to investigate their influence during the absorption of naphthalene using a wet scrubber. Removal efficiency was established in continuous experiments, with somewhat lower removal efficiencies in batch experiments.

Wyszkowski, M.; Wyszkowska, J.; Ziolkowska, A. **Effect of soil contamination with diesel oil on yellow lupine yield and macroelements content.** *Plant Soil and Environment*. 2004; 50 (5):218-226. ISSN: 1214-1178.

Xia, Lixin; Lu, Shiwei; Cao, Guoying. **Demulsification of emulsions exploited by enhanced oil recovery system.** *Separation Science and Technology*. 2003; 38 (16):4079-4094. ISSN: 0149-6395.
Authors present data showing the influence of factors affecting enhanced oil recovery systems (components, surfactants, alkalis, polymers) on demulsification of water from emulsions. Results of research suggest that the use of microwave radiation would greatly enhance demulsification efficiency.

Xu, Guanjun; Zhang, Dajiang; Wang, Peirong. **Using the biomarker bonded on the asphaltenes for biodegraded oil-source correlation.** *Chinese Science Bulletin*. 2003; 48 (3):300-304. ISSN: 1001-6538.
Ruthenium-oil-catalyzed oxidation (RICO) was employed to locate the origin of oils from different basins in China. Researchers believe that RICO can be an accurate method of identifying oil-source correlation.

Xu, Ran; Obbard, Jeffery P.; Tay, E. T. C. **Optimization of slow-release fertilizer dosage for bioremediation of oil-contaminated beach sediment in a tropical environment.** *World Journal of Microbiology & Biotechnology*. 2003; 19 (7):719-725. ISSN: 0959-3993.
Beach sediments were spiked with Arabian light crude and indigenous microorganism biomass was monitored to find the best concentration of slow-release fertilizer for stimulating growth and biodegradation rates. Investigators found that a dry weight concentration of 1.5% fertilizer yielded the best rates of biodegradation for branch-chain alkanes.

Xu, Ran; Obbard, Jeffrey P. **Effect of nutrient amendments on indigenous hydrocarbon biodegradation in oil-contaminated beach sediments.** *Journal of Environmental Quality*. 2003; 32 (4):1234-1243. ISSN: 0047-2425.
Various combinations of slow-release fertilizers and inorganic nutrients were tested on oil-spiked beach sediments to determine the best overall results involving rapid stimulation of microbial biomass, sustained release of nutrients, and enhanced biodegradation of PAHs.

Yamada, Mihoko et al. **Study on the fate of petroleum-derived polycyclic aromatic hydrocarbons (PAHs) and the effect of chemical dispersant using an enclosed ecosystem, mesocosm.** *Marine Pollution Bulletin*. 2003; 47 (1-6):105-113. ISSN: 0025-326X.
Chemical dispersants were added to mesocosm tanks that were filled with spiked seawater containing water-soluble heavy oil residues. Researchers then observed biodegradation rates for PAHs and calculated the amounts of high molecular weight particles in the water column to assess the impact on benthic environments.

Yang, Jian-gang et al. **Influence of nonionic surfactant on the solubilization and biodegradation of phenanthrene.** *Journal of Environmental Sciences - China*. 2003; 15 (6):859-862. ISSN: 1001-0742.
Phenanthrene solubilization with a nonionic surfactant in aqueous systems caused a simultaneous transfer of phenanthrene from solid to aqueous phase. Also, the surfactant did not appear to have an inhibitory effect on biodegradation rates, even when present in high concentrations.

Yang, L.; Lai, C. T.; Sheih, W. K. **Biodegradation of dispersed diesel fuel under high salinity conditions.** *Water Research*. 2000; 34 (13):3303-3314. ISSN: 0043-1354.
An aerobic, upflow submerged biofilter, coupled with a trickling filter, removed over 90% of total organic carbon while also effectively biodegrading volatile organic compounds.

Yanik, Peter J.; O'Donnell, Thomas H.; Macko, Stephen A.; Qian, Yaorong; Kennicutt, Mahlon C., II. **The isotopic compositions of selected crude oil PAHs during biodegradation.** *Organic Geochemistry*. 2003; 34 (2):291-304. ISSN: 0146-6380.
Isotopic variations in PAH compounds were monitored as crude oil biodegraded in wetland soil plots over a 2-month period. According to the authors, the extent of isotopic changes over time was unexpected.

Yateem, A.; Balba, M. T.; Al-Shayji, Y.; Al-Awadhi, N. **Isolation and characterization of biosurfactant-producing bacteria from oil-contaminated soil.** *Soil & Sediment Contamination*. 2002; 11 (1):41-55. ISSN: 1522-6514.
Two strains of *Pseudomonas aeruginosa* were isolated from oil-contaminated soil and tested for biosurfactant-producing capabilities. Investigations reveal that each strain differed in processes creating biosurfactant stimulation. Of these strains, one was particularly effective in the emulsification of crude oil.

Yen, Tin-Weng; Marsh, William P.; MacKinnon, Michael D.; Fedorak, Phillip M. **Measuring naphthenic acids concentrations in aqueous environmental samples by liquid chromatography.** *Journal of Chromatography A*. 2004; 1033 (1):83-90. ISSN: 0021-9673.
This paper describes the use of an enhanced HPLC technique, which is less complicated and faster at analyzing contaminants than Fourier-transform infrared spectrometry. Both methods were used to examine environmental samples containing naphthenic acids and the results were compared.

Yim, U. H. et al. **Identification of PAHs sources in bivalves and sediments 5 years after the *Sea Prince* oil spill in Korea.** *Environmental Forensics*. 2002; 3 (3/4):357-366. ISSN: 1527-5922.
Researchers investigated oiled remnants from a spill in 1995 for evidence of residual effects of weathered PAHs and possible transport of those hydrocarbons into the subtidal zone. No significant evidence was found of transport into the subtidal environment, but data was collected suggesting the bioconcentration of oil-derived PAHs in mussels.

Younes, Mohamed Abdel-Aziz. **Hydrocarbon seepage generation and migration in the southern Gulf of Suez, Egypt: insights from biomarker characteristics and source rock modelling.** *Journal of Petroleum Geology*. 2003; 26 (2):211-224. ISSN: 0141-6421.
Analysis of active oil seeps in the southern Gulf of Suez shows petroleum rich in tricyclic terpanes and extended hopanes, and suggests that the oil has undergone extensive lateral and vertical migration.

Yu, Hongtao. **Environmental carcinogenic polycyclic aromatic hydrocarbons: photochemistry and phototoxicity.** *Journal of Environmental Science and Health Part C - Environmental Carcinogenesis & Ecotoxicology Reviews*. 2002; 20 (2):149-183. ISSN: 1059-0501.
This paper updates current knowledge of the photochemical reaction, photo-transformation, and phototoxicity of PAHs and their derivatives at the molecular level.

Yuan, Hua; Cao, Chenzhong. **Topological indices based on vertex, edge, ring, and distance: application to various physicochemical properties of diverse hydrocarbons.** *Journal of Chemical Information and Computer Sciences*. 2003; 43 (2):501-512. ISSN: 0095-2338.
Two new components of a set of topological indices were used to better characterize molecular structure information for a variety of hydrocarbons.

Yuan, S. Y.; Chang, J. S.; Yen, J. H.; Chang, B. V. **Biodegradation of phenanthrene in river sediment.** *Chemosphere*. 2001; 43 (3):273-278. ISSN: 0045-6535.
Researchers investigated the potential for aerobic biodegradation of phenanthrene in a series of experiments. In the absence of sediment, phenanthrene showed higher biodegration rate constants.

Yuan, S. Y.; Chang, S. W.; Chang, B. V. **Biodegradation of polycyclic aromatic hydrocarbons in sludge.** *Bulletin of Environmental Contamination and Toxicology*. 2003; 71 (3):625-632. ISSN: 0007-4861.
The authors investigated the influence of pH levels, temperature, surfactants, and amendments such as nitrogen, carbon, yeast, or hydrogen peroxide on degradation rates of specific PAHs by native and introduced aerobic bacteria in contaminated sludge samples.

Yuan, S. Y.; Shiung, L. C.; Chang, B. V. **Biodegradation of polycyclic aromatic hydrocarbons by inoculated microorganisms in soil.** *Bulletin of Environmental Contamination and Toxicology*. 2002; 69 (1):66-73. ISSN: 0007-4861.
An aerobic PAH-reducing bacteria consortium was found to reduce five hydrocarbons by rates of 70-100% within forty days. The consortia is recommended for degradation of hydrocarbons in soil under conditions of pH7.0, 30° C, and the presence of phenanthrene, acenaphthene, anthracene, fluorene, and pyrene.

Yuan, S. Y.; Wei, S. H.; Chang, B. V. **Biodegradation of polycyclic aromatic hydrocarbons by a mixed culture.** *Chemosphere*. 2000; 41 (9):1463-1468. ISSN: 0045-6535.
An aerobic mixed culture was investigated for its ability to degrade PAHs. Phenanthrene was the sole carbon source in these experiments. The mixed culture was able to degrade pyrene and acenaphthene, but failed to degrade anthracene and fluorine. In addition, higher phenanthrene concentrations resulted in slower degradation rates.

Zabanbark, A. **Peculiarities of oil and gas basins in Brazil continental margins.** *Okeanologiya*. 2001; 41 (1):147-154. ISSN: 0030-1574.
The geology of oil and gas basins from offshore Brazil is described. It is shown that the formation content of sedimentary deposits is similar in all basins, leading to the conclusion that the potential for holding reserves is extremely high.

Zakaria, Mohammad Pauzi; Okuda, Tomoaki; Takada, Hideshige. **Polycyclic aromatic hydrocarbons (PAHs) and hopanes in stranded tar-balls on the coasts of Peninsular Malaysia: applications of biomarkers for identifying sources of oil pollution.** *Marine Pollution Bulletin*. 2001; 42 (12):1357-1366. ISSN: 0025-326X.
Tar-balls were collected and analyzed for hopanes and PAHs, in order to identify the source of the oil. Based on biomarker signatures, researchers identified the source of oils as being Middle East crude, and oil extracted from platforms in the South China Sea.

Zazueta-Sandoval, Roberto; Novoa, Vanesa Zazueta; Jiménez, Hortencia Silva; Ortiz, Roberto Cabrera. **A different method of measuring and detecting mono- and dioxygenase activities - key enzymes in hydrocarbon biodegradation.** *Applied Biochemistry and Biotechnology*. 2003; 108;725-736. ISSN: 0273-2289.
Enzyme activity of hydrocarbon-degrading fungi was quantified via a novel spectrophotometric method of observation.

Zerhouni, P.; Bengtsson, G. **A high throughput procedure for polycyclic aromatic hydrocarbons (PAHs) assayed for biodegradation in contaminated soils.** *International Journal of Environmental Analytical Chemistry*. 2001; 79 (1):1-14. ISSN: 0306-7319.

Zhang, Xiaoming; Sullivan, Elise R.; Young, L. Y. **Evidence for aromatic ring reduction in the biodegradation pathway of carboxylated naphthalene by a sulfate reducing consortium.** *Biodegradation*. 2000; 11 (2-3):117-124. ISSN: 0923-9820.
After carboxylation, researchers discovered six naphthalene metabolites as the next step in anaerobic metabolism. A proposed initial pathway for anaerobic naphthalene metabolism under sulfate-reducing conditions is presented.

Zhang, Y.; Wu, R. S. S.; Hong, H.-S.; Poon, K.-F.; Lam, M. H. W. **Field study on desorption rates of polynuclear aromatic hydrocarbons from contaminated marine sediment.** *Environmental Toxicology and Chemistry*. 2000; 19 (10):2431-2435. ISSN: 0730-7268.
An experiment was conducted to study desorption behavior of nine PAHs in contaminated sediments under field conditions mimicking marine disposal situations. The results of this study clearly state that a more reliable environmental and risk assessment of nonionic hydrophobic organic pollutants, in natural sediments under field conditions, is needed.

Zhang, Yong; Zhu, Ya-Xian; Kwon, Kae Kyoung; Park, Jae Hyun; Kim, Sang-Jin. **Novel method for determining pyrene biodegradation using synchronous fluorimetry.** *Chemosphere*. 2004; 55 (3):389-394. ISSN: 0045-6535.
Synchronous fluorimetry (SF) was used to detect the degradation of pyrene, and results were confirmed by the use of gas chromatography with flame ionized detector (GC/FID). Researchers point out that the SF method does not require solvent extraction of samples, and is faster and less expensive than CG/FID.

Zheng, G. D. et al. **Pyrolysis studies on the conversion of vitrinite reflectance and the primary productivity of various non-marine source rocks in China.** *Journal of Asian Earth Sciences*. 2004; 22 (4):353-361. ISSN: 1367-9120.
Laboratory pyrolysis studies indicate that sedimentary environment and age should be factored in when assessing vitrinite reflectivity values and hydrocarbon yields for source rock.

Zheng, Z.; Obbard, Jeffrey. Philip. **Oxidation of polycyclic aromatic hydrocarbons (PAH) by the white rot fungus, *Phanerochaete chrysosporium*.** *Enzyme and Microbial Technology*. 2002; 31 (1-2):3-9. ISSN: 0141-0229.

Zheng, Zhongming; M.; Obbard, Jeffrey. Philip. **Oxidation of polycyclic aromatic hydrocarbons by fungal isolates from an oil contaminated refinery soil.** *Environmental Science and Pollution Research*. 2003; 10 (3):173-176. ISSN: 0944-1344.
Researchers isolated 21 fungal strains from oil-contaminated soil and evaluated their effectiveness in the degradation of a number of PAHs. Of these isolates, *Penicillium* sp. 06, was found to be the most effective at oxidizing a range of PAHs, especially lower molecular weight hydrocarbons.

Zheng, Zhongming; Obbard, Jeffrey Philip. **Polycyclic aromatic hydrocarbon removal from soil by surfactant solubilization and *Phanerochaete chrysosporium* oxidation.** *Journal of Environmental Quality*. 2003; 31 (6):1842-1847. ISSN: 0047-2425.
This paper describes attempts to develop a method of removing PAHs from soil by combining soil washing with hydrocarbon oxidation by white rot fungus in a rotating biological contactor reactor.

Zheng, Zhongming; Obbard, Jeffrey Philip. **Removable of surfactant solubilized polycyclic aromatic hydrocarbons by *Phanerochaete chrysosporium* in a rotating biological contactor reactor.** *Journal of Biotechnology*. 2002; 96 (3):241-249. ISSN: 0168-1656.
Immobalized white rot fungus was tested for its ability to remove Tween 80-solubilized PAHs in a rotating biological contractor (BRC) reactor. Batch operations of the BRC reactor demonstrated that *P. chrysosporium* was able to remove over 90% of PAHs in eight successive tests.

Zheng, Zuoping; Aagaard, Per; Breedveld, Gijs D. **Intrinsic biodegradation of toluene coupled to the microbial reduction of ferric iron: laboratory column experiments.** *Environmental Geology*. 2002; 42 (6):649-656. ISSN: 0943-0105.
Rates of anaerobic biodegradation of toluene differed in column experiments where flow rates were set at two separate velocities.

Zhong, P.; Kong, L. R.; Lin, Z. F.; Liu, G. M. **Photodegradation of diesel oil in aqueous solutions.** *Bulletin of Environmental Contamination and Toxicology*. 2003; 70 (6):1128-1135. ISSN: 0007-4861.
Successful reduction of diesel oil in wastewater was achieved by combining photodegradation with Fenton reagent.

Zhu, Lizhong; Feng, Shaoliang. **Synergistic solubilization of polycyclic aromatic hydrocarbons by mixed anionin-nonionic surfactants.** *Chemosphere*. 2003; 53 (5):459-467. ISSN: 0045-6535.
Water solubility enhancements of various PAHs were accomplished by the addition of solutions of single and mixed anionic-nonionic surfactants.

Zhuang, W. Q.; Tay, J. H.; Maszenan, A. M.; Krumholz, L. R.; Tay, S. T. L. **Importance of Gram-positive naphthalene-degrading bacteria in oil-contaminated tropical marine sediments.** *Letters in Applied Microbiology*. 2003; 36 (4):251-257. ISSN: 0266-8254.
Investigators isolated three bacterial strains found to be able to degrade naphthalene. One strain, MN-003, was found to have a high specific growth rate on naphthalene, and outgrew the other two isolates in biodegradation experiments.

Zhuang, W. Q.; Tay, J. H.; Maszenan, A. M.; Tay, S. T. L. ***Bacillus naphthovorans* sp. nov. from oil-contaminated tropical marine sediments and its role in naphthalene biodegradation.** *Applied Microbiology and Biotechnology*. 2002; 58 (4):547-553. ISSN: 0175-7598.
A strain of bacteria was isolated and identified within marine sediments. Data from enrichment experiments demonstrate the effectiveness of this organism in the degradation of naphthalene.

Ziccardi, Michael H.; Gardner, Ian A.; Mazet, Jonna A. K.; Denison, Michael S. **Application of the luciferase cell culture bioassay for the selection of refined petroleum products.** *Marine Pollution Bulletin*. 2002; 44 (10):983-991.
This study was undertaken to detect and quantify the presence of Ah-R-active chemicals in various types and weathered samples of petroleum products. Luciferase-based bioassays are more accurate and less expensive than other testing methods for the presence of Ah-R-active chemicals.

Zima, Jiri; Housova, Alena; Barek, Jiri. **HPLC monitoring of the efficiency of chemical decomposition of genotoxic fluoranthene derivatives.** *Chemia Analityczna*. 2003; 48 (3):509-519. ISSN: 0009-2223.
Researchers used RP HPLC to separate and determine levels of fluoranthene, 3-aminofluoranthene, and 3-nitrofluoranthene, then evaluate the effectiveness of chemical destruction of the hydrocarbons with zinc and Fenton oxidizing reagent.

Zinjarde, S. S.; Pant, A. A. **Hydrocarbon degraders from tropical marine environments.** *Marine Pollution Bulletin*. 2002; 44 (2):118-121. ISSN: 0025-326X.
Seventeen bacteria and yeasts were isolated from 50 species found at 20 sites in mud and water along the Mumbai coast region. Analysis determined that the aliphatic fraction of Bombay High crude oil was most effectively degraded by the yeast isolates.

Ziolli, Roberta L.; Jardim, Wilson F. **Operational problems related to the preparation of the seawater soluble fraction of crude oil.** *Journal of Environmental Monitoring*. 2002; 4 (1):138-141. ISSN: 1464-0325.
This paper described the results of experiments investigating the effects of sunlight and peroxide photoproduction on water-soluble fractions (WSFs). The authors stress the urgency for the development of a standard procedure for the production of WSFs in order to ensure more reliability in impact assessments of oil spills.

Ziolli, Roberta L.; Jardim, Wilson F. **Photochemical transformations of water-soluble fraction (WSF) of crude oil in marine waters - a comparison between photolysis and accelerated degradation with TiO_2 using GC-MS and UVF.** *Journal of Photochemistry and Photobiology A - Chemistry*. 2003; 155 (1-3):243-252. ISSN: 1010-6030.
Researchers achieved complete degradation of PAHs when adding TiO_2 to a water-soluble fraction and exposing the mixture to UV light for 1-2 days.

Zucchi, M. et al. **Response of bacterial community during bioremediation of an oil-polluted soil.** *Journal of Applied Microbiology*. 2003; 94 (2):248-257. ISSN: 1364-5072.
Investigation of a microbial community showed successive stages of activity among different populations during bioremediation experiments with oil-polluted soil.

Aadnoy, Bernt S.; Saetre, Roar. **New model improves deepwater fracture gradient values off Norway.** *Oil & Gas Journal*. 2003; 101 (5):51-54. ISSN: 0030-1388.
During deepwater drilling, problems with depth and overburden densities limit margins during drilling, resulting in a low fracture gradient. In a study conducted off Norway, a method was tested that corrects for varying overburden densities, while also improving deepwater fracture gradient values.

Accardi-Dey, Amymarie; Gschwend, Philip M. **Reinterpreting literature sorption data considering both absorption into organic carbon and adsorption onto black carbon.** *Environmental Science & Technology*. 2003; 37 (1):99-106. ISSN: 0013-936X.
Field measurements and laboratory observations were used to assess a model created to combine both adsorption and absorption rates to account for the sorption of PAHs to natural sediments.

Ahmad, M. et al. **Interwell tracing by environmental isotopes at Fimkassar Oilfield, Pakistan.** *Applied Radiation and Isotopes*. 2003; 58 (5):611-619. ISSN: 0969-8043.
Environmental isotopes were used to identify sources of water in a production well. Analysis showed a combination of injected water and formation water from the samples collected over a period of 15 months.

Airborne sensor aids oil spill monitoring. *GeoWorld*. 2000; 13 (7):10-11. ISSN: 0897-5507.
In April 2000, 110,000-gallons of fuel-oil leaked from a Pepco pipeline in Maryland's Prince George's County into Swanson Creek. A rainstorm and high winds drove the spill, which had been contained in Swanson Creek-into the Patuxent River. In order to provide response teams with real time data to map the spill, the Maryland EPA and the Maryland Department of Natural Resources was hired to fly over the fuel-oil spill site with its SPECIM-built AISA airborne hyperspectral sensor. The river flights mark the first time the sensor was used to look for oil.

Akbarzadeh, K.; Ayatollahi, Sh.; Nasrifar, Kh.; Yarranton, H. W.; Moshfeghian, M. **Equations lead to asphaltene deposition predictions.** *Oil & Gas Journal*. 2002; 100 (44):51-52. ISSN: 0030-1388.
Authors present a method for predicting asphaltene precipitation in various oils, by inputting values into a regular solution theory model.

Alliot, Vincent; Frazer, Ian. **Tie-in system uses low-cost flanges on deepwater Girassol development.** *Oil & Gas Journal*. 2002; 100 (18):96-102. ISSN: 0030-1388.
Stolt Offshore, Inc. has developed and successfully performed ultra deepwater tie-in operations with their newly designed MATIS equipment, which deploys API flanges remotely. This technology provides economic and efficient applications for deep and ultra-deepwater field developments.

Al-Mutawa, Majdi; Al-Anzi, Ealian H.; Jemmali, Mohamed; Samuel, Mathew. **Polymer-free self-diverting acid stimulated Kuwaiti wells.** *Oil & Gas Journal*. 2002; 100 (31):39-42. ISSN: 0030-1388.
In a field test, a polymer-free viscoelastic diverting acid was evaluated for its stimulation capabilities by restoring reservoir pressure and production in a mature well.

Anderson, Brian S. **Enhancing seismic with field potential tools.** *Offshore*. 2002; 62 (11):54-56. ISSN: 0030-0608.
High quality resolution data for seismic surveys now exists because of new technological advances in the analysis of gravity and magnetic information. The cost-effective nature of the new technology has resulted in the industry reacquiring surveys completed before 1990.

Anderson, Malcolm; Gullco, Robert S. **Some probability applications to oil exploration.** *Natural Resources Research*. 2002; 11 (1):61-70. ISSN: 1520-7439.

Anderson, Roger; Boulanger, Albert. **How to realize LEM benefits in ultradeepwater oil and gas.** *Oil & Gas Journal*. 2003; 101 (25):36-43. ISSN: 0030-1388.
To optimize exploration in underdeveloped reservoirs, the oil and gas industry must implement a model that will integrate tools and processes to achieve a streamlined environment and develop a more cost-effective operation.

ENGINEERING/PHYSICS

Anderson, Roger; Boulanger, Albert. **Ultradeepwater oil-gas development: designing uncertainty into the enterprise.** *Oil & Gas Journal*. 2003; 101 (20):42-46. ISSN: 0030-1388.
An integrated definition methodology program used in an array of industries is now being incorporated into the oil and gas industry. The program consists of a software application designed to streamline activities, optimize performance, reduce costs and improve cycle time for oil production.

Anderson, Roger; Boulanger, Albert. **Ultradeepwater suitability matrix helps estimate value of lean processes.** *Oil & Gas Journal*. 2004; 102 (24):35-39. ISSN: 0030-1388.

Andrews, J. M.; Lieberman, S. H. **Multispectral fluorometric sensor for real time *in-situ* detection of marine petroleum spills.** *In* Garcia-Martinez, R.; Brebbia, C. A. (Eds.). *Oil and Hydrocarbon Spills, Modelling, Analysis and Control*. Billerica, Ma.: Computational Mechanics, Inc.; 1998; p. 291-302. ISBN: 1-85312-526-1.
A system, comprised of an array of underwater sensors, detects surface sheen and emulsified or dissolved phase petroleum in the water column. The system was designed for use in the protection of marine facilities from accidental spills by providing real-time information to spill response authorities.

Annika, Pollani et al. **The Poseidon operational tool for the prediction of floating pollutant transport.** *Marine Pollution Bulletin*. 2001; 43 (7-12):270-278. ISSN: 0025-326X.
The Poseidon system was designed to provide real time data for oil spill simulation and operational management in the Aegean Sea. In a crisis, the application would forecast the predicted movement and spreading of an oil spill, in addition to identifying potential coastal areas which might be impacted.

Antunes de Carmo, J.; Costa, M. **Modelling of oil spill evolution in estuaries and coastal regions.** *In* Rodriguez, G. R.; Brebbia, C. A. (Eds.) *Oil and Hydrocarbon Spills, Modelling, Analysis and Control II*. Billerica, Ma.: Computational Mechanics Inc.; 2000; p. 63-72. ISBN: 1-85312-828-7.
A numerical model, linked to a transport Langrangean approach and another two-dimensional hydrodynamic model, was created to predict oil spill events off the coast of Portugal. The model was then successfully tested by comparing generated data to information collected after the *New World* and *Cercal* tanker accidents.

Applebee, Michelle S.; Geissler, John D.; Schellinger, Adam P.; Jaeger, Richard J.; Pierce, David T. **Field screening of waterborne petroleum hydrocarbons by thickness shear-mode resonator measurements.** *Environmental Science & Technology*. 2004; 38 (1):234-239. ISSN: 0013-936X.
This paper describes a lightweight and inexpensive sensor that can be brought into the field for determining petroleum hydrocarbons in aqueous samples.

Barron, Mace G.; Ka'Aihue, Lisa. **Potential for photoenhanced toxicity of spilled oil in Prince William Sound and Gulf of Alaska waters.** *Marine Pollution Bulletin*. 2001; 43 (1-6):86-92. ISSN: 0025-326X.
Photoenhanced toxicity was evaluated to establish the mechanism of photoactivation in fish and aquatic invertebrates, and implications for injury and risk assessment and oil spill response.

Beens, J. **Multidimensional chromatographic applications in the oil industry.** *In* Mondello, L; Lewis, A. C.; Bartle, K. D. *Multidimensional Chromatography: Techniques and Applications*. New York: John Wiley & Sons; 2002; p. 379-406. ISBN: 0-471-98869-3.

Begak, O. Yu.; Syroezhko, A. M. **Identification of oil pollution sources by a set of modern instrumental methods.** *Russian Journal of Applied Chemistry*. 2001; 74 (5):784-787. ISSN: 1070-4272.
Authors describe multiple instrumental methods used to identify sources of oil pollution. Identification methods include computer comparison of absorption bands of oil samples, radionuclide composition analysis, impurity content of oils and metallic/nonmetallic elements found in those impurities.

Belt, John Q., Jr.; Rice, Gary K. **Application of statistical quality control measures for near-surface geochemical petroleum exploration.** *Computers & Geosciences*. 2002; 28 (2):243-260. ISSN: 0098-3004.
This paper describes four quality control measures that can be used to develop a petroleum exploration model, when integrated with geomorphology, surface geology, and seismic survey data.

Benedetti-Cecchi, Lisandro. **Beyond BACI: optimization of environmental sampling designs through monitoring and simulation.** *Ecological Applications*. 2001; 11 (3):783-799. ISSN: 1051-0761.
This paper addresses the impact of environmental disturbances on the abundance of algae and invertebrates, using real estimates of spatial and temporal variability of populations.

Berry, John R.; McCormack, Niall J.; Doyle, Eamonn F. **Overcoming pore-pressure challenges in deepwater exploration.** *Offshore*. 2003; 63 (6):62-64; 100. ISSN: 0030-0608.
Operators use real-time input of data from logging-while-drilling and surface data logging to automatically calculate quantitative pore pressure estimates to provide ample warning of pressure changes at the bit at all times.

Bird, David. **Scarecrow goes to sea: floating noisemaker steers birds away from oil spills.** *The Gazette (Montreal)*. February 24, 2001; K 3.
A new device designed by the Canadian Wildlife Service, the Environmental Innovation Program and Ultramar Canada, Breco Innovation, will be used to prevent birds from wandering into oil spills. The bird scaring device floats like a buoy, is watertight and resistant to all kinds of weather. The device is filled with four submersible loudspeakers and is designed to give off sudden, sharp sounds, well within the audible range of birds.

Biteau, Jean-Jaques; Perrodan, Alain. **The petroleum system: a fundamental tool.** *Oil & Gas Journal*. 2003; 101 (30):34-39. ISSN: 0030-1388.
Explorers are using a method that simultaneously evaluates the remaining hydrocarbon potential for mature reservoirs and assesses new petroleum prospects.

Black, Richard; Freman, Lawson; Calderon, Jaime A. **Pioneering deepwater gulf pipeline system integrates five segments.** *Oil & Gas Journal*. 2003; 101 (19):58-61. ISSN: 0030-1388.
The largest capacity deepwater pipeline system ever built is near completion in the Gulf of Mexico. The Mardi Gras transportation system will connect to existing infrastructure and will provide access to multiple processing facilities and onshore pipelines all along the Gulf Coast.

Bonham, C. D. **Selection of hydrocarbon variables to assess reduction of residual oil on nutrient enriched beaches.** *Applied Mathematics and Computation*. 2002; 126 (2):361-376. ISSN: 0096-3003.

Bonner, James S.; Page, Cheryl A.; Fuller, Chris. **Meso-scale testing and development of test procedures to maintain mass balance.** *Marine Pollution Bulletin*. 2003; 47 (9-12):406-414. ISSN: 0025-326X.
Investigators recount the search for a technique to help in the establishing of a protocol for materials balance when testing oil on water surfaces at a meso-scale testing facility.

BP rejuvenating North Slope outlook with new technology, strategies. *Oil & Gas Journal*. 2001; 99 (32):74-77. ISSN: 0030-1388.
BP Exploration's new giant oil and gas processing module will introduce new efficiencies with greater expanded use of such technologies as coiled tubing drilling and horizontal wells. In addition, advances in 3D seismic data gathering and processing have enabled the company to discover a number of small satellite fields in the greater Prudhoe area.

Brauner, J. Steven; Widdowson, Mark A. **Numerical simulation of a natural attenuation experiment with a petroleum hydrocarbon NAPL source.** *Ground Water*. 2001; 39 (6):939-952. ISSN: 0017-467X.
Quantification of various microbial processes on individual petroleum-contaminated sites during natural attenuation has always been problematic. The SEAM3D code was employed to create a numerical simulation of natural attenuation and to re-create concentration distributions observed during natural attenuation.

Brebbia, C. (Ed). **Oil Spill Modelling and Processes.** Boston, Ma.: WIT Press; 2001; 172 pp. ISBN: 1-85312-672-1.

Bryce, P.; Jax, P.; Fang, J. **Leak-detection system designed to catch slow leaks in offshore Alaska line.** *Oil & Gas Journal*. 2002; 100 (50):53-59. ISSN: 0030-1388.
Northstar began production of crude oil in October 2001 offshore in the Beaufort Sea. Because of continuous ice cover during winter months, installation of the LEOS leak-detection system has been installed to detect small and slow leaks in the pipeline.

Bufton, Scott A. **Ultradeepwater will require less conservative flow assurance approaches.** *Oil & Gas Journal*. 2003; 101 (18):66-77. ISSN: 0030-1388.
Flow assurance, once refined for offshore production, must now be reconsidered for deepwater projects, specifically to address risk mitigation for health, safety, environmental, and economic concerns.

Byfield, Russell. **Harbor pipelay is one of the world's longest bottom-pull jobs.** *Oil & Gas Journal*. 2000; 98 (33):76-80. ISSN: 0030-1388.
A 4-5-km pipeline bundle for Shell Eastern Petroleum was completed in May in the Singapore harbor. This is one of the world's largest bottom-pull installations. The bundle consists of eight pipelines and two fiberoptic cables connecting Shell's refinery on Pulau Bukom Island with the Petrochemical Corp. of Singapore on Jurong Island.

Caleyo, E.; Hallen, J. M.; González, J. L.; Fernández-Lagos, F. **Reliability-based method assesses corroding oil pipeline.** *Oil & Gas Journal*. 2003; 101 (2):56-61. ISSN: 0030-1388.
Assessment methodology is used to evaluate an application of a reliability-based pipeline condition of an in-service corroded oil pipeline.

Caribbean nations back Trinidad-based subsea gas pipeline. *Oil & Gas Journal*. 2002; 100 (51):25-27. ISSN: 0030-1388.
A proposed subsea natural gas pipeline system is presented. The pipeline system will travel from Trinidad and Tobago northward through the Caribbean Sea and possibly end on the mainland at Miami.

Caspian crude oil line gets power system. *Oil & Gas Journal*. 2001; 99 (25):62-63. ISSN: 0030-1388.
The 1,500-km Caspian pipeline is the site for installation of 113 grid-connected power systems, each in self-contained protective housing. The system has two separate battery banks specifically to ensure 100% power availability in the event that main line block valve actuation is required.

Chao, Xiaobo; Shankar, N. Jothi; Cheong, Hin Fatt. **Two- and three-dimensional oil spill model for coastal waters.** *Ocean Engineering*. 2001; 28 (12):1557-1573. ISSN: 0029-8018.
The coupling of 2-D and 3-D numerical models is being successfully used for predicting the movement of an oil slick spreading over a surface, as well as providing data for the many complex factors that influence the behavior of oil.

Chen, F. H.; Yapa, Poojitha D. **Modeling gas separation from a bent deepwater oil and gas jet/plume.** *Journal of Marine Systems*. 2004; 45 (3-4):189-203. ISSN: 0924-7963.
Authors describe a model that uses the Lagrangian control volume method for estimating the effects of turbulent multi-phase plume in a cross-flow. The model should help in the understanding of the nature of gas separation in a bent plume during deepwater blowouts.

Chen, W.; Kan, A. T.; Newell, C. J.; Moore, E.; Tomson, M. B. **More realistic soil cleanup standards with dual-equilibrium desorption.** *Ground Water*. 2002; 40 (2):153-164. ISSN: 0017-467X.
This paper describes the dual-equilibrium desorption model, which is the only biphastic model to date. According to results from this model, the authors suggest that many regulatory standards for cleanup of soils and sediments can be increased without increasing risk.

Chen, Z.; Huang, G. H. **Integrated subsurface modeling and risk assessment of petroleum-contaminated sites in western Canada.** *Journal of Environmental Engineering - ASCE*. 2003; 129 (9):858-872. ISSN: 0733-9372.
A model is developed that incorporates biodegradation modeling, health risk assessments, site remediation, and matters related to multicontaminant transport simulation to help the decision-making process regarding site remediation actions.

Cheng, Nian Sheng; Law, Adrian Wing Keung; Findikakis, Angelos N. **Oil transport in the surf zone.** *Journal of Hydraulic Engineering*. 2000; 126 (11):803-809. ISSN: 0733-9429.
A mass conservation equation is used to create a model for the understanding of the fates and effects of an oil spill along a coastline.

Chopra, Satinder; McConnell, Ian. **Using interwell chemical tracers and the coherence cube to understand reservoir communication.** *Oil & Gas Journal*. 2004; 102 (19):37-42. ISSN: 0030-1388.
Coherence technology and interwell chemical tracers were combined to demonstrate preferential flow in reservoirs.

Construction of most northerly LNG projects starts. *Oil & Gas Journal*. 2002; 100 (48):38-40. ISSN: 0030-1388.
This article describes a state-of-the-art gas liquefaction plant that will be located on the Norwegian continental shelf. The plant will be self-contained, without fixed or floating surface facilities.

Cory, Shelly; Turner, Evan. **Case-specific designs improve drill bit performance.** *Oil & Gas Journal*. 2003; 101 (11):55-59. ISSN: 0030-1388.
Historically, drilling operators based bit selection and application on information from previously drilled environments. Because modern operators must drill more wells to maintain the same production level, a collaborative effort is underway to develop a protocol for customizing specific applications and bit selection.

Cunneff, S.; Devitis, D.; Nash, J. **Test and evaluation of six fire resistant booms at Ohmsett.** *Spill Science & Technology*. 2000; 6 (5-6):353-355. ISSN: 1353-261.
The *in situ* burning of marine oil within booms is an effective response technique. An experiment was conducted at the Minerals Management Service's Ohmesett Facility to test six fire resistant booms for effectiveness for oil collection, wave conformance, and critical tow speed.

Curtis, G. P. **Comparison of approaches for simulating reactive solute transport involving organic degradation reactions by multiple terminal electron acceptors.** *Computers & Geosciences*. 2003; 29 (3):319-329. ISSN: 0098-3004.

Daling, Per S.; Moldestad, Merete Øverli; Johanses, Øistein; Lewis, Alun; Rodal, Jon. **Norwegian testing of emulsion properties at sea - the importance of oil type and release conditions.** *Spill Science & Technology Bulletin*. 2003; 8 (2):123-136. ISSN: 1353-2561.
Using various grades of oils, researchers performed a full scale field test, as well as laboratory bench scale and mesoscale tests to obtain data on the emulsification behavior of crude oils.

Daniel, P.; Poitevin, J.; Tiercelin, C.; Marchand, M. **Forecasting accidental marine pollution drift: the French operational plan.** *In* Garcia-Martinez, R.; Brebbia, C. A. (Eds.). *Oil and Hydrocarbon Spills, Modelling, Analysis and Control*. Billerica, Ma.: Computational Mechanics, Inc.; 1998; p. 43-52. ISBN: 1-85312-526-1.
This article discusses how Cedre (an environmental association) and Météo-France (the French national weather service) provide assistance to French authorities during oil spill response. It also describes Météo-France's development of MOTHY, a three-dimensional oil spill model.

Deissenberg, Christophe; Gottinger, Hans; Gurman, Vladimir; Marinushkin, Dmitry. **A dynamic model of optimal reduction of marine oil pollution.** *International Journal of Environment and Pollution*. 2001; 15 (3):322-332. ISSN: 0957-4352.
An ecological-economic model, which takes into account the realities of modern Russia, including problematic governmental response time, corrupt inspectors, and polluters' behavior, is presented in this paper.

Deissenberg, Christophe; Gurman, Vladimir; Ryumina, Elena; Tsirlin, Anatoly. **An empirically tractable model of optimal oil spills prevention in Russian sea harbours.** *International Journal of Environment and Pollution*. 2001; 15 (3):301-309. ISSN: 0957-4352.
Authors propose a simple model that accounts for the poor availability of data on spills in Russia and the Ukraine. The model is then applied to harbors on the Black and Baltic Seas.

Delvigne, Gerard A. L. **Physical appearance of oil in oil-contaminated sediment.** *Spill Science & Technology Bulletin*. 2002; 8 (1):55-63. ISSN: 1353-2561.
Droplet size distribution and the physical appearance of oil were investigated to establish the division of oil in its different phases, as it applies to three types of oil-contaminated sediment interaction processes.

Dey, Prasanta K.; Gupta, Soumitra S. **Risk-based model aids selection of pipeline inspection maintenance strategies.** *Oil & Gas Journal*. 2001; 99 (28):54-60. ISSN: 0030-1388.
A risk-based model that reduces the amount of time spent on inspection has been developed. This model not only reduces the cost of maintaining petroleum pipelines, but also suggests an efficient design and operation philosophy, construction method, and logical insurance plans.

Dharmadhikari, Shashi; Bretherton, Anthony. **Accurate fluid characterization, process optimization boosts crude production.** *Oil & Gas Journal*. 2004; 102 (25):45-53. ISSN: 0030-1388.
A process that accurately characterizes reservoir fluids is an essential tool for achieving the process design of oil and gas production facilities to optimize recover of hydrocarbons and maximize financial returns.

Donovan, G. G.; Ugueto C., G.; Pellerin, N. M. **Wireline and logging-while-drilling applications in undersaturated oil sands in deepwater GoM.** *Offshore*. 2002; 62 (12):42-44. ISSN: 0030-0608.
A tool that acquires magnetic resonance imaging logging (MRIL) is used to determine uncertainties in rock texture, fluid type and hydrocarbon saturation. This application has been tested in deepwaters of the Gulf of Mexico to compute flow throughout all zones, and to determine if the MRIL tool would be a workable replacement for the wireline instrument in difficult environments.

Douglas, Gregory; Owens, Edward H.; Hardenstine, Jeffrey ; Prince, Roger C. **The OSSA II pipeline oil spill: the character and weathering of the spilled oil.** *Spill Science & Technology Bulletin*. 2002; 7 (3-4):135-148. ISSN: 1353-2561.
A fracture in the OSSA II pipeline accidentally released oil in an area where it crosses over the Río Desaguadero in Bolivia, South America. Approximately one year following the release, samples of oil, oiled sediment, water and vegetation were collected from the surrounding areas to determine the composition of the spilled oil and the unique weathering processes that occurred after the spill.

Dutta, Nirmal; Kendall, Don. **ExxonMobil integrates information at Cerro Negro.** *Oil & Gas Journal*. 2001; 100 (4):55-59. ISSN: 0030-1388.
A new system's application referred to as integrated control and information management system went live in early 2001 at the ExxonMobil led joint venture, Operadora Cerro Negro SA facilities in Venezuela. The system will network information that will provide universal access via PCs to the entire facility.

Eghtesadi, P.; Riazi, G.; Taghikhani, M.; Ranaei Siadat, S. O. **Distribution and sources of polycyclic aromatic hydrocarbons in the Northern Persian Gulf as indicated by kinetic and thermodynamic criteria.** *Bulletin of Environmental Contamination and Toxicology*. 2002; 69 (5):704-711. ISSN: 0007-4861.
At offshore stations in the Persian Gulf, sediment sampling was monitored for the presence of PAHs. Chrysene was the most prevalent hydrocarbon found during the investigation. Authors urge for the periodic monitoring of the region as an indicator of environmental quality.

Elks, William C., Jr. **Extended-reach drilling develops Sacate field, offshore California.** *Oil & Gas Journal*. 2002; 100 (10):45-55. ISSN: 0030-1388.
Located at its Heritage platform offshore California, ExxonMobil has set a world record for an extended reach drilling (ERD) well in water depths greater than 650 ft. ERD technology will minimize offshore structures and allow marginal oil fields to be developed.

Espedal, H. A.; Johannessen, O. M. **Detection of oil spills near offshore installations using synthetic aperture radar (SAR).** *International Journal of Remote Sensing*. 2000; 21 (11):2141-2144. ISSN: 0143-1161.
SAR is capable of detecting oil spills independent of light at high spatial resolutions, unlike other remote sensing sensors. This technology provides a unique opportunity for global scale oil spill detection, compared to scattered ship observations or aircraft surveillance in limited areas.

Ezra, S. et al. **Weathering of fuel oil spill on the east Mediterranean coast, Ashdod, Israel.** *Organic Geochemistry*. 2000; 31 (12):1733-1741. ISSN: 0146-6380.
Systematic monitoring of a fuel oil spill showed initial rapid weathering, and then slower weathering after 3 months. Authors speculate that evaporation and wave energy play an important role in the degradation of oil.

Fang, Fangxin; Johnston, Archie J. **Oil containment by boom in waves and wind. I: numerical model.** *Journal of Waterway, Port, Coastal and Ocean Engineering*. 2001; 127 (4):222-227. ISSN: 0733-950X.
Authors develop a two-phase nonlinear hydrodynamic numerical model to simulate oil containment in open sea conditions with the use of a fixed boom. A simulation of oil slick behavior is described, with varying physical properties, slick shapes, and wave actions added to determine the accuracy of the model.

Fang, Fangxin; Johnston, Archie J. **Oil containment by boom in waves and wind. II: waves.** *Journal of Waterway, Port, Coastal, and Ocean Engineering*. 2001; 127 (4):228-233. ISSN: 0733-950X.
Authors apply differing hydrodynamic conditions to a two-phase numerical model. Specifically, they investigate effects of currents and waves on interfacial waves and differing thickness of oil. Effects of waves and currents on the effectiveness of the boom are described.

Fang, Fangxin; Johnston, Archie J. **Oil containment by boom in waves and wind. III: containment failure.** *Journal of Waterway, Port, Coastal, and Ocean Engineering*. 2001; 127 (4):234-239. ISSN: 0733-950X.
Authors focus on the effects of oil viscosity and containment failure in a numerical model. The influence of oil volume and boom draft is also investigated in this study. Results are compared to data from laboratory experiments using a wave flume.

Farzanegan, M. R. **Iranian options most economically viable for exporting Caspian oil.** *Oil & Gas Journal*. 2003; 101 (11):22-26. ISSN: 0030-1388.
This article outlines advantages and disadvantages to using Iran as a country to host a pipeline that will carry Caspian oil to ports along the Persian Gulf.

Fay, J. A. **Model of spills and fires from LNG and oil tankers.** *Journal of Hazardous Materials*. 2003; 96 (2-3):171-188. ISSN: 0304-3894.
A model that predicts the discharge flow of liquids less dense than seawater configures the discharge rate of the cargo by determining the pressure gradient with the surrounding environment at the time of the puncture opening.

Fingas, Mervin F.; Fieldhouse, Ben. **Studies of the formation process of water-in-oil emulsions.** *Marine Pollution Bulletin*. 2003; 47 (9-12):369-396. ISSN: 0025-326X.
Authors review published papers investigating the formation process and stability factors associated with water-in-oil emulsions. From existing studies, they determine that water-in-oil mixtures can be grouped into four states separated by rheological and visual gradations.

Fingas, Mervin F.; Hollebone, B. P. **Review of behaviour of oil in freezing environments.** *Marine Pollution Bulletin*. 2003; 47 (9-12):333-340. ISSN: 0025-326X.
Laboratory experiments were conducted to better understand the physical changes that occur when oil is discharged in waters with varied ice environments.

Fingas, Mervin, F.; Brown, Carl E. **Oil-spill remote sensing-an update.** *Sea Technology*. 2000; 41 (10):21-26. ISSN: 0093-3651.
A general review of oil-spill remote sensors includes discussions of infrared cameras, laser fluorosensors, radar, and remote sensors.

Fingas, Mervin, F.; Fieldhouse, Ben; Wang, Zhendi. **The long term weathering of water-in-oil emulsions.** *Spill Science & Technology Bulletin*. 2003; 8 (2):137-143. ISSN: 1353-2561.
To understand the breakdown processes of long-term stability of water-in oil emulsions, researchers analyzed data collected from laboratory experiments conducted over a 9-year period and investigated emulsion formation in experiments that were conducted for a period of 2-10 days.

Fiscella, B.; Giancaspro, A.; Nirchio, F.; Pavese, P.; Trivero, P. **Oil spill detection using marine SAR images.** *International Journal of Remote Sensing*. 2000; 21 (18):3561-3566. ISSN: 0143-11621.
Synthetic Aperture Radar images are used to distinguish oil spills from other similar oceanic features in a marine environment. Data sets containing examples of oil spill images and natural features exhibiting characteristics similar to oil spills were compared and evaluated using an algorithm classification.

Floating vane withstands strong currents to manage oil spills. *Offshore*. 2000; 60 (10):157. ISSN: 0030-0608.
The Bohus Innovation Company has introduced a new design of a flexible boom. Bohus claims that the system is ready for use in large rivers subject to strong currents of up to four knots, and with a little further development, the system will be suitable for offshore use. The design of a hydrodynamic separator allows the influence of the current, the water and oil to be guided into a rotational chamber where a slow-moving vortex is created that traps and concentrates the oil.

Fluids analysis system designed for deepwater environments. *Offshore*. 2003; 63 (6):82. ISSN: 0030-0608.
Fluid logging and real-time analysis technology is performed by using a mass spectrometer coupled to a gas chromatography that continuously measures hydrocarbons and sour gases. This process is improving reservoir evaluations at deepwater exploration sites.

Forde, Samantha E. **Modelling the effects of an oil spill on open populations of intertidal invertebrates.** *Journal of Applied Ecology*. 2002; 39 (4):595-604. ISSN: 0021-8901.
A model was used to predict the effects of an oil spill on barnacle populations. Results of the study indicate that recruitment variation is a critical factor in determining population disturbances of organisms with dispersal larval phases.

French, D. P. **Evolution of oil trajectory, fate, and impact assessment models.** *In* Garcia-Martinez, R.; Brebbia, C. A. (Eds.). *Oil and Hydrocarbon Spills, Modelling, Analysis and Control*. Billerica, Ma.: Computational Mechanics, Inc.; 1998; p. 73-86. ISBN: 1-85312-526-1.
This article discusses modelling as a means of quantifying the impacts of spills, and focuses on the development of models coupling oil fates and effects.

Friis-Hansen, Peter; Ditlevsen, Ove. **Nature preservation acceptance model applied to tanker oil spill simulations.** *Structural Safety*. 2003; 25 (1):1-34. ISSN: 0167-4730.
A standard profile for risk modelling was used to predict and simulate tanker collisions. Data collected from the application was then applied to another risk profile named the Poisson model, and scenarios were calculated to obtain a lognormal distribution for oil spill volume per spill.

Frysinger, Glenn S.; Gaines, Richard B. **GC x GC - a new analytical tool for environmental forensics.** *Environmental Forensics*. 2002; 3 (1):27-34. ISSN: 1527-5922.
Two-dimensional gas chromatography can be used effectively in the analysis of environmental samples. In this paper, harbor sediment extracts were investigated and several environmental contaminants, including numerous PAHs, were identified.

Fye, J. L.; Nelson, H. H.; Mowery, R. L.; Baronavski, A. P.; Callahan, J. H. **Scanning ultraviolet two-step laser mass spectroscopy of polycyclic aromatic hydrocarbon distributions on creosote-contaminated soil particles.** *Analytical Chemistry*. 2002; 74 (13):3019-3029. ISSN: 0003-2700.
Authors construct an instrument capable of producing two-dimensional images of PAH distribution on planar and three-dimensional objects. This device is able to collect data on PAH desorption from both UV and IR wavelengths.

Gao, Y. Z.; Zhu, L. Z. **Phytoremediation and its models for organic contaminated soils.** *Journal of Environmental Sciences - China*. 2003; 15 (3):302-310. ISSN: 1001-0742.

Gas, water injection included in off-Norway heavy-oil development. *Oil & Gas Journal*. 2003; 101 (4):50-51. ISSN: 0030-1388.
To achieve better recovery rates in the Grane field off Norway, selected pressure maintenance with gas and water was used for recovering heavy oil from the reservoir.

Ghannam, Mamdouh T. **Creep-recovery experimental investigation of crude oil-polymer emulsions.** *Journal of Applied Polymer Science*. 2004; 92 (1):226-237. ISSN: 0021-8995.
North Sea crude oil was used to better understand the visoelsatic behavior of crude oil-Alcoflood polymer emulsions. The Maxwell and Burger models were found to simulate visoelastic behavior depending upon the polymer concentration.

Giarrusso, C. C.; Carratelli, E. Pugliese; Spulsi, G. **On the effects of wave drift on the dispersion of floating pollutants.** *Ocean Engineering*. 2001; 28 (10):1339-1348. ISSN: 0029-8018.

Gilchrist, Robert, T.; Visser, R. C.; Carlson, Gary E. **Innovations drive pipeline installation in Cook Inlet.** *Oil & Journal*. 2003; 101 (37):80-89. ISSN: 0030-1388.
A newly designed heavy-wall seamless tubular pipeline was laid offshore in several areas surrounding the Osprey platform, Cook Inlet, Alaska, to test a new method of pipeline installation.

Gilchrist, Robert. **Preparedness validated in gulf deepwater flowline repair.** *Oil & Gas Journal*. 2001; 99 (34):58-66. ISSN: 0030-1388.
The first J-lay pipe-in-pipe insulated flowline, referred to as the Macaroni flowline system, was designed and installed to provide reliable transportation for produced fluids from a group of subsea wells to a location nearly 12 miles away. As construction and installation continued, an accident occurred suspending 3,800-ft of pipe into 3,400 feet of water. This article discusses the accident and steps used to recover the pipe and resume construction.

Gobas, Frank A. P. C.; MacLean, Laura G. **Sediment-water distribution of organic contaminants in aquatic ecosystems: the role of organic carbon mineralization.** *Environmental Science & Technology*. 2003; 37 (4):735-741. ISSN: 0013-936X.
A fugacity-based model is proposed and developed to account for chemical magnification during the food chain transfer of hydrophobic organic chemicals in sediment-water distribution.

González, M. et al. **Numerical tool for hydrocarbon pollution forecasting in the autonomous port of Bilbao.** *In* Rodriguez, G. R.; Brebbia, C. A. (Eds.) *Oil and Hydrocarbon Spills, Modelling, Analysis and Control II*. Billerica, Ma.: Computational Mechanics Inc.; 2000; p. 95-104. ISBN: 1-85312-828-7.
A model is being developed for the port of Bilboa with the cooperation of a number of groups. This model will be tested, calibrated, and used to predict the fate of an oil spill in the Abra estuary.

Goodman, Ron. **Tar balls: the end state.** *Spill Science & Technology Bulletin*. 2003; 8 (2):117-121. ISSN: 1353-2561.
The author analyzed data collected from previous studies on the topic of the formation of tar balls to ascertain the characteristics of tar ball origination from various types of oil. Based on that information, he evaluated the mechanisms involved in the formation of tar balls from oil and clay fines.

Gottinger, Hans W. **Stochastic models of oil spill processes.** *International Journal of Environment and Pollution*. 2001; 15 (3):266-289. ISSN: 0957-4352.
This paper presents a probabilistic model that investigates the situation of a spill, including the operating environment of a ship, patrol and enforcement of spills. The model demonstrates that a spill size is affected by pollution control instruments, such as fines, enforcement effort, and attentiveness of operating personnel.

Grattoni, Carlos; Moosai, Roshni; Dawe, Richard A. **Photographic observations showing spreading and nonspreading of oil on gas bubbles of relevance to gas flotation for oily wastewater cleanup.** *Colloids and Surfaces A - Physicochemical and Engineering Aspects*. 2003; 214 (1-3):151-155. ISSN: 0927-7757.
Photographic evidence of the spreading of oil around a gas bubble is made available in this article.

Gray, M. R. **New technique defines the limits of upgrading heavy oils, bitumens.** *Oil & Gas Journal*. 2002; 100 (1):50-53. ISSN: 0030-1388.
In order to transport heavy oils and bitumens by pipeline, they must be diluted with a solvent or upgraded to reduce viscosity and increase gravity. In this article, a new upgrading process is presented which is used to complement the existing coking and hydroconversion processes.

Grisolía-Santos, D.; Spaulding, M. L. **Influence of oil particle size distribution as an initial condition in oil spill random walk models.** *In* Rodriguez, G. R.; Brebbia, C. A. (Eds.) *Oil and Hydrocarbon Spills, Modelling, Analysis and Control II*. Billerica, Ma.: Computational Mechanics Inc.; 2000; p. 19-27. ISBN: 1-85312-828-7.
The authors of this paper employed a random walk model to study the influence of oil particle size distribution on horizontal spreading by a vertical shearing current.

Hamlat, M. S.; Kadi, H.; Fellag, H. **Precipitate containing NORM in the oil industry: modelling and laboratory experiments.** *Applied Radiation and Isotopes*. 2003; 59 (1):95-99. ISSN: 0969-8043.
This study describes a model that can calculate potential factors influencing a precipitate containing NORM, including shaking velocity, contact time, temperature, and mixing water ratio. Experimental results were compared with the model to confirm accuracy.

Han Myung Woo; Chang, Kyung Il; Park, Yong Chul. **Distribution and hydrodynamic model of the *Keumdong* oil spill in Kwangyang Bay, Korea.** *Environment International*. 2001; 26 (7-8):457-463. ISSN: 0160-4120.
Based on samples collected 165 days after the *Keumdong* oil spill, researchers were able to model the transport and fate of the spilled oil. Surface currents were found to influence the initial migration of the oil, but little evidence pointed to the role of bottom currents in oil dispersal.

Han, Do-Hung; Stuchinskaya, Tatiana; Won, Yang-Soo; Park, Wan-Sik; Lim, Jae-Kyong. **Oxidative decomposition of aromatic hydrocarbons by electron beam irradiation.** *Radiation Physics and Chemistry*. 2003; 67 (1):51-60. ISSN: 0969-806X.
Researchers identify a chlorine radical, formed from irradiation during exposure to an electron beam, responsible for causing a chain reaction that speeds up the oxidative destruction of aromatic compounds.

Hill, Paul S.; Khelifa, Ali; Lee, Kenneth. **Time scale for oil droplet stabilization by mineral particles in turbulent suspensions.** *Spill Science & Technology Bulletin*. 2002; 8 (1):73-81. ISSN: 1353-2561.
This paper presents a physical model that explains the variability in the formation rates of oil-mineral aggregates (OMA), and a time scale in which the stabilization of oil droplets with mineral particles are suspended in a turbulent medium. Researchers predict that this model will establish a protocol for oil-spill response communities by providing data important to OMA formation relative to other weathering processes in the coastal environment.

Holbrook, P. **Overburden, fracture pressure, permeability regulate *in situ* pore-pressure profiles.** *Oil & Gas Journal*. 2001; 99 (51):37-42. ISSN: 0030-1388.
A real-time application log that applies force-balance physics to calculate pore pressure is executed by operators to meet safety and cost objectives.

Horn, C. **Tool adds to deepwater flow-assurance flexibility.** *Oil & Gas Journal*. 2001; 99 (45):89-91. ISSN: 0030-1388.
Paragon Engineering Services, Inc. is currently developing a tool that will allow remediation of a subsea flow blockage from a surface vessel directly to a manifold. This new tool will ensure production flow for multiple fields and applications.

Horváth-Szabó, Géza; Czarnecki, Jan; Masliyah, Jacob H. **Sandwich structures at oil-water interfaces under alkaline conditions.** *Journal of Colloid and Interface Science*. 2002; 253 (2):427-434. ISSN: 0021-9797.

Hostettler, Frances D.; Rosenbauer, Robert J.; Kvenvolden, Keith A. **Response to comment by Bence et al.** *Organic Geochemistry*. 2000; 31(9):939-943. ISSN: 0146-6380.
Authors defend the use of a refractory index in the analysis of weathered oil, and address other aspects of their investigation that was questioned in a previous article.

Huang, Yen-Chieh; Liang, Uen-Chin. **Interferometric oil-spill detection system.** *Optical Engineering*. 2001; 40 (5):740-745. ISSN: 0091-3286.
Authors describe the creation of an optical early warning system for the detection of oil spills in water. The system is compact, inexpensive, energy efficient, and can monitor oil spills from a buoy.

Hussein, Maged; Jin, Minghui; Weaver, James W. **Development and verification of a screening model for surface spreading of petroleum.** *Journal of Contaminant Hydrology*. 2002; 57 (3-4):281-302. ISSN: 0169-7722.
The Oil Surface Flow Screening Model was used to predict the fate and transport of hydrocarbons that overflow or leak from aboveground storage tanks and pipelines.

Istre, Michael R. **Pipeline end-sled design for gulf lateral sets several benchmarks.** *Oil & Gas Journal*. 2001; 99 (31):66-75. ISSN: 0030-1388.
This article focuses on the successful use of large diameter, high-pressure diverless connectors, their design, fabrication, testing and installation of the lateral's pipeline end-sleds.

Izett, Ronaldo; Machado, Fernando; Moreira, Oswaldo; Ratterman, Gene; Hill, Leo H. **Cross-discipline technologies complete deepwater wells off Brazil.** *Oil & Gas Journal*. 2002; 100 (45):56-62. ISSN: 0030-1388.
The world’s first fully electric intelligent subsea system combining cross-discipline components with multizone sand-control systems will be remotely operated in Brazil’s Campos basin.

Jackson Nielsen, Victoria B.; Piedras, Jose; Stimatz, Gregory P.; Webb, Tamara R. **Intelligent completions vital for three-field deepwater project.** *Oil & Gas Journal*. 2003; 101 (16):41-45. ISSN: 0030-1388.
An application that provides operators with real-time or near-real time reservoir data is maximizing field efficiency and reservoir production.

Jacques, John. **Geographic information systems as an advanced exploration tool.** *Offshore*. 2002; 62 (11):58-59, & 90. ISSN: 0030-0608.
Integrating GIS functionality into a web-based program will provide data management systems a tool that will exceed current expectations for predicting geospatial relationships. However, implementation of this interface will depend on the time it takes to begin writing RDF-compatible scientific documents.

Jiang, Zhizhuang et al. **Mineralogy-based acid design restores sandstone productivity.** *Oil & Gas Journal*. 2004; 102 (23):44-47. ISSN: 0030-1388.

Jin, Meibing; Wang, Jia. **Interannual variability and sensitivity study of the ocean circulation and thermohaline structure in Prince William Sound, Alaska.** *Continental Shelf Research*. 2004; 24 (3):393-411. ISSN: 0278-4343.
A 3D model simulating ocean circulation and thermocline structure in Prince William Sound, Alaska shows variability of possible oil spill trajectories, importance of wind impact on surface circulation and mixed layer depth, and how salinity determines circulation patterns in the central sound.

Johannesen, J. et al. **3D oil migration modelling of the Jurassic petroleum system of the Stratfjord area, Norwegian North Sea.** *Petroleum Geoscience*. 2002; 8 (1):37-50. ISSN: 1354-0793.
This modelling study enabled researchers to determine the vertical and lateral migration of hydrocarbons over time, and to conclude that present-day resources are the result of a multi-layered, multi-directional migrating system originating from three separate fields.

Jovancicevic, B. et al. **Steranes and triterpanes as a tool for identification of petroleum-type pollutants in alluvial ground waters (Danube alluvial sediments, Yugoslavia).** *Fresenius Environmental Bulletin*. 2001; 10 (6):527-532. ISSN: 1018-4619

Kaplan, I. R. **Age dating of environmental organic residues.** *Environmental Forensics*. 2003; 4 (2):95-141. ISSN: 1527-5922.
The author describes both long-term and short-term methods of assessing time of release of organic residues into the environment. Short-term release includes crude oil and refined petroleum fuels, and methodology involves five approaches for estimating release times based on technology, time-frame of government mandated additives, onset of corrosion, weathering, and Pb-206/Pb-207 isotope ratios.

Khelifa, Ali; Stoffyn-Egli, Patricia; Hill, Paul S.; Lee, Kenneth. **Characteristics of oil droplets stabilized by mineral particles: effects of oil type and temperature.** *Spill Science & Technology Bulletin*. 2002; 8 (1):19-30. ISSN: 1353-2561.
Researchers investigated the characteristics of oil droplets by stabilizing them with the process of oil-mineral aggregation (OMA). Next, researchers combined seawater with a mixture of natural mineral fines, and added an assortment of variables to determine the extent of OMA formation.

Khristov, K.; Taylor, S. D.; Czarnecki, J.; Masliyah, J. **Thin liquid film technique - application to water-oil-water bitumen emulsion films.** *Colloids and Surfaces A - Physicochemical and Engineering Aspects*. 2000; 174 (1-2):183-196. ISSN: 0927-7757.

Kim, Byoung-Yun; Moon, Jun Hyuk; Sung, Tae-Hyun; Yang, Seung-Man; Kim, Jong-Duk. **Demulsification of water-in-crude oil emulsions by a continuous electrostatic dehydrator.** *Separation Science and Technology*. 2002; 37 (6):1307-1320. ISSN: 0149-6395.
In a series of experiments, demulsification of crude oil was observed and effects of demulsifier concentration, temperature, frequency, and contact time were monitored.

Kim, Yunjin; Huneycutt, Bryan. **Instrument characteristics and data products for NASA's next SAR mission.** *AAPG Bulletin*. 2000; 84 (9):1448. ISSN: 0149-1423.
The concept for a free-flying SAR, which could be used, in part, for oil exploration and oil spill detection, is described.

Knott, Michelle. **A cleaner way to drain oil wells to the last drop.** *New Scientist*. 2004; 181 (2432):23. ISSN: 0262-4079.
A method that separates oil from water in reservoirs that are presumed dried uses fluid mechanics, the "laminar flow" (flow without turbulence), allowing the fluid to move faster as it becomes further away from the wall of the chamber.

Kochergin, I. E.; Bogdanovsky, A. A.; Mishukov, V. F.; Putov, V. F. **Oil spill scenario modelling for Sakhalin shelf.** *In* Rodriguez, G. R.; Brebbia, C. A. (Eds.) *Oil and Hydrocarbon Spills, Modelling, Analysis and Control II*. Billerica, Ma.: Computational Mechanics Inc.; 2000; p. 39-50. ISBN: 1-85312-828-7.
A modelling technique is used to assess the impact of an oil spill in four areas around Sakhalin Island.

Kong, F. N. et al. **'Seabed logging': a possible direct hydrocarbon indicator for deepsea prospects using EM energy.** *Oil & Gas Journal*. 2002; 100 (19):30-38. ISSN: 0030-1388.
Seabed logging, a type of controlled source electromagnetic technique has been used to determine if deepsea structures have high resistivity during drilling operations. This method may aid in determining potential hydrocarbon resources.

Konopczynski, Michael. **Intelligent well technology maximizes recovery, reduces costs.** *Offshore*. 2003; 63 (1):58-60. ISSN: 0030-0608.
An evaluation process that will assess uncertainty in reservoir behavior can improve the economics of a project early in the planning stages. Intelligent well technology in combination with Stochastic evaluation processes provides this capability.

Korotenko, K. A.; Dietrich, D. E.; Bowman, M. J. **Modeling of the circulation and transport of oil spills in the Black Sea.** *Oceanology*. 2003; 43 (4):474-484. ISSN: 0001-4370.
A model, based on DieCAST and adapted to the Black Sea, is described in this paper. The authors assert that experiments confirm that the model accurately reproduces the principal features of sea dynamics, including near-shore eddies, and correctly predicts the spread of oil pollution.

Kostrov, Sergey; Wooden, William O.; Roberts, Peter M. ***In situ* seismic shockwaves.** *Oil & Gas Journal*. 2001; 99 (36):47-51. ISSN: 0030-1388.
The new *in situ* seismic stimulation (ISS) tool uses seismic pulses to mobilize oil left behind in reservoirs. ISS creates elastic waves of high-energy (up to 10Mw) and low-frequency that dislodge immobile oil droplets and coalesce oil films.

Kumagai, T.; Murakami, S.; Muraoka, M. **Hydrodynamic characteristics of water-jet pump for removing oils.** *In* Garcia-Martinez, R.; Brebbia, C. A. (Eds.). *Oil and Hydrocarbon Spills, Modelling, Analysis and Control*. Billerica, Ma.: Computational Mechanics, Inc.; 1998; p. 177-186. ISBN: 1-85312-526-1.
This article describes, in engineering terms, the efficiency of a water-jet pump designed for use in cleaning areas affected by oil spills.

Kutasov, I. M.; Kagan, M. **Procedures correct temperatures for deep offshore wells.** *Oil & Gas Journal*. 2002; 100 (49):56-61. ISSN: 0030-1388.
Authors describe a method of using an analytical equation combined with other techniques to simplify the prediction of bottomhole circulating temperature and bottomhole static temperatures during drilling and completion.

Lanan, Glenn A. **Arctic offshore oil pipeline will move production before year end.** *Oil & Gas Journal*. 2001; 99 (18):80-90. ISSN: 0030-1388.
BP Exploration has installed the first trenched subsea oil pipeline off Sea Island in the Beaufort Sea. The Northstar pipeline system began drilling in December 2000 with planned production to start in the fourth quarter of 2001, when crude oil will be transported to the Trans-Alaskan Pipeline System.

Larsen, P. T. et al. **Environmental spill modelling and risk assessment of Orimulsion 400 and heavy fuel oil.** *In* Rodriguez, G. R.; Brebbia, C. A. (Eds.) *Oil and Hydrocarbon Spills, Modelling, Analysis and Control II*. Billerica, Ma.: Computational Mechanics, Inc.; 2000; p. 3-10. ISBN: 1-85312-828-7.
Many scenarios were modeled to gauge the effects of a possible spill in Kalundborg fjord, off the Danish coast. Authors conclude that the model is capable of producing realistic spill conditions, which then can be used in risk assessment for bird life or aquatic organisms.

Lee, Jong-Hyeon; Landrum, Peter F.; Field, L. Jay; Koh, Chul-Hwan. **Application of a Sigma polycyclic aromatic hydrocarbon model and a logistic regression model to sediment toxicity data based on a species-specific, water-only LC50 toxic unit for *Hyalella azteca*.** *Environmental Toxicology and Chemistry*. 2001; 20 (9):2102-2113. ISSN: 0730-7268.
Two models were developed and tested to predict toxicity in organisms from PAH-contaminated sediments.

Lee, Richard F. **Photo-oxidation and photo-toxicity of crude and refined oils.** *Spill Science & Technology Bulletin*. 2003; 8 (2):157-162. ISSN: 1353-2561.
Researchers investigate the weathering and toxicity of an oil spill and how the process is affected by solar radiation through photooxidation and phototoxicity.

Lehr, William J.; Jones, Robert; Evans, Mary; Simecek-Beatty, Debra; Overstreet, Roy. **Revisions of the ADIOS oil spill model.** *Environmental Modelling and Software*. 2002; 17 (2):189-197. ISSN: 1364-8152.
A revised oil spill model, called ADIOS2, takes into account additional weathering processes and other types of cleanup strategies not included in the original version.

Lehr, William J.; Overstreet, Roy. **Smoke plume screening tool for *in-situ* burning.** *In* Garcia-Martinez, R.; Brebbia, C. A. (Eds.). *Oil and Hydrocarbon Spills, Modelling, Analysis and Control*. Billerica, Ma.: Computational Mechanics, Inc.; 1998; p. 121-129. ISBN: 1-85312-526-1. Authors present different mathematical formulas, adapted from Briggs' Gaussian smoke-stack model, to estimate the plume resulting from burning oil at sea under different conditions.

Lehr, William J.; Simecek-Beatty, Debra. **The relation of Langmuir circulation processes to the standard oil spill spreading, dispersion, and transport algorithms.** *Spill Science & Technology Bulletin*. 2000; 6 (3-4):247-253. ISSN: 1353-2561.
Authors develop formulas to account for the effects of spreading, dispersion and transport on an oil spill which are not currently in models, or in some cases, are not accurate enough based on data they have analyzed.

Li, Ming. **Estimating horizontal dispersion of floating particles in wind-driven upper ocean.** *Spill Science & Technology Bulletin*. 2000; 6 (3-4):255-261. ISSN: 1353-2561.
Data collected from sonar images of the ocean surface are used to formulate values of diffusivity of oil due to wind currents. Crosswinds and downwinds each cause the oil to spread in different ways, and need to be differentiated by an oil spill model.

Li, Mingyuan, et al. **Interfacial film properties of asphaltenes and resins.** *Fuel*. 2002; 81 (14):1847-1853. ISSN: 0016-2361.

Li, Y.; Brimicombe, A. J.; Ralphs, M. P. **Spatial data quality and coastal spill modeling.** *In* Garcia-Martinez, R.; Brebbia, C. A. (Eds.). *Oil and Hydrocarbon Spills, Modelling, Analysis and Control*. Billerica, Ma.: Computational Mechanics, Inc.; 1998; p. 53-62. ISSN: 1-85312-526-1.
Initial results of research are presented on a case study of Jiao Zhou Bay, in China.

Liu, Xinshan; Shi, Zaihong. **Improved method makes a soft landing of well path.** *Oil & Gas Journal*. 2001; 99 (43):47-51. ISSN: 0030-1388.
The authors propose an advanced 3D model for accurate well-path planning in order to successfully drill directional or horizontal wells.

López-Cortijo, J.; Méndez, A. **Gas-to-liquid FPSOs: the way forward.** *Offshore*. 2002; 62 (11):48. ISSN: 0030-0608.
This article presents a concept to construct floating gas-to-liquid FPSOs in remote offshore locations for the conversion of gas to premium grade liquids. An ultra-large floating production system would offload the finished product, as well as provide storage.

Luo, Yuejin; Barucha, Kaiwan; Samuel, Robello; Bajwa, Faris. **A simple, practical approach provides a technique for calibrating tortuosity factors.** *Oil & Gas Journal*. 2003; 101 (35):69-72. ISSN: 0030-1388.
Authors describe a new methodology that calibrates factors associated with contortions by using actual survey data. This technique provides operators with a simplified approach for dealing with complex directional well trajectories in thin reservoirs and extended reach wells.

MacLean, A. et al. **Fibre optic sensor for the detection of hydrocarbon fuel spills.** *In* Rodriguez, G. R.; Brebbia, C. A. (Eds.) *Oil and Hydrocarbon Spills, Modelling, Analysis and Control II*. Billerica, Ma.: Computational Mechanics Inc.; 2000; p. 221-227. ISBN: 1-85312-828-7.
A non-electrical, low-power laser sensor has been developed for use in detecting spills. The author describes the sensor, and also points out that the sensor is capable of accurately identifying the location of multiple spills along its 10 km length.

Maitland, G. C. **Oil and gas production.** *Current Opinion in Colloid & Interface Science*. 2000; 5 (5-6):301-311. ISSN: 1359-0294.
Advances in certain aspects of oil and gas production are reviewed from the perspective of colloidal and interface sciences. This review focuses three major aspects of production: well construction, reservoir simulation, and hydrocarbon production.

Marcelis, C. L. M.; van Leeuwen, M.; Polderman, H. G.; Janssen, A. J. H.; Lettinga, G. **Model description of dibenzothiophene mass transfer in oil/water dispersions with respect to biodesulfurization.** *Biochemical Engineering Journal*. 2003; 16 (3):253-264. ISSN: 1369-703X.
The mass transfer rate of a PAH compound was established by means of a mathematical model that accounted for medium (hydrocarbon distillates and solvents) as well as temperature and volume fractions of oil. The model showed the importance of oil viscosity influencing mass transfer rates, and found that microbial desulphurization was the rate-limiting process step.

Marghany, Maged. **RADARSAT observations and forecasting of oil slick trajectory movements.** *Journal of Environmental Sciences - China*. 2004; 16 (1):44-48. ISSN: 1001-0742.
A new method of oil slick trajectory incorporates the Doppler frequency shift model that simulates tidal current patterns based on RADARSAT data with the Langrangian model that can predict oil slick spreading patterns.

McCay, Deborah P. French. **Development and application of damage assessment modeling: example assessment for the *North Cape* oil spill.** *Marine Pollution Bulletin*. 2003; 47 (9-12):341-359. ISSN: 0025-326X.
A model that uses existing knowledge from site-specific data inputs has been developed for the purpose of quantifying natural resource damage and ecological risk assessment.

McCay, Deborah P. French. **Modelling oil, chemical, spill impacts.** *Sea Technology*. 2001; 42 (4):43-49. ISSN: 0093-3651.
This article gives an overall view of oil and chemical spill models. The biological, environmental, economic and legal importance of the models is also mentioned.

McWilliams, James C.; Sullivan, Peter P. **Vertical mixing by Langmuir circulations.** *Spill Science & Technology Bulletin*. 2000; 6 (3-4):225-237. ISSN: 1353-2561.
A formula was tested accounting for vertical effects of oil spreading in a water column with large eddy movement. A K-profile parameterization model was tested, and some formulas were presented to generalize the results.

Means, Steve R.; Mehdizadeh, Parviz. **New technology improves portable well testing units.** *Oil & Gas Journal*. 2000; 98 (44):36-38. ISSN: 0030-1388.
Over the last 2 years, the portable well testing trailer device was compared with the performance of conventional automatic well-testing measurements. The portable well testing device allows an operator to optimize a field's performance by shutting-in wells, working them over or stimulating them. Conventional well testing involves gravity separation of the production stream into oil, water, and gas. This new multiphase measurement technology for on line determination of oil, water and gas volumes are accurate and consistent.

Mearns, Alan J.; Simecek-Beatty, Debra. **Longer-term weathering - research needs in perspective.** *Spill Science & Technology Bulletin*. 2003; 8 (2):223-227. ISSN: 1353-2561.
Participants of the Long-Term Fate Workshop collectively identify uncertainties in oil spill modelling, simulation, and field monitoring and focus on ways to improve spill response activities.

Mearns, E. W.; McBride, J. J. **Strontium isotope analysis can help define compartmentalization.** *Oil & Gas Journal*. 2001; 99 (35):70-78. ISSN: 0030-1388.
This article describes and evaluates the use of Strontium Isotope Residual Salt Analysis of core samples as a means of measuring the ($^{87}Sr/^{86}Sr$) ratios in formation water from hydrocarbon columns and aquifers. This method provides information during the early stages of field evaluation and development, which are important for cost-effective exploitation.

Mehdizadeh, Parviz ; Perry, D. T. **Procedure optimizes well test frequency.** *Oil & Gas Journal*. 2002; 100 (12):49-53. ISSN: 0030-1388.
Operators routinely test wells to evaluate well performance. Determining the optimum well testing interval, with the model discussed in this article, can balance the cost of performing periodic well tests and offer additional benefits.

Mehdizadeh, Parviz. **Test verifies water-cut meter accuracy in steamflood.** *Oil & Gas Journal*. 2000; 98 (40):97-100. ISSN: 0030-1388.
A field evaluation was undertaken to establish the capability of new oil and water-monitoring devices to accurately measure water cut in producing streams that have different crude and water salinities.

Mehdizadeh, Parviz; Marrelli, Jack; Ting, Ven C. **Meter designs provide wet-gas measurement alternatives.** *Oil & Gas Journal*. 2003; 101 (12):53-56. ISSN: 0030-1388.
To optimize production from a remote and subsea field, a new design has been introduced that provides real-time wet-gas flow rates.

Michels, Thomas J. **Technology drives the oil and gas industry push into deep water.** *Sea Technology*. 2000; 41 (8):41-43. ISSN: 0093-3651.
Heightened competition has spurred advances in offshore drilling and exploration technology that have focused the domestic industry's attentions on deeper waters.

Miessner, Daniel; Chong, Adrian C. K.; Rodman, Dave; Wong, Thomas. **Steerable hole-enlargement technology drills complex directional wells.** *Oil & Gas Journal*. 2003; 101 (2):43-47. ISSN: 0030-1388
Engineers ran a variety of bottomhole assembly configurations with an alternate steerable hole-enlargement technology, which enabled crews to enlarge wellbore in a single run and easily run casing strings.

Moazed, H.; Viraraghavan, T. **Coalescence/filtration of an oil-in-water emulsion in a granular organo-clay/anthracite mixture bed.** *Water, Air, & Soil Pollution*. 2002; 138 (1-4):253-270. ISSN: 0049-6979.
This study explains the contributions of filtration, coalescence and adsorption mechanisms in the separation of oil from water by a bentonite organo-clay sorbent.

Moe, K. A. **The Svalbard Intertidal Zone: a concept for the use of GIS in applied oil sensitivity, vulnerability and impact analyses.** *Spill Science & Technology Bulletin*. 2000; 6 (2):187-206. ISSN: 1353-2561.
A mathematical model is developed which incorporates GIS data for the characterization of habitat sensitivity and vulnerability in terms of coastal segments and grid aggregations. These types of analyses have been used in prioritizing environmental impact assessments and risk analyses as well as oil spill contingency planning.

Mohamad Puad, H. A.; Muhd Noor, M. Y. **Behaviors of ^{323}Th, ^{238}U, ^{228}Ra and ^{226}Ra on combustion of crude oil terminal sludge.** *Journal of Environmental Radioactivity*. 2004; 73 (3):289-305. ISSN: 0265-931X.
Radionuclides present in crude oil terminal sludge are thought to be better disposed of by incineration than traditional methods. In this study, researchers compare initial results of incineration with a model used to predict percentage of volatilization, as a way of measuring concentrations of material remaining in filter ash.

Moore, Michael N.; Allen, J. Icarus. **A computational model of the digestive gland epithelial cell of marine mussels and its simulated response to oil-derived aromatic hydrocarbons.** *Marine Environmental Research*. 2002; 54 (3-5):579-584. ISSN: 0141-1136.
This paper describes a model that can be used to predict the interaction between digestive cells and aromatic hydrocarbons. Physiological factors affecting the uptake of contaminants by the cells are also included in the model.

Morgan, Dennis; Yuan, Mike; Lowson, Brent. **Multilateral technique increases production in a mature offshore China field.** *Offshore*. 2002; 62 (11):44-45, & 89. ISSN: 0030-0608.
A new junction construction technique was combined with a multilateral application to increase production in a mature offshore field without compromising the flow of the original well.

Moritis, Guntis. **Liquid management influences large, long flowline tie-back design.** *Oil & Gas Journal*. 2002; 100 (23):59-60. ISSN: 0030-1388.
Flow assurance and operability were two factors that influenced the design of large OD lines for carrying gas ashore from subsea-completed deepwater fields in the Mediterranean Sea, off the coast of Egypt.

Moritis, Guntis. **New tools, approaches meet increased downhole demands.** *Oil & Gas Journal*. 2003; 101 (23):45-51. ISSN: 0030-1388.
New tools and advanced technology are being implemented by operators to combat the harsh conditions associated with deep water production.

Moritis, Guntis. **Symposium focuses on IOR technology advances.** *Oil & Gas Journal*. 2002; 100 (20):26-27. ISSN: 0030-1388.
Papers presented at the Society of Petroleum Engineers Symposium focused on employing new technologies and adding existing technologies for the advancement of recovering oil from deepwater reservoirs.

Morkin, M.; Devlin, J. F.; Barker, J. F.; Butler, B. J. ***In situ* sequential treatment of a mixed contaminant plume.** *Journal of Contaminant Hydrology*. 2000; 45 (3-4):283-302. ISSN: 0169-7722.
Researches evaluated an *in situ* treatment sequence for remediation of contaminants in a groundwater plume. Results indicated that treatment sequences are viable, but also that further work is needed to optimize the process.

Mullen, Steve. **Appropriate practices avoid tube fitting failures.** *Oil & Gas Journal*. 2002; 100 (41):48-52. ISSN: 0030-1388.
This article describes current methods of preventing corrosion and failed tube fitting by establishing regular maintenance schedules and by using exotic materials, such as alloys and titanium, on tubes.

Multiphase flowmeters test wells in Netherlands. *Oil & Gas Journal*. 2000; 98 (40):106. ISSN: 0030-1388.
Oil well performance data was collected from three wells, each with different flowrates and conditions, without production disruption. The deployment of the multiphase flowmeter was used at the onshore Pernis West facility at Nederlandse Aardolie Maatschappij. According to the well-test service provider, Expro North Sea Ltd., the multiphase meter eliminates the need to depressurize the system and flare hydrocarbons.

Multi-purpose catamaran designed for deepwater heavy-lift market. *Offshore*. 2002; 62 (11):70-71. ISSN: 0030-0608.
Huisman-Itrec has developed a vessel capable of transporting loads up to 100,000 metric tons on its 13,800-sq-m main deck. The 196-m multi-purpose catamaran can perform in both deepwater and shallow-draft areas.

Nagel, N. B. **Compaction and subsidence issues within the petroleum industry: from Wilmington to Ekofisk and beyond.** *Physics and Chemistry of the Earth Part A - Solid Earth and Geodesy*. 2001; 26 (1-2):3-14. ISSN: 1464-1895.
Key issues and impacts of compacting and subsiding oilfields are addressed in this paper. Numerical models are presented to predict the impact of subsidence, and methods of monitoring the effects are presented.

Nagihara, Seiichi, et al. **Application of marine heat flow data important in oil, gas exploration.** *Oil & Gas Journal*. 2002; 100 (27):43-49. ISSN: 0030-1388.
Geothermal heat flow in the seafloor is determined with a single instrument that separates the thermal gradient and thermal conductivity of the sediment in a depth interval. Data analysis is then used to focus on applications of hydrocarbon maturation, subsalt exploration and assessing the stability of marine gas hydrates.

Nakhla, George. **Biokinetic modeling of *in situ* bioremediation of BTX compounds - impact of process variables and scaleup implications.** *Water Research*. 2003; 37 (6):1296-1307. ISSN: 0043-1354.
Researchers examined the effects of groundwater velocity, dissolved oxygen and BTX concentrations on bioremediation kinetics in a pilot-scale bioremediation system. Additionally, they investigated the impact of scale on biokinetic coefficients by comparing results from laboratory versus field investigations.

Nonconcrete gravity-based platform refloated successfully. *Oil & Gas Journal*. 2001; 99 (24):72-78. ISSN: 0030-1388.
This article provides designers and operators with background information and the applicability of tanker design requirements for FPSOs. It also evaluates loading issues, comparing the use of empirical formulas versus direct analysis methods, and provides recommendations for when to consider direct analysis methods.

Norwegian designer sees new production opportunities in GoM. *Offshore*. 2003; 60 (5):98-100. ISSN: 0030-0608.
A submerged turret loading (STL) production technology system will be the first of its kind to enter the Gulf of Mexico. The design of the STL enables the system to continue functioning during loading operations in extreme weather conditions.

Novotny, Ladislav; Herout, Martin; Kalvoda, Robert. **Device for oil spill detection on water surfaces.** *Electroanalysis*. 2000; 12 (15):1237-1239. ISSN: 1040-0397.
Authors describe an electrochemical device for detecting an oil layer on water.

Oil spill surveillance. *Offshore*. 2000; 60 (8):196. ISSN: 0030-0608.
The Swedish Space Corporation has developed another advanced system for airborne surveillance of oil spills. The new MSS 5000 System uses radar and infrared images of an oil spill. The images are geo-corrected and overlaid on an electronic map in real time to display the location and extent of the spill.

Olufsen, Arnt; Løland, Geir; Gorf, Peter; Webb, Simon. **Evaluation ranks deepwater, harsh-environment floater, riser concepts.** *Oil & Gas Journal*. 2003; 101 (3):39-46. ISSN: 0030-1388.
A two-step ranking process was developed to assess the status and maturity of different technology elements and their range of application. This study also outlined areas where the industry needs to develop new technology for harsh environments to provide a feasible and economically viable application.

Omotoso, Oladipo E.; Munoz, Vincente A.; Mikula, Randy J. **Mechanisms of crude oil-mineral interactions.** *Spill Science & Technology Bulletin*. 2002; 8 (1):45-54. ISSN: 1353-2561.
In this study, two types of oil-mineral interactions were observed in the formation of oil-mineral aggregates (OMA). Researchers observed shearing action and the ability of mineral solids to stabilize the droplets and prevent them from coalescing during the OMA formation process. In addition, researchers analyzed the stabilization of OMA formation by trapping minerals in an oil-continuous phase.

O'Sullivan, Michael. **Predicting interactive effects of CALM buoys with deepwater offloading systems.** *Offshore*. 2003; 63 (1):66-68. ISSN: 0030-0608.
Catenary anchor leg mooring and taut anchor leg mooring buoys are begin used as an alternative for FPSO offloading systems in areas of remote deepwater fields.

Otremba, Zbigniew; Krol, Tadeusz. **Modeling of the crude oil suspension impact on inherent optical parameters of coastal seawater.** *Polish Journal of Environmental Studies*. 2002; 11 (4):407-411. ISSN: 1230-1485.

Otremba, Zbigniew; Piskozub, Jacek. **Modelling the bidirectional reflectance distribution function (BRDF) of seawater polluted by an oil film.** *Optics Express*. 2004; 12 (8):1671-1676. ISSN: 1094-4087.
A Monte Carlo model was used to determine angles of visual and non-visual light wavelengths for observing oil film on seawater.

Otremba, Zbigniew; Piskozub, Jacek; Król, Tadeusz. **Modelling the reflectance of sea areas polluted with oil emulsion.** *Fresenius Environmental Bulletin*. 2003; 12 (9):1109-1113. ISSN: 1018-4619.
Authors describe two stages of a model that determines reflectance of oil in different concentrations under different wind and light conditions. The model can account for optical parameters of both seawater and oil suspension.

Oudot, J. **Biodegradabilty of the *Erika* fuel oil.** *Comptes Rendus de l'Académie des Sciences Series III - Sciences de la Vie - Life Sciences*. 2000; 323 (11):945-950. ISSN: 0764-4469.

Park, Seok S.; Park, Jae-Woo; Uchrin, Christopher; Cheney, Marcos A. **A micelle inhibition model for the bioavailability of polycyclic aromatic hydrocarbons in aquatic systems.** *Environmental Toxicology and Chemistry*. 2002; 21 (12):2737-2741. ISSN: 0730-7268.
Authors developed a bioaccumulation model and validated it by comparing data from the model with experimental results of accrued PAHs in the gills of a freshwater mussel.

Pereira, Pedro et al. **Aquaconversion technology offers added value to E. Venezuela synthetic crude oil production.** *Oil & Gas Journal*. 2001; 99 (20):79-85. ISSN: 0030-1388.
This article summarizes the main results from a prefeasibility study to incorporate additional extra-heavy oil production in eastern Venezuela using Aquaconversion. The development of the Aquaconversion technique transforms an 8 ° gravity extra-heavy crude oil to synthetic crude oil of 16 ° gravity and decreased viscosity at a low investment.

Peters, Ruth. **NSW: a mobile bird washing unit will save oiled birds.** *AAP Newsfeed*. April 23, 2001.
Taronga Zoo, in conjunction with Procter and Gamble Australia, has developed a mobile bird washing unit designed for use at oil spill sites. The sink-like unit uses dishwashing liquid and hot water under constant high pressure to remove oil from feathers and provides a means of stabilizing the bird's temperature before the cleaning begins.

Peterson, Charles H.; McDonald, Lyman L.; Green, Roger H.; Erickson, Wallace P. **The joint consequences of multiple components of statistical sampling designs.** *Marine Ecology - Progress Series*. 2002; 231;309-314. ISSN: 0171-8630.
In this reply commentary, the authors clarify the rationale for conclusions reached from their assessment of biological impacts and recovery of intertidal benthic communites following the *Exxon Valdez* oil spill.

Peterson, Charles H.; McDonald, Lyman L.; Green, Roger. H.; Erickson, Wallace P. **Sampling design begets conclusions: the statistical basis for detection of injury to and recovery of shoreline communities after the '*Exxon Valdez*' oil spill.** *Marine Ecology - Progress Series*. 2001; 210;255-283. ISSN: 0171-8630.
Following the *Exxon Valdez* oil spill in 1989, 4 assessment studies of the effects of the spill on the intertidal biota were conducted. With studies overlapping sufficiently in geographic areas, shoreline habitat, and biological responses, variables of multiple design decisions led to substantial differences in conclusion.

Petit, B. **Expected impact of oil spills in the Southern Ocean.** *In* Rodriguez, G. R.; Brebbia, C. A. (Eds.) *Oil and Hydrocarbon Spills, Modelling, Analysis and Control II*. Billerica, Ma.: Computational Mechanics Inc.; 2000; p. 29-38. ISBN: 1-85312-828-7.
A model of the Weddel Sea was created and used as an experiment in order to demonstrate the effects of an oil spill in icy waters. Researchers found that the ice pack modifies the effect of the slick, by controlling the spreading and drift of the oil.

Petrocchi, Andrea. **Slick sensing: monitoring oil spills with satellite imagery.** *Geo Info Systems*. 2000; 10 (5):32-38. ISSN: 1051-9858.
The European Space Agency is spearheading an effort to aid marine and coastal authorities in tracking illegal oil discharge activities at sea. By using synthetic aperture radar images from its Earth Remote Sensing Satellites, the agency is providing vital information for spill response planning.

Phillips loads first ANS crude cargo on new double-hulled tanker. *Oil & Gas Journal*. 2001; 99 (32):69. ISSN: 0030-1388.
The new Millennium class tanker is designed to isolate all cargo, fuel and lube oils from the ship's side by ballast tanks or void spaces. The vessel carrying capacity is a little over 1 million barrels of crude oil in 12 cargo tanks.

Pikas, Joe L.; Beighle, Bruce D. **Direct assessment, data integration important in establishing pipeline integrity.** *Oil & Gas Journal*. 2002; 100 (36):66-72. ISSN: 0030-1388.
Authors describe the role of direct assessment in a structural framework of determining pipeline integrity as mandated by federal regulations, as well as an initiative by the state of Texas.

Prosser, Thomas E.; Deul, Hans; Rhone, Bill. **Aluminum-alloy riser extends driller's reach into deeper water.** *Oil & Gas Journal*. 2003; 101 (26):53-56. ISSN: 0030-1388.
The first industry-approved aluminum-alloy drilling riser has been successfully deployed in deepwater off the coast of Brazil. A new structural design allows drilling activities to extend further offshore, compared to conventional risers that require increased support to stabilize the riser during drilling operations.

Qiao, B. **Oil spill model development and application for emergency response system.** *Journal of Environmental Sciences - China*. 2001; 13 (2):252-256. ISSN: 1001-0742.

Rach, Nina M. **R & D programs yield advances in drilling technologies.** *Oil & Gas Journal*. 2003; 101 (43):55-58. ISSN: 0030-1388.
Collaborative projects among government, academic, and industry engineers are advancing drilling technology by creating next-generation tools and methods for immediate use in the field.

Rach, Nina M. **Scientific ocean drilling.** *Oil & Gas Journal*. 2003; 101 (36):19. ISSN: 0030-1388.
The Integrated Ocean Drilling Program, a successor to the Deep Sea Drilling Project, is a partnership between 15 countries and over 750 scientists, and represents international cooperation in basic scientific research funding.

Rainey, Gail; Lehr, William; Johnson, Walter. **Longer term weathering workshop: an overview.** *Spill Science & Technology Bulletin*. 2003; 8 (2):115-116. ISSN: 1353-2561.
A joint workshop among participants of NOAA and MMS reviewed concerns over the importance of spill response in deep water operations. Presentations focused around weathering processes and potential of the spilled oil to remain as cohesive entities for longer periods of time.

Ramnath, Lawrence et al. **Fiber optics profiles real-time temperature across horizontal lateral.** *Oil & Gas Journal*. 2003; 101 (13):33-40. ISSN: 0030-1388.
A fiber-optic temperature sensing system was successful in providing valuable information by logging continuous, real-time temperature data across a horizontal wellbore off Trinidad.

Reardon, Kenneth F.; Mosteller, Douglas C.; Rogers, Julia Bull; DuTeau, Nancy M.; Kim, Kee-Hong. **Biodegradation kinetics of aromatic hydrocarbon mixtures by pure and mixed bacterial cultures.** *Environmental Health Perspectives*. 2002; 110 (Supp. 6):1005-1011. ISSN: 0091-6765.
Experimental data reveals that simple models for mixed substrate kinetics do not accurately predict the results of biodegradation experiments with mixed cultures. Authors propose a new model to account for mixed culture interactions and competition.

Reeves, A. D.; Chudek, J. A. **Use of Nuclear Magnetic Resonance Imaging (MRI) to assess impact of oil-related waste on estuarine sediments and sediment dynamics.** *Geological Society Special Publication*. 2000 (175):201-206.

Ribeiro, F. A. D.; Ferreira, M. M. C. **QSPR models of boiling point, octanol-water partition coefficient and retention time index of polycyclic aromatic hydrocarbons.** *Journal of Molecular Structure - Theochem*. 2003; 663 (1-3):109-126. ISSN: 0166-1280.

Riddle, A. M.; Beling, E. M.; Murray-Smith, R. J. **Modelling the uncertainties in predicting produced water concentrations in the North Sea.** *Environmental Modelling and Software*. 2001; 16 (7):659-668. ISSN: 1364-8152.

Roberts, Sheila J. **Fluid flow in the South Eugene Island area, offshore Louisiana: results of numerical simulations.** *Marine and Petroleum Geology*. 2001; 18 (7):799-805. ISSN: 0264-8172.
Fault zones below the South Eugene Island area were found to be the likely paths of heat and fluid transport in numerical simulations. Results of the simulations also indicate that fluid movement in the area has occurred recently.

Rosenfeld, Michael J. **Here are factors that govern evaluation of mechanical damage to pipelines.** *Oil & Gas Journal*. 2002; 100 (37):64-69. ISSN: 0030-1388.
This article presents damage-assessment criteria to address the mechanical damage that causes major failures in pipelines.

Rowson, Chris. **4C seismic technology makes mark in Caspian Sea.** *Offshore*. 2003; 63 (5):50. ISSN: 0030-0608.
Continued investments in oil exploration in the Caspian Sea and the surrounding region has resulted in the use of modern exploration methods. Geophysical surveys that consist of (4C) 3D seismic surveys are being used to improve imaging of the subsurface.

Rye, Henrik. **Probable effects of Langmuir circulation observed on oil slicks in the field.** *Spill Science & Technology Bulletin*. 2000; 6 (3-4):263-271. ISSN: 1353-2561.
Using field data, LC "cells" are identified and their influence on spreading oil in water is described. The investigator acknowledges that it is difficult to include the effects of LC cells in contingency planning at present.

Sagehashi, M.; Miyagishi, A.; Kose, T.; Nishijima, W.; Okada, M. **Numerical modelling of the petroleum oil penetration into sandy beach sediments.** *Water Science and Technology*. 2003; 47 (9):9-14. ISSN: 0273-1223.

Schuler, Mark; Friedman, Y. Zak.; Kesler, Michael G.; Belanger, Paul. **Refinery uses column data to infer and control product properties.** *Oil & Gas Journal*. 2001; 99 (8):40-42. ISSN: 0030-1388.
A Pennsylvania refinery has installed an online closed-loop system that controls product qualities and internal reflux of the refinery's preflash and atmospheric columns in their crude units.

Scott, Stuart L. **Multiphase pumping addresses a wide range of operating problems.** *Oil & Gas Journal*. 2003; 101 (37):59-66. ISSN: 0030-1388.
In an effort to improve production rates and eliminate emissions during drilling operations, multiphase pumping is being adopted throughout the offshore industry.

Shi, Zaihong; Liu, Xiushan. **Multiphase technique improves mud-pulse velocity calculations.** *Oil & Gas Journal*. 2002; 100 (26):45-51. ISSN: 0030-1388.
The authors present a method used to monitor mud-pulse velocity that yields high data-transfer rates from the drillbit. This new method, measurement-while-drilling (MWD), is expected to furnish more accurate data than conventional methods, provide a better understanding of pulse velocity, and prepare the industry for failures and limitations of the MWD tool.

Shin, W. S.; Park, J. C.; Pardue, J. H. **Oxygen dynamics in petroleum hydrocarbon contaminated salt marsh soils: III. A rate model.** *Environmental Technology*. 2003; 24 (7):831-843. ISSN: 0959-3330.
Authors propose and test a model that simultaneously accounts for oxygen uptake, cell growth, and oil degradation in establishing oxygen demands during the biodegradation of crude oil in flooded saltwater wetland environments.

Simecek-Beatty, Debra; Clemente-Colón, P. **Locating a sunken vessel using SAR imagery: detection of oil spilled from the *SS Jacob Luckenbach*.** *International Journal of Remote Sensing*. 2004; 25 (11):2233-2241. ISSN: 0143-1161.
SAR imagery was used to locate small persistent episodes of oil seeps on the ocean surface. Divers later confirmed oil sightings in the same area, and the source of the oil was established as coming from a sunken vessel.

Simecek-Beatty, Debra; Lehr, William J. **Langmuir circulation and oil spill trajectory models workshop comments and recommendations.** *Spill Science & Technology Bulletin*. 2000; 6 (3-4):273-274. ISSN: 1353-2561.
The importance of LC in the spreading of a slick has not been widely studied in the past. NOAA and the MMS held a workshop to encourage ideas about how LC could be included in modelling studies. The panel recommended that parameters for including LC into models should be easily obtained; that the causes of LC are well understood, so building models should not be too difficult; and that the information presented at the meeting should be disseminated to a larger audience.

Simple suggestions for including vertical physics in oil spill models. *Spill Science & Technology Bulletin*. 2000; 6 (3-4):209-211. ISSN: 1353-2561.
In this editorial, the author suggests routinely monitoring the density stratification of a water column to later incorporate the data into a working oil spill model.

Sjöblom, Johan et al. **Our current understanding of water-in-crude oil emulsions. Recent characterization techniques and high pressure performance.** *Advances in Colloid and Interface Science*. 2003; 100-102;399-473. ISSN: 0001-8686.
Authors review the latest advances in research to identify mechanisms and processes in relation to the creation of water-in-oil emulsions created during the production of crude oil.

Skyllingstad, Eric D. **Scales of Langmuir circulation generated using a large eddy simulation model.** *Spill Science & Technology Bulletin*. 2000; 6 (3-4):239-246. ISSN: 1353-2561.
A large eddy simulation model was employed to understand the sensitivity of upper-ocean turbulence to wave and wind forcing. Results show that waves have a large influence in organizing surface material.

Smith, Eric P.; Robinson, Tim; Field, L. Jay; Norton, Susan B. **Predicting sediment toxicity using logistic regression: a concentration-addition approach.** *Environmental Toxicology and Chemistry*. 2003; 22 (3):565-575. ISSN: 0730-7268.
Three models were tested to find whether they could be considered as good predictors for sediment toxicity. For these experiments, researchers used field data on several types of contaminants, including PAHs.

Soares de Santos, A.; Daniel, P. **Oil spill modelling near the Portuguese coast.** *In* Rodriguez, G. R.; Brebbia, C. A. (Eds.) *Oil and Hydrocarbon Spills, Modelling, Analysis and Control II*. Billerica, Ma.: Computational Mechanics Inc.; 2000; p. 11-18. ISBN: 1-85312-828-7.
MOTHY, an oil spill model used in France, has been adapted to be used for simulations off the northern Portuguese coast near the Lexiões oil terminal. A simulation of a spill of 100,000 tons of Iranian heavy crude oil is described.

Spence, G. D.; Hyndman, R. D. **The challenge of deep ocean drilling for natural gas hydrate.** *Geoscience Canada*. 2001; 28 (4):179-186. ISSN: 0315-0941.

Squyres, D. H.; Lichman, E.; Peters, S. W.; Sheng, Zhang Dai. **Direct gas reservoir detection from seismic wavelets using absorption.** *Oil & Gas Journal*. 2004; 102 (1):32-37. ISSN: 0030-1388.
Wavelet energy absorption a new state-of-the art seismic direct detection technology, has been employed to identify hydrocarbons in a clastic data set from western China.

Stearns, John. **Canyon express touts industry firsts, shared infrastructure for deepwater gulf development.** *Oil & Gas Journal*. 2003; 101 (20):64-69. ISSN: 0030-1388.
The Canyon Express Pipeline project is the deepest gas subsea project to date. The flowlines total 114 miles. Nine subsea wells will produce from three ultra deepwater reservoirs into a common subsea multiphase gathering system.

Sterling, Michael C., Jr. ; Bonner, James S.; Ernest, Andrew N. S.; Page, Cheryl A.; Autenrieth, R. L. **Chemical dispersant effectiveness testing: influence of droplet coalescence.** *Marine Pollution Bulletin*. 2004; 48 (9-10):969-977. ISSN: 0025-326X.
Coalescence kinetics of crude oil were established for certain shear rates and salinity concentrations. After modelling coalescent reaction rates, the effects of dispersant-oil contact efficiency could be separated from water column transport efficiency and coalescence efficiency.

Stoffyn-Egli, Patricia; Lee, Kenneth. **Formation and characterization of oil mineral aggregates.** *Spill Science & Technology Bulletin*. 2002; 8 (1):31-44. ISSN: 1353-2561.
In this study, three types of oil-mineral aggregates (OMA) are identified for the purposes of understanding the nature and properties of OMA and the factors influencing their formation. Researchers investigate these processes in order to gain a better understanding of how OMA enhances and prolongs oil weathering processes.

Subsea-to-subsea gulf pipelay further signals movement into deep water. *Oil & Gas Journal*. 2002; 100 (11):68-69. ISSN: 0030-1388.
Shell Exploration & Production Co. achieved its deepest pipelay to date by installing a flowline and an umbilical tied between a new deepwater Einstat well and two existing Tahoe facilities. The "subsea-to-subsea" installation was said to be rare, but seems to be more common for deepwater development.

Suffridge, G. S.; Tarlton, O. **Full-scale test of deepwater hot-tap system set for early 2002.** *Oil & Gas Journal*. 2001; 99 (45):92-99. ISSN: 0030-1388.
A new diverless hot-tap clamp, hot-tapping machine, and ocean-floor support equipment perform deepwater taps greater than 1,500 feet on infrastructure along the Gulf Coast.

Sumrow, Mike H. **Drilling industry advances deepwater, related technologies.** *Oil & Gas Journal*. 2001; 99 (46):60-62. ISSN: 0030-1388.
The author highlights papers that were presented at the 2001 SPE annual technical conference and exhibition in New Orleans.

Sumrow, Mike H. **Expandable tubulars gaining industry confidence.** *Oil & Gas Journal*. 2002; 100 (3):33-37. ISSN: 0030-1388.
The Houston-based Enventure Global Technology LLC company has developed four different expandable tubular products. This new technology will enable operators to drill in deep waters to reservoirs with sufficient hole-size remaining until the job is completed.

Sumrow, Mike H. **Harsh environments, emerging technologies, organizational capacity to shape future of drilling.** *Oil & Gas Journal*. 2002; 100 (24):52-54. ISSN: 0030-1388.
Deepwater exploration and development is challenging existing operational and well design concepts, and there is a need for experienced personnel that can quickly organize and employ new technologies.

Sumrow, Mike H. **Industry promotes surface BOPs for floating drilling operations.** *Oil & Gas Journal*. 2002; 100 (51):37-40. ISSN: 0030-1388.
Health, safety and environmental issues related to surface blowout preventer applications were presented at a MMS workshop, which allowed the industry and regulators to present the technology's current state-of-the-art concepts in reference to pending work.

Sumrow, Mike H. **MMS to require casing pressure monitoring for subsea wellheads.** *Oil & Gas Journal*. 2001; 99 (50):58-59. ISSN: 0030-1388.
A notice was issued by the US Minerals Management Service proposing a regulation requiring oil and gas well-completion operations completed after January 1, 2005 to have a means for monitoring casing pressures. Wellhead manufacturers state that the requirement represents a technical challenge to existing subsea wellhead designs.

Sumrow, Mike H. **Rotary steerable tool design targets increased drilling efficiency, lower running costs.** *Oil & Gas Journal*. 2001; 99 (30):45-49. ISSN: 0030-1388.
A new rotary steerable tool (RST) was designed with two objectives in mind: simplicity and drilling system compatibility. The company wanted the RST to be cost-competitive with other directional drilling technologies, and to be simple to use and serviceable in remote locations.

Sumrow, Mike H. **SPE: government, industry unveil new drill pipe telemetry test results.** *Oil & Gas Journal*. 2002; 100 (47):38-39. ISSN: 0030-1388.
Officials at the SPE conference presented test results from new drill pipe telemetry technology in October 2002. This technology will allow high-speed data transmission from the drill bit to the surface during drilling and other operations.

Tao, Shu et al. **Fate modeling of phenanthrene with regional variation in Tianjin, China.** *Environmental Science & Technology*. 2003; 37 (11):2453-2459. ISSN: 0013-936X.
Authors describe the development of a multimedia fate model, which was evaluated by calculating phenanthrene concentrations in the air, water, soil, and sediment of Tianjin, China.

Tearpock, D. J.; Brenneke, J. C. **Multidisciplinary teams, integrated software for shared-earth modeling key E&P success.** *Oil & Gas Journal*. 2001; 99 (50):84-88. ISSN: 0030-1388.
The use of a single database that stores and incorporates real-time data from all disciplines was designed by a multidisciplinary team in oil and gas exploration. The integrated interpretation software and project workflows allows the team to develop an accurate shared-earth model for exploration or development projects.

Thoma, G. J.; Lam, T. B.; Wolf, D. C. **A mathematical model of phytoremediation for petroleum contaminated soil: model development.** *International Journal of Phytoremediation*. 2003; 5 (1):41-55. ISSN: 1522-6514.
This study describes a model for root length density that includes parameters accounting for annual biomass turnover, maximum standing biomass, and maximum depth of root penetration.

Thoma, G. J.; Lam, T. B.; Wolf, D. C. **A mathematical model of phytoremediation for petroleum contaminated soil: sensitivity analysis.** *International Journal of Phytoremediation*. 2003; 5 (2):125-136. ISSN: 1522-6514.
Authors present a sensitivity analysis model that can evaluate the effects of manipulated variables, such as rate of growth and seasonal root biomass cycles, on the efficiency of phytoremediation.

Thompson, Richard Eugene. **A Probabilistic Model for Predicting Polycyclic Aromatic Hydrocarbon (PAH) Bioavailability to American Oysters (*Crassostrea virginia*) Inhabiting South Carolina Estuarine Environments.** Thesis (Ph. D.): Medical University of South Carolina; 1999; 195 leaves.

Thompson, Richard Eugene; Voit, E. O.; Scott, G. I. **A probabilistic model for predicting distributions of PAH ratios between oysters and marine sediments.** *Ecological Modelling*. 2000; 135 (2-3):231-242. ISSN: 0304-3800
The results of statistical tests on the bioavailability of contaminants to oysters led researchers to conclude that Equilibrium Partitioning was not an accurate model for estimating biota-to-sediment ratios. In this paper an alternate kinetic model is proposed for predicting the uptake, fate, and transport of PAHs by oysters.

Thorpe, S. A. **Langmuir circulation and the dispersion of oil spills in shallow seas.** *Spill Science & Technology Bulletin*. 2000; 6 (3-4):213-223. ISSN: 1353-2561.
Effects of LC in dispersing oil are identified as convergence, advective dispersal and spread and dispersion by cell instability or breakdown. Processes which compete with LC are also identified.

Tkalich, P. **Numerical simulation of oil spills and oil combating techniques.** *In* Rodriguez, G. R.; Brebbia, C. A. (Eds.) *Oil and Hydrocarbon Spills, Modelling, Analysis and Control II*. Billerica, Ma.: Computational Mechanics Inc.; 2000; p. 51-59. ISBN: 1-85312-828-7.
A multiphase spill model has been developed which incorporates surface and sediment components. The author adds that different spill responses can be incorporated into the model, giving response teams more accurate information.

Tkalich, Pavlo; Chan, Eng Soon. **Vertical mixing of oil droplets by breaking waves.** *Marine Pollution Bulletin*. 2002; 44 (11):1219-1229. ISSN: 0025-326X.
This study describes a model that provides for a rapid estimation of the amount of dispersed oil in a water column that has been affected by breaking waves.

Tough, G.; Denniel, S.; Sharif, M.; Hutchison, J. **Innovations key reeled pipe-in-pipe flowline for gulf deepwater project.** *Oil & Gas Journal*. 2001; 99 (33):46-51. ISSN: 0030-1388.
This method of fabrication of pipe-in-pipe flowline allows optimum spoolbase efficiency and removes the requirement for field joints. This removes the need for welded half shells or sleeves that may prove problematic during reeling and pipeline operation. This paper presents details of design and qualifications testing for the insulation material, pipeline centralizers, buckle arrestors, and reelable water-stops.

True, Warren R. **Insulated, coated pipe headed to Nigeria for offshore project.** *Oil & Gas Journal*. 2001; 99 (26):62-63. ISSN: 0030-1388.
Elf Petroleum Nigeria Ltd. announced that it would begin taking delivery of thermally insulated and weight-coated line pipe for its Amenam-Kpono field project in the Niger Delta off the coast of Nigeria. The pipeline was designed for deepwater production and it would link a production platform to a floating storage and offloading terminal.

Ueyama, S.; Hijikata, K.; Hirotsuji, J. **Water monitoring system for oil contamination using polymer-coated quartz crystal microbalance chemical sensor.** *Water Science and Technology*. 2002; 45 (4-5):175-180. ISSN: 0273-1223.
Authors report on the effectiveness of a new high-sensitivity oil monitoring system. This new system has a quick response time, can discern types of petroleum (gasoline, kerosene, diesel and fuel oil), and has a long lifetime under field conditions.

Ünlü, S.; Güven, K. C. **Role of reference materials used in measurement of oil pollution and a correlation equation to determine oil in seawater.** *Bulletin of Environmental Contamination and Toxicology*. 2001; 67 (1):1-5. ISSN: 0007-4861.
This paper examines the importance of reference materials in determining oil pollution levels in seawater. The authors also propose a correlation equation for unspecified pollutant oils.

Urquhart, Frank. **Fast-response device for oil spills.** *The Scotsman*. Edinburgh: The Scotsman Publications Ltd.; May 30, 2001; 3.
Two of Britain's leading oil spill specialist companies have joined together in providing a service as well as developing a new device that will be used to fight against oil pollution in the North Sea. The joint service will have a Cessna surveillance aircraft, equipped with digital and infra-red cameras, as well as the new device - the dispersant pod, which will be fitted to the undercarriage of an aircraft, and will be capable of carrying enough dispersant to clean a spill of up to 25 tons of oil.

UV searchlight enhances navigation, rescue, and oil spill detection. *Offshore*. 2001; 61 (7):126. ISSN: 0030-0608.
A new technological development by the company ColorLight is a searchlight that uses a special frequency ultraviolet (UV) light to detect oil on water. Natural fluorescent properties in oil allow the UV light to see the sheen of oil on the water, regardless of the thickness or type of oil product floating on the water.

van der Spuy, D.; Jikelo, N. A.; Ziegler, T.; Bowyer, M. **Deepwater 2D data reveal Orange basin objectives off western South Africa.** *Oil & Gas Journal*. 2003; 101 (14):44-49. ISSN: 0030-1388.
A recent seismic survey of the deepwater Orange basin off the coast of South Africa suggests conditions favorable for an active petroleum basin.

Veil, John A. **Interest revives in downhole oil-water separators.** *Oil & Gas Journal*. 2001; 99 (9):47-56. ISSN: 0030-1388.
Downhole oil-water separators (DOWS), once technologically unproven and expensive, are now being investigated for use in the field. DOWS holds the promise to reduce produced water at the surface of a well, saving costs in disposal of the water and protecting aquifers as well.

Veitch, Gordon; Barboza, Gabriela; Nasr, Hatem; Suheil, Sami. **Field trial tests web-based wireless eSCADA.** *Oil & Gas Journal*. 2002; 100 (38):39-41. ISSN: 0030-1388.
New wireless and web-based software called eSCADA (supervisory control and data-acquisition system) is providing remote asset management and operations in the upstream oil and gas sector.

Ventikos, N. P.; Psaraftis, H. N.; Iacovou, E. **A prototype statistical approach of oil pollution in the Mediterranean Sea.** *In* Garcia-Martinez, R.; Brebbia, C. A. (Eds.). *Oil and Hydrocarbon Spills, Modelling, Analysis and Control*. Billerica, Ma.: Computational Mechanics, Inc.; 1998; p. 33-42. ISBN: 1-85312-526-1.
The development and capabilities of SPILLASE, an oil spill database of incidents in the Mediterranean Sea from 1978 to 1995, is described in this report.

Ver Hoef, Jay M.; Frost, Kathryn J. **A Bayesian hierarchical model for monitoring harbor seal changes in Prince William Sound, Alaska.** *Environmental and Ecological Statistics*. 2003; 10 (2):201-219. ISSN: 1352-8505.
Researchers inputted a number of variables into a model, and from that calculated a 3.3% decrease per year in harbor seal populations in Prince William Sound.

Vieth, Patrick; Moghissi, Oliver; Beavers, John A. **Integrity-verification methods support US efforts in pipeline safety.** *Oil & Gas Journal*. 2002; 100 (51):52-58. ISSN: 0030-1388.
Due to safety reasons and an effort to validate pipeline-integrity verification programs, the US pipeline industry is undergoing significant changes.

Villasenor, R. et al. **An air quality emission inventory of offshore operations for the exploration and production of petroleum by the Mexican oil industry.** *Atmospheric Environment*. 2003; 37 (26):3713-3729. ISSN: 1352-2310.
Data was collected from a number of facilities and platforms related to the offshore petroleum industry to build a model that can accurately assess the transport and dispersion of SO_2 generated from offshore production.

Washburn, Libe; Johnson, Cyril; Gotschalk, Chris C.; Egland, E. Thor. **A gas-capture buoy for measuring bubbling gas flux in oceans and lakes.** *Journal of Atmospheric and Oceanic Technology*. 2001; 18 (8):1411-1420. ISSN: 0739-0572.
This article describes the design, calibration and deployment of the flux buoy, an instrument used for measuring gas flux that arises from marine hydrocarbon seeps. The flux buoy is also used to quantify the spatial distribution of methane seepage over continental shelves. Summaries of the instrument characteristics and performance are presented.

Wellhead retrieval system speeds subsea abandonment. *Oil & Gas Journal*. 2002; 100 (42):52-53. ISSN: 0030-1388.
This article describes the development of a new retrieval system consisting of a four-component fishing tool designed to keep the workstring in tension during cutting. Downhole motors and explosives are not needed for this method of wellhead retrieval.

Werkema, D. Dale, Jr.; Atekwana, Estella A.; Endres, Anthony L.; Sauck, William A.; Cassidy, Daniel P. **Investigating the geoelectrical response of hydrocarbon contamination undergoing biodegradation.** *Geophysical Research Letters*. 2003; 30 (12):1647. ISSN: 0094-8276.
A geoelectrical model predicted high conductivity related to an area undergoing biodegradation at a PAH-contaminated site. *In situ* vertical conductivity measurements from a non-aqueous phase liquid contaminated site confirmed results of the model, which the authors stress can be used to evaluate biodegradation success for specific types of contaminated soils.

Wick, Lokas Y.; Colangelo, T.; Harms, Hauke. **Kinetics of mass transfer-limited bacterial growth on solid PAHs.** *Environmental Science & Technology*. 2001; 35 (2):354-361. ISSN: 0013-936X.

Williams, Bob; Petzet, G. Alan; Clark, Judy R.; Dittrick, Paula. **Deepwater hotspots, offshore gas transport advances top OTC agenda.** *Oil & Gas Journal*. 2003; 101 (19):18-26. ISSN: 0030-1388.
During the most recent OTC conference, heads of the oil industry and the Minerals Management Service discussed problems and solutions on topics related to deepwater petroleum transport, storage and technology issues surrounding exploration.

Wood, D. A. **Probabilistic methods with simulation help predict timing, costs of projects.** *Oil & Gas Journal*. 2001; 99 (46):79-83. ISSN: 0030-1388.
Advanced spreadsheet applications offer sophisticated probabilistic simulation models, which can be designed and efficiently applied to a wide range of oil and gas projects to help manage time and cost overruns.

Ye, Xiaodong. **Gas oil desalting reduces chlorides in crude.** *Oil & Gas Journal*. 2000; 98 (42):76-78. ISSN: 0030-1388.
In crude-distillation units, the accumulation of salt causes chlorides in crude oil. A new atmospheric gas oil electrical-desalting process reduces the amount of chlorides in the main fractionator of a fluid-catalytic cracking unit.

Yeung, A.; Dabros, T.; Masliyah, J.; Czarnecki, J. **Micropipette: a new technique in emulsion research.** *Colloids and Surfaces A - Physicochemical and Engineering Aspects*. 2000; 174 (1-2):169-181. ISSN: 0927-7757.
In order to demonstrate the effectiveness of micropipettes in micron-scale studies, experiments were conducted with water droplets in crude oil.

Yip, Francis K. **New operation strategies in heavy crude pipeline will increase profit margin.** *Oil & Gas Journal*. 2003; 101 (6):60-64. ISSN: 0030-1388.
To insure the movement of heavy crude through pipelines with varying temperatures, a design is presented that will optimize the temperature of the inlet of the pipeline.

Yudhbir, Lalit. **Maritime risk and transportation model for the transport of crude oil and petroleum products.** Thesis (Ph. D.): University of Miami; 1999; 156 leaves.

Zhao, Dongye; Hunter, Margaret; Pignatello, Joseph J.; White, Jason C. **Application of the dual-mode model for predicting competitive sorption equilibria and rates of polycyclic aromatic hydrocarbons in estuarine sediment suspensions.** *Environmental Toxicology and Chemistry*. 2002; 21 (11):2276-2282. ISSN: 0730-7268.
A model was employed to further understand the role of competition in sorption and desorption rates of PAHs in estuarine sediments. The model has great potential for predicting contaminant transport and bioavailability in sediments.

Zhao, Dongye; Pignatello, Joseph J. **Model-aided characterization of Tenax®-TA for aromatic compound uptake from water.** *Environmental Toxicology and Chemistry*. 2004; 23 (7):1592-1599. ISSN: 0730-7268.
A polymer adsorbent was tested and a model was used to help determine equilibrium and kinetic parameters for uptake of a number of PAHs.

Zhao, Yong; Liao, Yanbiao. **Compensation technology for a novel reflex optical fiber temperature sensor used under offshore oil well.** *Optics Communications*. 2003; 215 (1-3):11-16. ISSN: 0030-4018.
Authors propose and describe a temperature sensor system for offshore exploration that corrects for errors caused by changes in light intensity, fluctuations in detector responsiveness and the amplification of processor circuitry.

Zhen, Z. C.; Harbert, T. **Optical technology improves batch cutting, quality determination.** *Oil & Gas Journal*. 2004; 102 (16):66-68. ISSN: 0030-1388.
Optical technology is being tested on an 800-mile pipeline in China to reduce the downgrading of product quality. The technology also provides online quality control and monitoring.

Zheng, Q. et al. **Space shuttle observations of open ocean oil slicks.** *Remote Sensing of Environment*. 2001; 76 (1):49-56. ISSN: 0034-4257.
Demonstrated in this paper is information on how to extract data from space shuttle photography regarding details of oil slicks in the open ocean. The method that was developed may also be used for interpreting other satellite images, such as SAR images that are even more efficient and can extract data under cloudy conditions and at night.

Zhu, Song-Ping; Strunin, Dmitry. **Modelling the confinement of spilled oil with floating booms.** *Appplied Mathematical Modelling*. 2001; 25 (9):713-729. ISSN: 0307-904X.

Zpraster, Steven. **A surface modeling algorithm designed for speed and ease of use with all petroleum industry data.** *Computers & Geosciences*. 2003; 29 (9):1175-1182. ISSN: 0098-3004.
The author presents a multi-grid algorithm for constructing grid-based surface models that can be used with petroleum industry data.

ENVIRONMENT/ECOSYSTEM MANAGEMENT/SPILLS

A new oil spill hits Buzzards Bay. *Marine Pollution Bulletin*. 2003; 46 (7):800. ISSN: 0025-326X.
Scientists from Woods Hole Oceanographic Institution began investigations of a spill in coastal Massachusetts. Data collected from the recent spill of 15,000 gallons of Number 6 fuel oil will be compared with baseline data collected from a spill in 1969 to assess the fate and effects of the recent event. Various marine species were captured for rehabilitation, including loons, sea ducks and oystercatchers.

Adebajo, M. O.; Frost, R. L.; Kloprogge, J. T.; Carmody, O.; Kokot, S. **Porous materials for oil spill cleanup: a review of synthesis and absorbing properties.** *Journal of Porous Materials*. 2003; 10 (3):159-170. ISSN: 1380-2224.
This review focuses on current knowledge about porous materials, such as hydrophobic silica aerogels, zeolites, organoclays and natural sorbents, and identifies areas where future developments are possible.

Aisien, F. A.; Hymore, F. K.; Ebewele, R. O. **Potential application of recycled rubber in oil pollution control.** *Environmental Monitoring and Assessment*. 2003; 85 (2):175-190. ISSN: 0167-6369.
Rubber particles between 0.15 and 2.36 mm were used to absorb crude oil at temperatures ranging from 5 to 40°C. Changes in equilibrium absorption were attained at different periods of time depending upon factors such as oil temperature, size of rubber particles, and recycled versus regenerated recycled rubber.

Aislabie, Jackie M.; Balks, Megan R.; Foght, Julia M.; Waterhouse, Emma J. **Hydrocarbon spills on Antarctic soils: effects and management.** *Environmental Science & Technology*. 2004; 38 (5):1265-1274. ISSN: 0013-936X.
The authors review data of hydrocarbon spills located on ice-free soil areas in the Antarctic, and analyze the physical and chemical breakdown of the PAHs to understand how weathered properties of hydrocarbons impact the soils.

Al-Masri, M. S.; Suman, H. **NORM waste management in the oil and gas industry: the Syrian experience.** *Journal of Radioanalytical and Nuclear Chemistry*. 2003; 256 (1):159-162. ISSN: 0236-5731.
Authors identify three categories of radioactive waste associated with the petroleum industry and the present disposal and cleanup criteria as defined and approved by Syria's Regulatory Office.

Anderson, C. M.; Labelle, R. P. **Update of comparative occurrence rates for offshore oil spills.** *Spill Science & Technology*. 2000; 6 (5-6):303-321. ISSN: 1353-2561.
In this study estimates of spill occurrence rates were restricted to spills greater than or equal to 1000 barrels. Occurrence rates for offshore oil spills are useful for analyzing potential oil-spill impacts and for oil-spill response contingency planning.

Anderson, Roger N.; Boulanger, Albert; Longbottom, James; Oligney, Ronald. **Lean energy management required for economic ultradeepwater development.** *Oil & Gas Journal*. 2003; 101 (11):47-53. ISSN: 0030-1388.
Energy management teams are requiring operators of ultradeepwater development to integrate computer software among all project participants in order to increase efficiency and reduce production costs.

At least 1,000 fowl dead in wake of tanker spill. *Houston Chronicle*. Houston, Tx. The Houston Chronicle Publishing Company; April 3, 2001; A 12.
A freighter carrying 9.7 million gallons of oil wrecked March 28, 2001 off the coast of Denmark. 764,000 gallons of oil spilled into the Baltic Sea, killing at least 1,000 ducks, swans and seagulls. Approximately 59,000 gallons of oil remain on 12 miles of beaches, which are migratory stopovers for shorebirds and assorted waterfowl. Danish Forest and Nature Agencies sent hunters to comb more than 75 miles of coastline with orders to destroy birds deemed beyond saving.

Baine, Mark. **The North Sea rigs-to-reefs debate.** *ICES Journal of Marine Science*. 2002; 59 (Supplement):S277-S280. ISSN: 1054-3139.
In an effort to establish a rigs-to-reef program in the North Sea, a steering group has been created to assess the potential need and suitability of artificial reefs and guide ongoing independent research. The steering group will also monitor the actions of fishermen to evaluate the success of the program.

Balks, Megan R.; Paetzold, Ron F.; Kimble, John M.; Aislabie, Jackie; Campbell, Lain B. **Effects of hydrocarbon spills on the temperature and moisture regimes of cryosols in the Ross Sea region.** *Antarctic Science*. 2002; 14 (4):319-326. ISSN: 0954-1020.
Hydrocarbon-contaminated sites were found to have higher soil temperatures than control sites, possibly due to surface reflectivity. The ability of soil to retain moisture was not found to be affected by the presence of PAHs.

Banat, I. M. **Potentials for use of biosurfactants in oil spills cleanup and oil bioremediation.** *In* Rodriguez, G. R.; Brebbia, C. A. (Eds.) *Oil and Hydrocarbon Spills, Modelling, Analysis and Control II*. Billerica, Ma.: Computational Mechanics Inc.; 2000; p. 177-185. ISBN: 1-85312-828-7.
This article reviews state of the art techniques for the potential use of biosurfactants in oil spill remediation.

Banks, Stuart. **SeaWiFS satellite monitoring of oil spill impact on primary production in the Galápagos Marine Reserve.** *Marine Pollution Bulletin*. 2003; 47 (7-8):325-330. ISSN: 0025-326X.
Satellite images taken from 1998 to 2000 were used as a baseline to determine the impact on primary production of phytoplankton following the grounding of the oil tanker *Jessica* in 2001. Further investigations into the impact of chlorophyll-a distribution were compared to data collected in years within the El Niño/Southern Oscillation cycle.

Barbier, Sandra. **Hole in pipe leads to Lafitte oil spill; cleanup of greasy mess under way.** *New Orleans Times-Picayune*. New Orleans, La: Times-Picayune Publishing Company; April 8, 2002; B 1.
Divers discovered a three-inch hole in a pipeline which spilled 75,000 gallons of crude oil along Little Lake in the Barataria estuary of Louisiana. An oil containment boom was laid and roughly 50 percent of the oil had been recovered or had evaporated by late that evening. Rough weather caused the remaining oil to drift into fragile coastal marshes, delaying recovery efforts.

Barbier, Sandra. **Oil spill threatens 2 wildlife refuges.** *New Orleans Times-Picayune*. New Orleans, La.: Times-Picayune Publishing Company; November 30, 2000; A 6.
Approximately 25 miles downriver of the grounding of the oil tanker *Westchester* are two major wintering grounds for migratory waterfowl. Cleanup crews contained the oil on the east side of the river by placing floating booms across the channels from the lower Mississippi River. The Louisiana Department of Wildlife and Fisheries reported that no oil had entered the Delta.

Barker, Christopher H.; Galt, J. A. **Analysis of methods used in spill response planning: trajectory analysis planner TAP II.** *Spill Science & Technology Bulletin*. 2000; 6 (2):145-152. ISSN: 1353-2561.
To plan a response to an oil spill, the complexity of physical oceanography and trajectory analysis procedures must be understood. Spill scenarios are used as a basis for planning response capability. In order for model developers to be successful and gain support, expectations and a criteria must be satisfied. This paper deliberates specific constraints and discusses methods that can be used to quantify some aspects of the uncertainty.

Barron, Mace G.; Holder, Eric. **Are exposure and ecological risks of PAHs underestimated at petroleum contaminated sites?** *Human and Ecological Risk Assessment*. 2003; 9 (6):1533-1545. ISSN: 1080-7039.
Results of screening level analysis show that current ecological risk assessments and the proposed numerical correction factor don't adequately account for alkylated PAHs and underestimate the hazards of these toxins.

Barry, Maggie. **Tanker rock smash sparks oil spill fears; leaking hull threatens wildlife.** *The Mirror*. May 8, 2001;14.
A Swedish tanker carrying hazardous chemicals and tons of heavy oil ran aground in the Sound of Mull, offshore Scotland. Coast guard officials reported that 200-plus tons of oil remained on board, but posed no great environmental concern.

Barth, Hans-Jörg. **The coastal ecosystems of the Arabian Gulf ten years after the 1991 oil spill.** *Geographische Rundschau*. 2002; 54 (12):36-42. ISSN: 0016-7460.
Data collected in this study contradicts previously published research suggesting site recovery from oil spilled in the 1991 Gulf War. Delayed recovery is best seen in salt marshes, which are not exposed to wave action and suffer from anaerobic conditions due to oily substrates.

Basheer, Chanbasha; Obbard, Jeffrey Philip; Lee, Hian Kee. **Persistent organic pollutants in Singapore's coastal marine environment: part I, seawater.** *Water, Air, & Soil Pollution*. 2003; 149 (1-4):295-313. ISSN: 0049-6979.
While analyzing collecting seawater from several offshore sites around Singapore, researchers found higher levels of PAHs than other organic pollutants. It is believed that this is due to the extensive petroleum industry in the region.

Basheer, Chanbasha; Obbard, Jeffrey Philip; Lee, Hian Kee. **Persistent organic pollutants in Singapore's coastal marine environment: part II, sediments.** *Water, Air, & Soil Pollution*. 2003; 149 (1-4):315-325. ISSN: 0049-6979.
Authors investigate levels of individual PAH compounds in the marine sediments surrounding Singapore. Results show widespread contamination, but in levels considered moderate.

Begak, O. Y.; Syroezhko, A. M. **Monitoring of the sources of environmental pollution with crude oil.** *Russian Journal of Applied Chemistry*. 2001; 74 (4):636-639. ISSN: 1070-4272.
The authors describe methods used in determining the identification of crude oil samples recovered from various fields, including samples of contaminated soil and water.

Bercaru, Ofelia; Gawlik, Bernd Manfred; Ulberth, Franz; Vandecasteele, Carlo. **Reference materials for the monitoring of the aquatic environment - a review with special emphasis on organic priority pollutants.** *Journal of Environmental Monitoring*. 2003; 5 (4):697-705. ISSN: 1464-0325.
The authors argue for Certified Reference Materials covering different matrices and focusing on organic pollutants.

Betti, M. et al. **Results of the European Commission Marina II study part II - effects of discharges of naturally occurring radioactive material.** *Journal of Environmental Radioactivity*. 2004; 74 (1-3):255-277. ISSN: 0265-931X.
A study of NORM discharges into the North Sea showed that oil and gas production are now the major contributor of alpha emitting radionuclides into the sea.

Biers, John. ***Westchester* oil spill is bad but not the worst.** *New Orleans Times-Picayune*. New Orleans, La: Times-Picayune Publishing Company; November 30, 2000; A 07.
The grounding of the *Westchester* oil tanker in the lower Mississippi River was caused by a power failure on board before the ship ran aground. In recent years, regulators have been prosecuting more companies for oil spills. In this particular case, investigators have not turned up any evidence of criminal intent.

Bohannon, John; Bosch, Xavier. **Spanish researchers vent anger over handling of oil spill.** *Science*. 2003; 299 (5606):490. ISSN: 0036-8075.
Arguments between the Spanish scientific community and the Spanish government continued following the sinking of the *Prestige* oil tanker off the Iberian coast. Scientist claimed they were not consulted regarding the decision to tow the tanker out to sea rather than bring it into port.

Bohannon, John; Bosch, Xavier; Withgott, J. **Scientists brace for bad tidings after spill.** *Science*. 2002; 298 (5599):1695, 1697. ISSN: 0036-8075.
In November 2002, the *Prestige* oil tanker split in half and began spilling Bunker oil into the Atlantic Ocean, off the coast of Spain. Scientists blame the governments of France, Spain, and Portugal for long-term ecological and environmental damages, because the leaking ship was not allowed into their ports.

Bosch, Xavier. **For Spain, oil spill disaster is in the bag.** *Science*. November 23, 2003; 302 (5660):1485. ISSN: 0036-8075.
Following a long dispute between researchers and government officials regarding the correct or incorrect handling of the shipwrecked tanker *Prestige*, scientists have convinced the government of Spain to allow them to deploy a technological process for the removal of the remaining oil aboard the sunken tanker.

Bosch, Xavier. **Spain: research chief a victim of the oil spill?** *Science*. 2003; 299 (5607):637, 639. ISSN: 0036-8075.
Following the *Prestige* oil spill, hundreds of scientists accused the Spanish government of not listening to views from the scientific community. Intensified pressure from the scientific community to the president of Spain's Higher Research Council requesting that he address several concerns about management of the agency is said to have led to his resignation.

Brebbia, C. A.; Saval Perez, J. M.; Garcia Andion, L. (Eds.) **Oil and Hydrocarbon Spills IV: Modelling, Analysis and Control.** Billerica, Ma: Computational Mechanics; 2004; 250 pp. ISBN: 1-85312-711-6.

Breuer, E.; Stevenson, A. G.; Howe, J. A.; Carroll, J.; Shimmield, G. B. **Drill cutting accumulations in the Northern and Central North Sea: a review of environmental interactions and chemical fate.** *Marine Pollution Bulletin*. 2004; 48 (1-2):12-25. ISSN: 0025-326X.
In this review, the results of over two decades of research on drill cuttings indicate that hydrocarbons found in accumulations are relatively unchanged over time. It is believed that they are likely to remain in this state unless disturbed, at which point they can become exposed to organisms.

Brown, Carl E.; Fingas, Mervin F. **Development of airborne oil thickness measurements.** *Marine Pollution Bulletin*. 2003; 47 (9-12):485-492. ISSN: 0025-326X.
A newly developed sensor remotely measures oil-on-water slick thickness and provides information about the dynamics of the oil slick spreading and spill response applications.

Brown, Carl E.; Fingas, Mervin F. **Review of the development of laser fluorosensors for oil spill application.** *Marine Pollution Bulletin*. 2003; 47 (9-12):477-484. ISSN: 0025-326X.
This paper reviews the use of airborne laser fluorosensors for the detection of oil spills in complex marine environments.

Bruzzone, A. G. et al. **Risk analysis in harbor environments using simulation.** *Safety Science*. 2000; 35 (1-3):75-86. ISSN: 0925-7535.

Burlington, Linda B. **An update on implementation of natural resource damage assessment and restoration under OPA.** *Spill Science & Technology Bulletin*. 2002; 7 (1-2):23-29. ISSN: 1353-2561.
The Natural Resource Damage Assessment (NRDA) regulation allows recovery of damages for restoration of injured natural resources and lost services due to oil spills. This paper presents legal standards used in two previous case studies under the NDRA for spill recovery and rehabilitation.

Burns, George; Pond, Robert; Tebeau, Peter; Etkin, Dagmar Schmidt. **Looking to the future-setting the agenda for oil spill prevention, preparedness and response in the 21st century.** *Spill Science & Technology Bulletin*. 2002; 7 (1-2):31-37. ISSN: 1353-2561.
To develop an improved action plan for future oil pollution threats, the Coast Guard is overseeing the formulation of a coordinated Broad-Based OSPPR Program Risk Assessment.

Burton, A. **Spain studies problems of *Prestige* oil spill.** *Frontiers in Ecology and the Environment*. 2003; 1 (1):5. ISSN: 1540-9295.

Caravaca, F.; Roldan, A. **Assessing changes in physical and biological properties in a soil contaminated by oil sludges under semiarid Mediterranean conditions.** *Geoderma*. 2003; 117 (1-2):53-61. ISSN: 0016-7061.
Researchers found that soils contaminated by oil sludge showed reduced efficiencies by organisms, as seen in higher rates of microbial biomass carbon, basal respiration and metabolic quotient. The total porosity of contaminated soil showed a 15-fold increase compared with uncontaminated soil, and minute cracks were found that could hamper the soil's ability to hold water for plants and microorganisms.

Carlowicz, Mike. **Oil spill lingers in Falmouth marsh.** *Woods Hole Currents*. 2003; 9 (4):8-9.
Researchers at WHOI renewed a grant that will continue to study the long-term fate of petroleum products from contaminated sediments in Buzzards Bay, Massachusetts.

Carls, Mark G.; Harris, Patricia M.; Rice, Stanley D. **Restoration of oiled mussel beds in Prince William Sound, Alaska.** *Marine Environmental Research*. 2004; 57 (5):359-376. ISSN: 0141-1136.
After experimental restoration of mussel beds in areas contaminated by crude oil, bivalve population dynamics and residual hydrocarbon levels were monitored for five years. Mussel population densities and fluctuations were not significantly different from other sites, and contamination levels were typically at baseline levels with oiled reference cites. Researchers believe that although mussel relocation is feasible, chemical or mechanical removal of oil from sediment is more effective than manual removal.

Carney, R. S.; (Ed.) **Workshop on Environmental Issues Surrounding Deepwater Oil and Gas Development: Final Report.** New Orleans: U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region; 1997; OCS Study MMS 98-0022; 163 pp.
Various issues in deepwater drilling were addressed in this report. Different working groups met to address socioeconomic, ecological, geological and biological issues related to deepwater drilling.

Carroll, Loren. **Turning drilling waste into a resource.** *Offshore*. 2002; 62 (11):96. ISSN: 0030-0608.
The author describes a pilot project in New Zealand that converts drill cuttings to organic fertilizer using worm-based bioremediation.

Caselle, J. E.; Love, M. S.; Fusaro, C.; Schroeder, D. **Trash or habitat? Fish assemblages on offshore oilfield seafloor debris in the Santa Barbara Channel, California.** *ICES Journal of Marine Science*. 2002; 59 (Supplement):S258-S265. ISSN: 1054-3139.
Offshore oilfield debris was assessed in central and southern California to determine its significance related to fish assemblages. A ROV was used to video the fish assemblages and measure debris characteristics.

Cassidy, Daniel P.; Hudak, Andrew J.; Murad, Ahmed A. **Effect of loading in soil slurry-sequencing batch reactors on biosurfactant production and foaming.** *Journal of Environmental Engineering - ASCE*. 2002; 128 (7):575-582. ISSN: 0733-9372.
In a series of experiments, it was determined that three different amounts of contaminants loaded into a bioslurry resulted in vastly different population distributions of hydrocarbon-degrading bacterial species.

Cetin, Eylem; Odabasi, Mustafa; Seyfioglu, Remzi. **Ambient volatile organic a petrochemical (VOC) concentrations around compound complex and a petroleum refinery.** *Science of the Total Environment*. 2003; 312 (1-3):103-112. ISSN: 0048-9697.
Air samples taken near petroleum processing facilities found high levels of ethylene dichloride, ethyl alcohol and acetone. Concentrations of VOCs were influenced by seasonal variation, and by combinations of temperature and wind speed.

CGES: Baltic exports of Russian crude threaten dominance of Black Sea routes. *Oil & Gas Journal*. 2004; 102 (23):53-54. ISSN: 0030-1388.
Traditional Russian crude ports are being threatened by rapid expansion of new export terminals on the Baltic Sea. With the rise in the volume of crude oil being transported, bordering countries of the Baltic Sea are concerned with the potential impact of an oil spill on the fragile ecosystem.

Chen, N. Y. **An environmentally friendly oil industry?** *Chemical Innovation*. 2001; 31 (4):10-21. ISSN: 1527-4799.

Chen, Z.; Huang, G. H.; Chan, C. W. ; Geng, L. Q.; Xia, J. **Development of an expert system for the remediation of petroleum-contaminated sites.** *Environmental Modeling & Assessment*. 2003; 8 (4):323-334. ISSN: 1420-2026.
This paper describes the processes involved in the conception and implementation of an expert system used to assess remediation alternatives for decision makers in petroleum waste management.

Cheong, C. J.; Okada, M. **Effects of spilled oil on the tidal flat ecosystem evaluation of wave and tidal actions using a tidal flat simulator.** *Water Science & Technology*. 2001; 43 (2):171-177. ISSN: 0273-1223.
Using fuel oil C, researchers tested to determine the effects of wave and tidal actions on the penetration of spilled oil on tidal flats. Results show that fuel oil C penetrated into sediments by tidal action, not wave action. The oil then inhibited seawater infiltration into the sediments, resulting in impeding the delivery of oxygen, nitrogen, nutrients, and organic matter from seawater to benthic communities.

Chilean oil spill damages birds, salmon farm. *Reuters News Service*. June 7, 2001.
On May 25, 2001, a tanker ran aground in a remote southern Chilean fjord, spilling 92,600 gallons of crude oil. The Chilean Navy reported that the slick was 70 miles long. Reports of damage included wildlife and one of the numerous salmon farms that comprise the main commercial activity in the region.

Christensen, Jan H. **Application of multivariate data analysis for assessing the early fate of petrogenic compounds in the marine environment following the *Baltic Carrier* oil spill.** *Polycyclic Aromatic Compounds*. 2002; 22 (3-4):703-714. ISSN: 1040-6638.
Principal component analysis was used to monitor the changes in chemical composition of oil after a spill at sea.

Chun, C. L.; Park, J. W. **Oil spill remediation using magnetic separation.** *Journal of Environmental Engineering - ASCE*. 2001; 127 (5):443-449. ISSN: 0733-9372.
Two magnetic substances, magnetite and maghemite, were used in experiments to determine the effectiveness of their use in the sorption of crude oil. Due to several factors maghemite was found to be the most effective in the remediation of oil.

Cicero, Anna Maria et al. **Monitoring of environmental impact resulting from offshore oil and gas installations in the Adriatic Sea: preliminary evaluations.** *Annali di Chimica*. 2003; 93 (7-8):701-705. ISSN: 0003-4592.
Researchers monitored the water column around several offshore installations in the Adriatic sea to assess effects of produced water on physical and chemical properties of sea water, and to establish concentrations of PAHs in mussels for further studies.

Clean-up begins in month-old oil spill. *San Diego Union-Tribune*. San Diego, Ca.: Union-Tribune Publishing Company; February 12, 2001; A 12.
Approximately one month following the grounding of the *Amargos* tanker in Taiwan, cleanup of hundreds of tons of sludge began. Central and county government officials are under investigation for neglecting to rapidly deploy an oil spill response plan.

Coast guard helps with oil spill cleanup in Galápagos Islands. *Houston Chronicle*. Houston, Tx.: Houston Chronicle Publishing Company; January 21, 2001; A 21.
On Tuesday, January 16, 2001, the tanker *Jessica* ran aground on San Cristobal Island. The tanker started leaking diesel on Friday into the bay that is populated by rare marine species. A team of U.S. experts headed out to the ecologically fragile Galápagos Islands to help clean up the oil spill. Officials were concerned that the oil spill posed a risk of being a major environmental disaster.

Copeland, Morgan Lee, Jr.; Wilkinson, George. **Preparation key for pipeline's management of large spill, explosion.** *Oil & Gas Journal*. 2004; 102 (21):60-64. ISSN: 0030-1388.
A set of guidelines is presented for safety issues, regulatory compliance and litigation following a pipeline explosion or large oil spill in a populated area.

Cordes, Erik E.; Bergquist, Derk C.; Shea, Katriona; Fisher, Charles R. **Hydrogen sulphide demand of long-lived vestimentiferan tube worm aggregations modifies the chemical environment at deep-sea hydrocarbon seeps.** *Ecology Letters*. 2003; 6 (3):212-219. ISSN: 1461-023X.
Authors describe the ecosystem changes that take place when aggregations of *Lamellibrachia luymesi* modify the habitat over time around hydrocarbon seeps.

Cormack, Douglas. **Response to Marine Oil Pollution: Review and Assessment.** Boston, Ma.: Kluwer Academic; 1999. 385 pp. ISBN: 0792356748.

Cripps, S. J.; Aabel, J. P. **Environmental and socio-economic impact assessment of Ekoreef, a multiple platform rigs-to-reefs development.** *ICES Journal of Marine Science*. 2002; 59 (Supplement):S300-S308. ISSN: 1054-3139.
A multiple platform located in the Ekofisk oil field in North Sea is at the end of its production time and is being recommended for the rigs-to-reef program. A standard decommissioning impact assessment process is used to identify factors that present special environmental or socio-economic risks or benefits.

Cross, Ian. **Far East deepwater exploration to see strong growth, bias to gas.** *Oil & Gas Journal*. 2002; 100 (45):38-48. ISSN: 0030-1388.
Future exploration and recovery of deepwater basins of the Far East should have excellent returns for liquefied natural gas. The Chinese government sees economic benefits for their country, as they become less dependent on Middle East suppliers for oil and gas.

Curran, K. J.; Hill, P. S.; Milligan, T. G. **The role of particle aggregation in size-dependent deposition of drill mud.** *Continental Shelf Research*. 2002; 22 (3):405-416. ISSN: 0278-4343.

Dauvin, Jean-Claude; Gesteira, J. L. G.; Fraga, M. S. **Taxonomic sufficiency: an overview of its use in the monitoring of sublittoral benthic communities after oil spills.** *Marine Pollution Bulletin*. 2003; 46 (5):552-555. ISSN: 0025-326X.
Taxonomic sufficiency is a process where organisms are identified to the lowest possible taxonomic species level. Scientists believe that by using this approach to assess the impact on a macrobenthic communities following an oil spill, it will clearly reflect pollution gradients and be less affected by natural nuisance variables than species analysis.

Davies, A. M.; Kwong, S. C. M.; Flather, R. A. **On determining the role of wind wave turbulence and grid resolution upon computed storm driven currents.** *Continental Shelf Research*. 2000; 20 (14):1825-1888. ISSN: 0278-4343.

Davis, Donald; Baumann, Robert. **Oil in Louisiana's estuarine environments: a development model.** *Science in China Series B - Chemistry*. 2001; 44 (Suppl. S):230-239. ISSN: 1006-9291.
Louisiana's barrier islands are considered the most important defense against oil spills. In an effort to protect and provide Louisiana's coastal areas with an effective oil-spill response plan; a comprehensive database is being developed with detailed pre-existing environmental, ecological, historic and habitat information.

de Leon, J. B.; Arguelles, A.; Morales, R. M. **Pipeline installations critical in Cantarell.** *Oil & Gas Journal*. 2001; 99 (35):54-57. ISSN: 0030-1388.
This article describes the construction of additional subsea pipelines to support the operating objectives of the Cantarell field in the Gulf of Mexico. The purpose of the project is to increase production, conserve gas resources, and improve operational safety.

Dean, K. Bruce et al. **Remediating UK river crossing.** *Oil & Gas Journal*. 2001; 99 (14):64-70. ISSN: 0030-1388.
A petroleum products line that crosses the River Wye in the UK poses environmental risk partly because of the meandering bend in the river. The pipeline was originally laid in 1972; however, in 1999 Mainline Pipelines discovered that vertical scour of the riverbed had exposed the pipeline, leaving an unsupported span of 9 meters. An assessment of the situation concluded that remedial measures were required to ensure the integrity of the pipeline as rapidly and as practically as possible.

Deepwater oil spills: how do plumes spread and negotiate water column? *Offshore*. 2000; 60 (4):182. ISSN: 0030-0608.

Deissenberg, Christophe; Gurman, Vladimir; Ryumina, Elena; Shevlyagin, Konstantin; Shevchuk, Elena. **Empirical data and optimal monitoring policies: the case of four Russian sea harbours.** *International Journal of Environment and Pollution*. 2001; 15 (3):310-321. ISSN: 0957-4352.
Data was collected and used to run a monitoring efforts optimization model that weighs the economic costs of monitoring against the cost of controlling harbor pollution. Authors stress that measures other than monitoring should be immediately implemented in order to prevent a future spill.

Delille, D. **Response of Antarctic soil bacterial assemblages to contamination by diesel fuel and crude oil.** *Microbial Ecology*. 2000; 40 (2):159-168. ISSN: 0095-3628.
The effects of diesel fuel and crude oil on bacteria in soil were monitored in a year-long series of experiments.

DelValls, Ángel. **The oil spill produced by the tanker *Prestige* (13/11/2002): impact assessment of the northwest coast of the Iberian Peninsula.** *Ciencias Marinas*. 2003; 29 (1): i-iii. ISSN: 0185-3880.
The weathering properties of the remaining oil on the shores of the Iberian Peninsula, Italy, indicate that the soluble fraction is low and biodegradation is slow under natural conditions. It is feared that the worst is yet to come for this region, with more than 50,000 tons of oil still aboard the sunken *Prestige*.

DERA washes up slicker technologies. *Harts E&P*. 2000; 73 (6):106. ISSN: 0164-8322.
A new type of measuring buoy was developed by U.K.'s Defense Evaluation and Research Agency, which can be used to monitor oil slick conditions. Dispersion of oil slicks can be calculated by measuring wave height.

Deschampes, Gerald; Caruel, Hefve; Borredon, Marie-Elisabeth; Bonnin, Christophe; Vignoles, Christian. **Oil removal from water by selective sorption on hydrophobic cotton fibers. 1. Study of sorption properties and comparison with other cotton fiber-based sorbents.** *Environmental Science & Technology*. 2003; 37 (5):1013-1015. ISSN: 0013-936X.
Researchers investigated hydrophobic cotton fibers for sorption properties and compared their use with other cotton fiber-based sorbents for the removal of oil.

Dieguez, L. V.; Hernandez, A. F.; Fernandez, J. J. G. **Distribution of polycyclic aromatic hydrocarbons in surficial sediments of the Vigo estuary, Spain, central axis and adjacent shelf.** *Polycyclic Aromatic Compounds*. 2002; 22 (2):161-173. ISSN: 1040-6638.

Donlan, Michael; Sperduto, Molly; Hebert, Charlie. **Compensatory mitigation for injury to a threatened or endangered species: scaling piping plover restoration.** *Marine Ecology - Progress Series*. 2003; 264;213-219. ISSN: 0171-8630.
A fusion of population limitations from species recovery plans were used as a backdrop for developing compensatory restoration of piping plovers in newly colonized areas recently impacted by the *North Cape* oil spill. Although this restoration option cannot account in advance for future effects of the spill on bird populations, such as abundance and diversity of prey, authors believe that the model can be adjusted as monitoring data is gathered.

Dubai beach cleanup starts. *Associated Press Online*. April 17, 2001.
The Georgian-flagged vessel, *Zainab*, broke up and sank while being escorted by Navy ships for violating U.N. sanctions. The vessel had less than 380,000 gallons of fuel on board, some of which spilled after the ship sank. Municipality workers collected patches of the slime that began to wash up on the shoreline of the Dubai beaches. Emirate officials reported that there was no indication of a large cleanup operation needed, and thus far they had found only 15 to 20 small patches of oil.

Edgar, Graham J.; Kerrison, Linda; Shepherd, Scoresby A.; Toral-Granda, M. Veronica. **Impacts of the *Jessica* oil spill on intertidal and shallow subtidal plants and animals.** *Marine Pollution Bulletin*. 2003; 47 (7-8):276-283. ISSN: 0025-326X.
Surveys of intertidal and subtidal sites were obtained prior to the *Jessica* oil spill and compared to data one month following the spill to determine the impact on densities of flora and fauna. Data indicates that the spill caused very little impact on intertidal and shallow subtidal zones.

Edgar, Graham J.; Marshall, Paul A.; Mooney, Peter. **The effect of the *Jessica* grounding on Galápagos reef fish communities adjacent to the wreck site.** *Marine Pollution Bulletin*. 2003; 47 (7-8):296-302. ISSN: 0025-326X.
Fish assemblages were surveyed 15 weeks post-spill following the grounding of the oil tanker *Jessica*. Results of data indicated elevated fish numbers rather than a depressed species population at the reference site 60-90 meters adjacent to the wreck.

Efendiyeva, I. M. **Ecological problems of oil exploration in the Caspian Sea area.** *Journal of Petroleum Science and Engineering*. 2000; 28 (4):227-231. ISSN: 0920-4105.

Ehlers, Laura J.; Luthy, Richard G. **Contaminant bioavailability in soil and sediment.** *Environmental Science & Technology*. 2003; 37 (15):295A-302A. ISSN: 0013-936X.
This article describes the benefits of bioavailability as a tool in the cleanup of soils containing a number of contaminants, including PAHs.

Ekundayo, E. O.; Emede, T. O.; Osayande, D. I. **Effects of crude oil spillage on growth and yield of maize (*Zea mays* L.) in soils of Midwestern Nigeria.** *Plant Foods for Human Nutrition*. 2001; 56 (4): 313-324. ISSN: 0921-9668.

Eljarrat, E.; Barceló, D. **Priority lists for persistent organic pollutants and emerging contaminants based on their relative toxic potency in environmental samples.** *TrAC - Trends in Analytical Chemistry*. 2004; 22 (10):655-665. ISSN: 0165-9936.
Current estimates of the toxic equivalent quantity for several environmental contaminants, including PAHs, are compiled in this overview of recently published data.

Elliot, A. J.; Jones, B. **The need for operational forecasting during oil spill response.** *Marine Pollution Bulletin*. 2000; 40 (2):110-121. ISSN: 0025-326X.
Relying on response to the *Sea Empress* oil spill, authors argue for better coordination between the scientific community and the U.K.'s Meteorological Office to facilitate real-time forecasting of oil spill movement.

Essiad, Hedeff I. et al. **Inverse modeling of BTEX dissolution and biodegradation at the Bemidji, MN crude-oil spill site.** *Journal of Contaminant Hydrology*. 2003; 67 (1-4):269-299. ISSN: 0169-7722.

Evans, David D.; Mulholland, George W.; Baum, Howard R.; Walton, William D.; McGrattan, Kevin B. ***In situ* burning of oil spills.** *Journal of Research of the National Institute of Standards and Technology*. 2001; 106 (1):231-278. ISSN: 1044-677X.
NIST's role in establishing *in situ* burning as an option to oil spill response is described in this article. The development of a smoke plume modelling software, the ALOFT-FT for personal computers, is also described.

Fabi, G.; Grati, F.; Lucchetti, A.; Trovarelli, L. **Evolution of the fish assemblage around a gas platform in the northern Adriatic Sea.** *ICES Journal of Marine Science*. 2002; 59 (Supplement):S309-S315. ISSN: 1054-3139.
Over a two-year period, monthly sampling with a trammel net was conducted near a gas platform and at an open-sea control site to investigate the effects of platforms on fish assemblages. Researchers also observed seasonal patterns of the fish assemblages at the two sites, as well as identifying species richness and establishing a diversity index.

Fang, Jianzhi. **Instability Study of Oil Slicks Contained by Oil Boom Systems.** Thesis (Ph. D.): University of Miami; 2000; 136 leaves.

Fattal, P.; Fishaut, B. ***Erika*: a first assessment of the impact of the cleaning techniques on the coastal morphology.** *Annales de Geographie*. 2002; (623):3-24. ISSN: 0003-4010.

Findikakis, A. N.; Law, A. W. K.; Papadimitrakis, Y. **Assessment of the risk of shore contamination by offshore oil spills: model formulation.** *In* Garcia-Martinez, R.; Brebbia, C. A. (Eds.). *Oil and Hydrocarbon Spills, Modelling, Analysis and Control*. Billerica, Ma.: Computational Mechanics, Inc.; 1998; p. 209-220. ISBN: 1-85312-526-1.
A simulation model has been developed which takes a number of factors into account following an oil spill, including the effect of the ocean and weather on the spread of a slick. The model also accounts for other aspects of a spill, including shore characteristics and the behavior of oil as it approaches the shoreline.

Fingas, Mervin F.; Charles, Jennifer. **Basics of Oil Spill Cleanup.** *2nd Edition*; Boca Raton, Fl.: Lewis Publishers; 2000; 272 pp. ISBN: 1566705371.

Fingas, Mervin; Brown, C. **A review of the status of advanced technologies for the detection of oil in and with ice.** *Spill Science & Technology Bulletin*. 2001; 6 (5-6):295-302. ISSN: 1353-2561.
In this review, the authors assess current remote sensors used to detect oil in ice and with ice. Acoustic, optical, and other methods are discussed in their ability to distinguish oil from the non-oil heterogeneous matter of the ice.

Fitzpatrick, M.; Warren, R.; Rkrol, N. **South Arne field development: an environmental impact assessment of oil spills.** *Spill Science & Technology Bulletin*. September 2000; 6 (2):133-144. ISSN: 1353-2561.
As part of the requirement for obtaining field development approval, a comprehensive environmental impact assessment was carried out. This paper presents a brief review of the methodology applied in the EIA and a summary of the most important results.

Fletcher, Sam. **Trinidad and Tobago seeks sustainable gas development.** *Oil & Gas Journal*. 2002; 100 (32):22-24. ISSN: 0030-1388.
Trinidad and Tobago's minister of energy and energy industries has proposed a plan to attract outside investments in order to double current production levels and maintain sustainable development for natural gas resources.

Flores, H.; Andreatta, A.; Llona, G.; Saavedra, I. **Measurements of oil spill spreading in a wave tank using digital image processing.** *In* Garcia-Martinez, R.; Brebbia, C. A. (Eds.). *Oil and Hydrocarbon Spills, Modelling, Analysis and Control*. Billerica, Ma.: Computational Mechanics, Inc.; 1998; p. 165-173. ISBN: 1-85312-526-1.
After analysis of oil spreading on the surface of water, the authors discovered that the speed of dispersal exceeded results expected in Fay's spreading theory.

Ford, N. **Oil drilling vs. conservation, continued.** *Scientific American*. 2001; 285 (5):10. ISSN: 0036-8733.
The opinion of the author challenges this nation to uphold its commitment to a clean energy future that will enable the US to cut one third of today's consumption of oil. Attempting to reduce consumption would require a massive change in emphasis and in funding priorities on the part of the federal government.

Fritcher, D. L. et al. **Evaluation of two direct immunoassays for rapid detection of petroleum products on marine birds.** *Marine Pollution Bulletin*. 2002; 44 (5):388-395. ISSN: 0025-326X.
Two commercially available immunoassays were evaluated for cost-effectiveness and efficiency by testing common murres captured near an oil spill. These products can be used in the field to quickly identify unoiled birds that can be then be relocated, thereby reducing mortality due to captive handling.

Fry, Carolyn. **Map sends out warning of oil-spill black spots.** *New Scientist*. 2003; 179 (2412):10. ISSN: 0262-4079.
This article describes a map that details areas of potential risk to oil spills in the Black Sea, which is being used by the International Tanker Owners Pollution Federation for preventive measures, in addition to reinforcing international agreements and assessing spill response preparedness of regional nations.

Fuel leaks from sunken Japan ship. *Associated Press*. July 24, 2001.
The *Takeo Maru*, sunken in 1979 off Sakhalin Island in Russia, began seeping oil that formed a slick a half-mile long and 165 feet wide. Emergency workers were collecting the oil, while divers attempted to stop up holes in the tanks.

Fuel spilled from the tanker *Jessica*, which ran aground in a bay 850 meters from San Cristobal, Galápagos archipelago, threatened to affect the rare species that are native to the islands. Emergency plans to relocate the species were being implemented.

Furlow, William. **As deepwater fields become more complex, flow assurance issues change: custom solutions pit remediation against prevention.** *Offshore*. 2002; 62 (12):40. ISSN: 0030-0608.
In deeper waters, hydrates and paraffins in oil flowlines are more intense because of low seabed temperatures. Operators are using a new approach to flowline assurance by insulating deepwater pipes and continuously injecting a chemical inhibitor in order to maintain continuous flow.

Gage, John D. **Deep-sea benthic community and environmental impact assessment at the Atlantic frontier.** *Continental Shelf Research*. 2001; 21 (8-10):957-986. ISSN: 0278-4343.
The author argues for a profile of the community structure in the northeast Atlantic sea, so that future impacts from oil and gas production and other anthropogenic effects can be measured.

Galápagos Islands threatened by second oil spill in less than two years. *Marine Pollution Bulletin*. 2002; 44 (9):838. ISSN: 0025-326X.
Two thousand gallons of diesel fuel spilled from the BAE *Taurus* in July 2002, threatening the beaches of Isabel Island in the Gálapagos archipelago.

Gamini, Gabriella; Henderson, Mark. **Galápagos species in peril: Ecuador pleads for help to save animals from disaster.** *Ottawa Citizen*. January 23, 2001; A 08.

Garcia-Martinez, R. **Some recommendations for testing oil spill computer models.** *In* Garcia-Martinez, R.; Brebbia, C. A. (Eds.). *Oil and Hydrocarbon Spills, Modelling, Analysis and Control*. Billerica, Ma.: Computational Mechanics, Inc.; 1998; p. 97-105. ISBN: 1-85312-526-1.
This article lists various objectives that should be achieved for the development of a standard benchmark for the evaluation of oil dispersal models.

Gaspar, M. L.; Cabello, M. N.; Cazau, M. C.; Pollero, R. J. **Effect of phenanthrene and *Rhodotorula glutinis* on arbuscular mycorrhizal fungus colonization of maize roots.** *Mycorrhiza*. 2002; 12 (2):55-59. ISSN: 0940-6360.

Gesteria, J. L. G.; Dauvin, Jean-Claude. **Amphipods are good bioindicators of the impact of oil spills on soft-bottom macrobenthic communities.** *Marine Pollution Bulletin*. 2000; 40 (11):1017-1027. ISSN: 0025-326X.
Benthic community structures in areas affected by different oil spills (*Amaco Cadiz* and *Aegean Sea*) are compared in this study.

Ghannam, Mamdouh T.; Chaalal, Omar. **Oil spill cleanup using vacuum technique.** *Fuel*. 2003; 82 (7):789-797. ISSN: 0016-2361.
Authors describe a vacuum method of cleaning oil spills that promises to be quick, efficient and economical. This technique can operate under any environmental condition.

Gin, Karina Yew Hoong; Huda, Kamrul; Lim, Wee Kiat; Tkalich, Pavlo. **An oil spill-food chain interaction model for coastal waters.** *Marine Pollution Bulletin*. 2001; 42 (7):590-597. ISSN: 0025-326X.
A multiphase oil spill model, in combination with a food chain model, was developed to determine possible impacts of spills on marine species. The model was then applied to the 1997 *Evoikos-Orapin Global* spill.

Global oil spill responsibility. *Petroleum Review*. 2001; 55 (648):30. ISSN: 0020-3076.

Glover, Adrian G.; Smith, Craig R. **The deep-sea floor ecosystem: current status and prospects of anthropogenic change by the year 2025.** *Environmental Conservation*. 2003; 30 (3):219-241. ISSN: 0376-8929.
Authors relate a number of factors affecting the deep-sea floor ecosystem, including the effects of deep water drilling operations and impacts from accumulations of contaminated drill cuttings. They conclude that, given the immensity of the deep-sea floor, anthropogenic influence on the ecosystem will be relatively small within the next 20 years.

Gottinger, Hans W. **Special issue - monitoring pollution accidents: the case of oil spills - preface and introduction.** *International Journal of Environment and Pollution*. 2001; 15 (3):243-248. ISSN: 0957-4352.

Graham-Rowe, Duncan. **A slicker way to clean up oil tanker spills.** *New Scientist*. 2003; 177 (2385):16. ISSN: 0262-4079.
The author describes a ship that is designed to clean up spilled oil at sea.

Grant, Alastair; Briggs, Andrew D. **Toxicity of sediments from around a North Sea oil platform: are metals or hydrocarbons responsible for ecological impacts?** *Marine Environmental Research*. 2002; 53 (1):95-116. ISSN: 0141-1136.
Researchers investigated contaminated sediments associated with by-products of offshore petroleum production, in an effort to identify the components most responsible for toxicity in the benthic environment. Hydrocarbons were found to be the most significant pollutant in the contaminated sediments.

Grimwood, M. J. (Ed.) **Crude Oil Derived Petroleum Products in the Aquatic Environment: Priorities and Control.** Bristol, UK: Env. Agency; 2001; 78 pp. ISBN: 1857052404.

Grossi, Vincent.; Massias, Delphine.; Stora, G.; Bertrand, Jean-Claude. **Burial, exportation and degradation of acyclic petroleum hydrocarbons following a simulated oil spill in bioturbated Mediterranean coastal sediments.** *Chemosphere*. 2002; 48 (9):947-954. ISSN: 0045-6535.
A one-year study found that bioturbation processes have a significant influence on the fate of acyclic hydrocarbons following petroleum contamination. Sizeable losses of hydrocarbons were contributed to the macrobenthic organisms, which aided in the degradation process.

Guillen, G.; Rainey, Gail; Morin, M. **A simple rapid approach using coupled multivariate statistical methods, GIS and trajectory models to delineate areas of common oil spill risk.** *Journal of Marine Systems*. 2004; 45 (3-4):221-235. ISSN: 0924-7963.
Authors propose a model that combines cluster analysis to real-time GIS data to identify areas of risk following oil spills in open waters.

Guitart, C.; García-Flor, N.; Dachs, J.; Bayona, Josep M.; Albaigés, Joan. **Evaluation of sampling devices for the determination of polycyclic aromatic hydrocarbons in surface microlayer coastal waters.** *Marine Pollution Bulletin*. 2004; 48 (9-10):961-968. ISSN: 0025-326X.
After testing four sampling devices, researchers concluded that a metal screen was the most efficient sampling method for finding PAHs in the sea surface microlayer.

Gulf oil spill dissipates; marine life unharmed. *Houston Chronicle*. Houston,Tx.: Houston Chronicle Publishing Company; April 3, 2001; A 16.
On March 30, 2001, approximately 5,000 gallons of crude oil was spilled into the Gulf of Mexico, 70 miles south of Galveston. Coast Guard officials reported that the oil had dissipated by the next morning posing no threat to marine life.

Guyomarch, Julien; Le Floch, Stéphane; Merlin, François-Xavier. **Effect of suspended mineral load, water salinity and oil type on the size of oil-mineral aggregates in the presence of chemical dispersant.** *Spill Science & Technology Bulletin*. 2002; 8 (1):95-100. ISSN: 1353-2561.
Authors investigated the process of oil-mineral aggregates and the formation of size and buoyancy in the presence of chemical dispersants to evaluate whether chemical dispersion is an option for spill response in a particular environment.

Haines, J. R.; Koran, K. M.; Holder, E. L.; Venosa, A. D. **Protocol for laboratory testing of crude-oil bioremediation products in freshwater conditions.** *Journal of Industrial Microbiology & Biotechnology*. 2003; 30 (2):107-113. ISSN: 1367-5435.
An EPA protocol for evaluation of bioremediation products in marine environments was revised for freshwater environments. Authors report on the results of studies on four bioremediation products with the revised protocol, noting that differences in product performance were easily discerned using the protocol.

Hall, S. J. **Is offshore oil exploration good for benthic conservation?** *Trends in Ecology and Evolution*. 2001; 16 (1):58. ISSN: 0169-5347.
Resources needed to conduct large-scale surveys that would identify valuable seabed communities and in particular, sessile epifauna communities, are limited by most research institutions. However, as part of the licensing agreements for exploration, oil companies must provide an environmental impact assessment, which will provide the resources for distribution data that will identify areas for protection.

Hall, S. J. **The continental shelf benthic ecosystem: current status, agents for change and future prospects.** *Environmental Conservation*. 2002; 29 (3):350-374. ISSN: 0376-8929.

Hamada, Sei-Ichi. **Remaining position of stranded oil in beach profiles.** *Report of the Geological Survey of Hokkaido*. 2001; 72; 73-84. ISSN: 1345-3815.

Hamlat, M. S.; Kadi, H.; Djeffal, S. **Formation and prevention of NORM containing scale in the Algerian oil production.** *Revue Roumaine de Chimie*. 2003; 48 (5):405-412. ISSN: 0035-3930.

Harkins, Timothy J. **Oil Spill Response Techniques: Reactions to the *Valdez* Disaster.** Thesis (M.S.): SUNY Maritime College; 1999; 77 leaves.

Hawkins, S. J. et al. **Recovery of polluted ecosystems: the case for long-term studies.** *Marine Environmental Research*. 2002; 54 (3-5):215-222. ISSN: 0141-1136.
Authors propose possible pathways of recovery for sites affected by pollution, and argue for long-term research to better understand the recovery process at impacted areas.

Hayes, Dan. **Oilwatch gets tough on polluters.** *Harts E & P*. 2000; 73 (6):105. ISSN: 0164-8322.
This article describes the creation of Oilwatch, a joint venture between several large oil operators, U.K.'s Defence Evaluation and Research Agency, and the Earth Observation Sciences, Ltd. The purpose of Oilwatch is to speed up responses to oil spills by using satellites and new software applications.

Helvey, Mark. **Are southern California oil and gas platforms essential fish habitat?** *ICES Journal of Marine Science*. 2002; 59 (Supplement):S266-S271. ISSN: 1054-3139.
An oil and gas platform located in southern California is slated for decommissioning. Federal agencies are consulting with the National Marine Fisheries Service to properly evaluate fish assemblages around the platform and its ecological structure and function for essential fish habitat.

Herrenkohl, Mark J.; Lunz, John D.; Sheets, Richard G.; Wakeman, John S. **Environmental impacts of PAH and oil release as a NAPL or as contaminated pore water from the construction of a 90-cm *in situ* isolation cap.** *Environmental Science & Technology*. 2001; 35 (24):4927-4932. ISSN: 0013-936X.
A sediment cap was placed over PAH-contaminated sediments in an effort to restrain the pollutant from leaching into the surrounding harbor near the Wyckoff/Eagle Harbor Superfund site. Research on sediment cores showed that PAHs had not migrated up to the to 10 cm of the sediment, and were contained by the cap.

Herrick, Thaddeus. **Oil companies grapple with how to dispose of abandoned platforms.** *The Wall Street Journal*. Chicopee, Ma.: Dow Jones and Company Incorporated; June 27, 2001.
There is controversy over what to do with abandoned drilling platforms in the Gulf of Mexico. One alternative is converting rigs into artificial reefs. However, some environmentalists see this option as turning the gulf into an undersea junkyard.

Hester, Mark et al. **Potential for Accelerated Bioremediation and Restoration of Oil-Impacted Marshes Through the Selection of Superior Oil-Tolerant Vegetation**. New Orleans, La.: U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region; May 2000; OCS Study MMS 2000-042; 47 pp.

Heubeck, Martin et al. **Assessing the impact of major oil spills on seabird populations.** *Marine Pollution Bulletin*. 2003; 46 (7):900-902. ISSN: 0025-326X.
The authors argue for a comprehensive, four step oil spill impact assessment to monitor seabirds exposed to spilled oil.

Hoberg, Max; Feder, Howard. **The macrobenthos of sites within Prince William Sound, Alaska, prior to the *Exxon Valdez* oil spill.** *International Review of Hydrobiology*. 2002; 87 (1):25-45. ISSN: 1434-2944.
Authors present data on the benthic community of Prince William Sound for the years 1982 and 1990. Extreme variability in the fauna was noted within Rocky and Zaikov Bays between the two sampling periods.

Holdway, D. A. **The acute and chronic effects of wastes associated with offshore oil and gas production on temperate and tropical marine ecological processes.** *Marine Pollution Bulletin*. 2002; 44 (3):185-203. ISSN: 0025-326X.

Hopkins, Liz; Olleveant, Andrew. **A collaborative approach to the environmental assessment process prior to oil exploration activites offshore the Falkland Islands.** *Aquatic Conservation-Marine and Freshwater Ecosystems*. 2002; 12 (1):137-144. ISSN: 1052-7613.
This paper describes the cooperative approach taken between offshore operators in establishing a framework for exploration that relies heavily on feedback from government agencies and environmental concerns.

Hornaday, Bill W. **Fort Worth, Texas, firm's device fights Mississippi River oil spill.** *Knight-Ridder/Tribune Business News*. December 1, 2000.
SeaPatch, a magnetic device believed to be able to stop leaking hulls immediately, was to be tried on the *Westchester*.

Hull, Jennifer Pallanich. **Deepwater, deep gas focus of exploration work.** *Offshore*. 2003; 63 (1):32-33. ISSN: 0030-0608.
Five-year projections for exploration in the Gulf of Mexico show steady increases. As major oil companies exit the mature basins, independent and large companies are beginning to explore the deep and ultra-deepwater reservoirs.

Hull, Jennifer Pallanich. **Extensive decommissioning work ahead for aging GoM platforms.** *Offshore*. 2003; 60 (5):135-137. ISSN: 0030-0608.
The author presents a number of possible industry solutions for the thousands of unproductive and aging rigs presently located in the Gulf of Mexico.

Hupka, Jan. **Proceedings of the 3rd International Conference on Oil Pollution - Gdansk, Poland, 08-11 Sept. 2002 - foreword.** *Fresenius Environmental Bulletin*. 2004; 13 (3A):175. ISSN: 1018-4619.
This foreword describes the topic of oil discharge that was the general focus of a recent conference. Issues covered at the conference included bioremediation technology, analytical procedures and characterization of contaminants, oil spills and oil sorption, and pollution prevention.

Huyter, Matthew G. **Oil Spill Containment Technology, Techniques, and Selection.** Thesis (M.S.): SUNY Maritime College; 1999; 83 leaves.

If offshore drilling rig sinks, huge oil spill from underwater pipes is possible, Brazil warns. *St. Louis Post-Dispatch*. March 17, 2001; p. 12.
A giant 40-story oil rig off the coast of Rio de Janeiro State, was crippled by an explosion to its pillar supporting the rig. Approximately 400,000 gallons of oil was reported to be aboard the platform as it began to sink. Cleanup crews responded immediately by stationing floating barriers around the rig.

Indonesia and Norway to set up an oil spill response unit. *Jakarta Post*. March 3, 2001.
Norway's Ministry of Maritime Affairs and Fisheries, in cooperation with the Ministry of International Development, signed an agreement to establish an oil spill response unit in Indonesia. Over the years Indonesia has been used as a dumpsite for oil residue from foreign and domestic ships. Indonesia faces the problem of a lack of adequate rules and law enforcement for oil spill incidents.

Irvine, G. V. **Persistence of spilled oil on shores and its effects on biota.** *In* Sheppard, C. R. C. (Ed.) *Seas at the Millennium: an Environmental Evaluation, v.3. 3rd Edition*; New York: Pergamon Press; 2000; p. 267-281. ISBN: 0080432077.

Itavaara, M.; Piskonen, R.; Rytkonen, J. **Biodegradation of crude oil in cold climatic conditions.** *In* Wise, D. L.; Trantolo, D. J.; Cichon, H. I.; Stottmeister, U. (Eds.) *Bioremediation of Contaminated Soils (Environmental Science and Pollution Control Series, v.22)*. New York: Marcel Dekker; 2000; p. 327-337. ISBN: 0-8247-0333-2.

Janiot, Lucio Jose; Sericano, Jose Luis; Marcucci, Omar. **Evidence of oil leakage from the *Bahía Paraíso* wreck in Arthur Harbour, Antarctica.** *Marine Pollution Bulletin*. 2003; 46 (12):1619-1622. ISSN: 0025-326X.
High-resolution gas chromatography was used to analyze water samples to assess sources and relative concentrations of hydrocarbons associated with oil and fuels aboard a ship that had wrecked in the Antarctic in 1989.

Jensen, Hans V.; Mullin, Joseph V. **MORICE - new technology for mechanical oil recovery in ice infested waters.** *Marine Pollution Bulletin*. 2003; 47 (9-12):453-469. ISSN: 0025-326X.
A coordinated effort among multinational organizations and researchers has led to the development of a unit for removing oil in ice that incorporates ice processing equipment and alternative oil recovery units installed on a work platform.

Jézéquel, R.; Menot, L.; Merlin, F. X.; Prince, R. C. **Natural cleanup of heavy fuel oil on rocks: an *in situ* experiment.** *Marine Pollution Bulletin*. 2003; 46 (8):983-990. ISSN: 0025-326X.
Brest Harbor was used as a study site to examine the weathering process of Bunker C heavy oil on rocks that were subsequently exposed to the elements for a period of 556 days.

Jones, B. **A comparison of visual observations of surface oil with Synthetic Aperture Radar imagery of the *Sea Empress* oil spill.** *International Journal of Remote Sensing*. 2001; 22 (9):1619-1638. ISSN: 0143-1161.
After analyzing SAR imagery with visual observations of the *Sea Empress* oil spill, the author found cases where the SAR imagery indicated the thickness of the oil spill. However, this only occurred under certain environmental conditions, with low wind speeds on the surface of the slick.

Jones, Nicola. **Oil spills show they can stick around.** *New Scientist*. 2002; 176 (2366):21. ISSN: 0262-4079.
Trapped oil remains in oxygen-deprived sediments off the cost of Massachusetts, in an area that sustained environmental damage from a major oil spill some 30 years ago. New data collected by chemists suggests that contamination could persist indefinitely in this environment.

Jones, Nicola. **Spills' lethal legacy lives on.** *New Scientist*. 2003; 178 (2389):16. ISSN: 0262-4079.
Researchers began studying the effects of weathered oil on local mussels, noting toxicological effects and specific toxins responsible for changes in the health of individual bivalves.

Jørgensen, Terje; Løkkeborg, Svein; Soldal, Aud Vold. **Residence of fish in the vicinity of a decommissioned oil platform in the North Sea.** *ICES Journal of Marine Science*. 2002; 59 (Supplement):S288-S293. ISSN: 1054-3139.
Transmitters were surgically implanted into fish caught near a decommissioned platform in the Norwegian sector of the North Sea. Researchers anchored receivers around the decommissioned platform and at another platform 8 km away to monitor the presence of the tagged fish. From May to August 1998, data was collected from both sites to determine the residence of the tagged fish around the artificial reef.

Kapustka, Lawrence A. **Establishing eco-SSLs for PAHs: lessons revealed from a review of literature on exposure and effects to terrestrial receptors.** *Human and Ecological Risk Assessment*. 2004; 10 (2):185-205. ISSN: 1080-7039.
A review of published research on PAHs found that only 4% met the minimum criteria for the US EPA's ecological soil-screening values.

Kaur, Karamjit. **Oil spills after tanker runs aground.** *Straits Times (Singapore)*. Singapore Press Holdings Limited; October 4, 2000; 39.
The Panama-registered oil tanker, *Natuna Sea*, ran aground October 3, 2000, 8 km from Sentosa. 7,000 tones of crude oil leaked out into Indonesian waters. Maritime and Port Authorities of Singapore are implementing spill response strategies to contain the oil spill and prevent it from spreading to Singapore waters.

Kazakh government orders oil majors to halt work after spill. *Agence France Presse*. France: Agence France Presse; April 20, 2001.
On April 20, 2001, the Kazakhstan's government ordered a consortium of Western oil majors to halt production activity at a mobile rig off the Caspian Sea after an oil spill occurred. 210 liters of oil leaked into the sea during the testing of the West Kashagan well.

Kazakhstan clears up oil spill from submerged well. *Global News Wire*. Interfax News Agency; April 2, 2001.
A submerged oil well at the South-western Tajigali deposit in the Kazakh sector of the Caspian Sea leaked about 200 tons of oil into the sea. An absorbent floating barrier was erected around the well to collect and prevent the oil from spreading to other locations.

Khan, Faisal I.; Husain, Tahir; Hejazi, Ramzi. **An overview and analysis of site remediation technologies.** *Journal of Environmental Management*. 2004; 71 (2):95-122. ISSN: 0301-4797.
An analysis and summary of site remediation techniques are presented in the hopes of giving aid in the selection and implementation of appropriate technologies for site cleanup.

Kim, Yong-Jin; Osako, Masahiro. **Leaching characteristics of polycyclic aromatic hydrocarbons (PAHs) from spiked sandy soil.** *Chemosphere*. 2003; 51 (5):387-395. ISSN: 0045-6535.
Researchers looked at a number of factors influencing the leachability of organic pollutants. It was recommended that an alternative reagent be used in the place of dissolved humic matter (DHM) in leaching experiments, due to a lack of uniformity in DHMs.

Kingston, Emily. **Pakistan sues shipping company after oil spill.** *Marine Pollution Bulletin*. 2003; 46 (10):1216. ISSN: 0025-326X.
A $1 billion suit has been filed by the Karachi Port Trust for an oil spill caused by the grounding of the Greek-registered *Tasman Spirit*. The spill impacted 16 kilometers of beach and threatened rare turtle breeding areas along the coast.

Kingston, P. F.; Runciman, D.; McDougall, J. **Oil contamination of sedimentary shores of the Galápagos Islands following the wreck of the *Jessica*.** *Marine Pollution Bulletin*. 2003; 47 (7-8):303-312. ISSN: 0025-326X.
Samples of beach sediments were collected from a variety of sites located in the southern Galápagos Archipelago following the wreck of the *Jessica*. Low levels of hydrocarbon contamination were noted for most sites.

Kingston, Paul F. **Long-term environmental impact of oil spills.** *Spill Science & Technology Bulletin*. 2002; 7 (1-2):53-61. ISSN: 1353-2561.
The author defines long-term environmental impact and recovery based on specific environments, the organisms and plants that live there, and the type of oil that is spilled into that environment.

Korotenko, K. A.; Mamendov, R. M.; Mooers, C. N. K. **Prediction of the dispersal of oil transport in the Caspian Sea resulting from a continuous release.** *Spill Science & Technology*. 2000; 6 (5-6):323-339. ISSN: 1353-2561.
The 3-D hybrid flow/transport model presented in this paper is divided into three major modules: input, trajectory and fate prediction algorithms and output; the latter, in turn, is subdivided into the oil data output and environmental data output. The combination of incident-specific environmental data and spilled oil characteristics allows conducting diagnostic and prognostic simulations of behavior of the oil slick in the marine environment.

Kreuzer, Heidi. ***Westchester* incident highlights oil spill concerns.** *Pollution Engineering*. 2001; 33 (1):9-10. ISSN: 0032-3640.

Krotikov, V. D.; Mordvinkin, I. N.; Pelyushenko, A. S.; Pelyushenko, S. A.; Rakut, I. V. **Radiometric methods of remote sensing of oil spills on water surfaces.** *Radiophysics and Quantum Electronics*. 2002; 45 (3):220-229. ISSN: 0033-8443.

Kuwait tries to contain spill of oil. *Associated Press*. October 30, 2001.
A Panamanian-registered tanker carrying 3,500 tons of heavy crude oil ran aground in shallow waters off Boubyan, the largest of Kuwait's uninhabited islands. Officials report that the tanker's captain had deliberately tried to pollute Kuwait's beaches. Reports indicated that the tanker was not damaged. Kuwait's government activated a national emergency plan to contain and clean up the spill.

Kvenvolden, K. A.; Cooper, C. K. **Natural seepage of crude oil into the marine environment.** *Geo - Marine Letters*. 2003; 23 (3-4):140-146. ISSN: 0276-0460.
Natural seeps account for approximately 47% of all crude oil entering the marine environment, and, as a category, surpasses each type of human-induced introduction. The amount of seepage is estimated at 600,000 metric tons per year, but may reach as high as 2,000,000 metric tons, according to the authors.

Lacerda, L. D.; Rezende, C. E.; Ovalle, Á. R. C.; Carvalho, C. E. V. **Mercury distribution in continental shelf sediments from two offshore oil fields in southeastern Brazil.** *Bulletin of Environmental Contamination and Toxicology*. 2004; 72 (1):178-185. ISSN: 0007-4861.
Sediment samples were collected during the winter and summer months of 1998-1999, around platforms south of the Paraíba do Sul River mouth and along the Campos coast. Analysis of data suggests terrigenous influence of Hg in sediments around platforms, although it is difficult to establish the effects of oil producing activities on concentrations of the metal in sediments.

Lambton, J. W. (Ian). **Summary of field equipment requirements for responding to riverine oil spills in ice.** *Spill Science & Technology Bulletin*. 2002; 7 (3/4):173-181. ISSN: 1353-2561.
This paper summarizes the technological requirements and equipment needed for oil spill responses in icy environments, based on data collected from oil spill responses in Western Canada.

Le Floch, Stéphane et al. **The influence of salinity on oil-mineral aggregate formation.** *Spill Science &Technology Bulletin*. 2002; 8 (1):65-71. ISSN: 1353-2561.
In a laboratory experiment, oil-mineral aggregate formation was tested in diluted seawater to obtain a salinity range to predict the significance of this process for the removal of stranded oil in coastal marine environments.

Le Hir, Maryvonne; Hily, Christian. **First observations in a high rocky-shore community after the *Erika* oil spill (December 1999, Brittany, France).** *Marine Pollution Bulletin*. 2002; 44 (11):1243-1252. ISSN: 0025-326X.
Researchers identify changes in community structure in various habitats of an upper shore area following a major oil spill. Long-term monitoring is recommended to track the progression of ecological successions towards a new stable community structure.

Lederer, Cynthia Anne. **Geographic Specific Tactical Response Plan: a Practical Guide for Oil Spill Management and Response.** Thesis (Ph. D.): The Union Institute; 1999; 104 leaves.

Lee, J. C.; Lee, K. Y. **Emulsification using environmental compatible emulsifiers and de-emulsification using DC field and immobilized *Nocardia amarae*.** *Biotechnology Letters*. 2000; 22 (14):1157-1163. ISSN: 0141-5492.

Lee, Kenneth. **Oil-particle interactions in aquatic environments: influence on the transport, fate, effect and remediation of oil spills.** *Spill Science & Technology Bulletin*. 2002; 8 (1):3-8. ISSN: 1353-2561.
Research efforts are being focused on the mechanisms and factors that influence the rate and extent of oil-mineral aggregates, and how this contributes to the removal of stranded oil in secluded intertidal environments.

Lenhart, Melissa; Savage, Kevin. **Vapor combustion solves odor problem at marine crude-oil terminal.** *Oil & Gas Journal*. 2000; 98 (40):78-83. ISSN: 0030-1388.
Over the years a subsidiary of B.C. Gas, Vancouver, had experienced periodic odor problems at its Westridge marine terminal in Burnaby, B.C., from the loading of sour crudes and condensates. TMPL's Westridge marine facility operates the only pipeline system transporting crude oil and petroleum products from Alberta to the western coast of British Columbia. Complaints from neighboring communities regarding odors of sour crude forced the facility to install the vapor-combustion system designed by John Zink Co., Tulsa. The vapor-combustion unit is capable of handling a wide variety of products simultaneously, as well as other high performance design features.

Lessard, R. R.; Demarco, G. **The significance of oil spill dispersants.** *Spill Science & Technology Bulletin*. 2000; 6 (1):59-68. ISSN: 1353-2561.
This paper provides basic information about the use of dispersants as a tool for responding to oil spills. It also provides an overview of dispersant principles and advantages and summarizes the development of COREXIT 9500, a new formula capable of dispersing heavy and weathered oils.

Lin, Qianxin; Mendelssohn, Irving A.; Carney, Kenneth; Bryner, Nelson P.; Walton, William D. **Salt marsh recovery and oil spill remediation after *in-situ* burning: effects of water depth and burn duration.** *Environmental Science & Technology*. 2002; 36 (4):576-581. ISSN: 0013-936X.

Linden, O.; Husain, T. **Impact of wars; the Gulf War 1990-91.** *Gulf Ecosystem: Health and Sustainability (Series: Ecovision World Monograph Series)*. Leiden, Netherlands: Backhuys; 2002; p. 279-290. ISBN: 90-5782-106-0.

Lipscombe, Ray. **Australia's tyranny of distance in oil spill response.** *Spill Science & Technology Bulletin*. 2000; 6 (1):13-25. ISSN: 1353-2561.
This paper has been prepared to identify problems with small oil spill response by personnel in Australia, when compared to possibilities of facing larger spills from sources like large tankers.

Literathy, P.; Quinn, M.; Al-Rashed, M. **Pollution potential of oil-contaminated soil on groundwater resources in Kuwait.** *Water Science and Technology*. 2003; 47 (7-8):259-265. ISSN: 0273-1223.

Løkkeborg, Svein; Humborstad, Odd-Børre; Jørgensen, Terje; Soldal, Aud Vold. **Spatio-temporal variations in gillnet catch rates in the vicinity of North Sea oil platforms.** *ICES Journal of Marine Science*. 2002; 59 (Supplement):S294-S299. ISSN: 1054-3139.
Results obtained from three fishing experiments conducted around an oil platform in the North Sea provided data for potential commercial fishing sites. This data may also provide enough information for the use of decommissioned oil platforms as artificial reefs.

Losh, Steven; Cathles, Lawrence; Meulbroek, Peter. **Gas washing of oil along a regional transect, offshore Louisiana.** *Organic Geochemistry*. 2002; 33 (6):655-663. ISSN: 0146-6380.
GC data was used to plot the mass depletion of *n*-alkanes from oils found along the Louisiana coastline, in a transect extending 180 kilometers into the Gulf of Mexico. Gas washing was found to occur at extremely high rates near to the coast, yet diminished to nil at the south end of the transect.

Lu, J. **Marine oil spill detection, statistics and mapping with ERS SAR imagery in south-east Asia.** *International Journal of Remote Sensing*. 2003; 24 (15):3013-3032. ISSN: 0143-1161.
In this paper, a four-step process is described for successful ocean oil spill monitoring using data generated by ERS-1/2 SAR imagery.

Lyndon, Alastair R. **Long-term impact of Massachusetts oil spill.** *Marine Pollution Bulletin*. 2003; 46 (1):6. ISSN: 0025-326X.
This article reviews a recent study investigating the long-term impact of heavy oil that remains in deep sediments off the cost of Massachusetts following an oil spill that occurred in 1969.

MacAvoy, Stephen E.; Carney, Robert S.; Fisher, Charles R.; Macko, Stephen A. **Use of chemosynthetic biomass by large, mobile, benthic predators in the Gulf of Mexico.** *Marine Ecology - Progress Series*. 2002; 225;65-78. ISSN: 0171-8630.
The benthic community living around a hydrocarbon seep was the focus of a study to determine what role chemosynthetic material played in the nutritional needs of predatory species that thrived in the area.

Madaeni, Sayed Siavash; Yeganeh, Mehrdad Kasrayie. **Microfiltration of emulsified oil wastewater.** *Journal of Porous Materials*. 2003; 10 (2):131-138. ISSN: 1380-2224.
Polyvinylidenefluoride membranes were tested for the treatment of emulsified oil wastewater. Researchers determined the best operating conditions for filtration, and investigated the effects of concentration of contaminants and pH on filtration efficiency.

Maliszewska-Kordybach, Barbara. **Soil quality criteria for polycyclic aromatic hydrocarbons - current information and problems.** *Fresenius Environmental Bulletin*. 2003; 12 (8):919-924. ISSN: 1018-4619.
This review synthesizes data collected in numerous studies regarding PAH content of soils in several European countries, as well as policies and regulatory measures to address the contamination. In conclusion, it suggests that working towards a harmonized European database on PAH content in soils would be beneficial.

Malnic, Eric. **Oil slick is traced to sunken ship; pollution: the substance that has killed birds in the Bay area for years leaks from fuel tanks of vessel that sank in 1953.** *Los Angeles Times*. Los Angeles, Ca.: Times Mirror Company; February 9, 2002; B 12.
Using a remote-controlled submarine, the task force studied the wreckage of the *Luckenbach*, an oil tanker that sank some 50 years ago southwest of the Golden Gate Bridge. Samples of oil collected from the sea surface were taken and compared with the oil previously collected. Experts were able to conclude that the samples of oil matched.

Marshall, Paul A.; Edgar, Graham J. **The effect of the *Jessica* grounding on subtidal invertebrate and plant communities at the Galápagos wreck site.** *Marine Pollution Bulletin*. 2003; 47 (7-8):284-295. ISSN: 0025-326X.
Following the grounding of the *Jessica*, the wreckage caused a shallow furrow approximately 50 by 30 meters to be gouged out in a species-rich area. Concerns over the introduction of foreign species into the area prompted researchers to assess the distribution and abundance of biota within 100 meters of the wreck. Researchers did observe large amounts of indigenous organisms, including algae and large barnacles relatively soon after the accident.

Martinez, M. G. et al. **Diagnostic and resulting approaches to restore petroleum-contaminated soil in a Mexican tropical swamp.** *Water Science and Technology*. 2000; 42 (5-6):377-384. ISSN: 0273-1223.

Masak, Jan; Machackova, Jirina; Siglova, Martina; Cejkova, Alena; Jirku, Vladimir. **Capacity of the bioremediation technology for clean-up of soil and groundwater contaminated with petroleum hydrocarbons.** *Journal of Environmental Science and Health Part A - Toxic/Hazardous Substances & Environmental Engineering*. 2003; 38 (10):2447-2452. ISSN: 1093-4529.
A column reactor was used to assess the efficiency of new technology employed in the cleanup of hydrocarbon pollution at an airport site.

Mayer, P. et al. **Sensing dissolved sediment porewater concentrations of persistent and bioaccumulative pollutants using disposable solid-phase microextraction fibers.** *Environmental Science & Technology*. 2000; 34 (24):5177-5183. ISSN: 0013-936X.

McCay, Deborah P. French; Gibson, Mark; Cobb, J. Stanley. **Scaling restoration of American lobsters: combined demographic and discounting model for an exploited species.** *Marine Ecology - Progress Series*. 2003; 264;177-196. ISSN: 0171-8630.
Following population losses of American lobsters due to the *North Cape* oil spill, researchers create a model for estimating the impact of the spill on populations, as well as develop a restoration course of action that is believed to be the most reliable for recovery of the species.

McCay, Deborah P. French; Peterson, Charles H.; DeAlteris, Joseph T.; Catena, John. **Restoration that targets function as opposed to structure: replacing lost bivalve production and filtration.** *Marine Ecology - Progress Series*. 2003; 264;197-212. ISSN: 0171-8630
The *North Cape* oil spill impacted bivalve populations along the Rhode Island coast. In this paper, a modelling approach was used to estimate population impacts on surf clams, and scaling restoration was employed to develop the optimal recovery scenario for the species.

McCay, Deborah P. French; Rowe, Jill J. **Habitat restoration as mitigation for lost production at multiple trophic levels.** *Marine Ecology - Progress Series*. 2003; 264;233-247. ISSN: 0171-8630.
Scaling restoration was employed to assess recovery habitat following the *North Cape* oil spill. Data from a trophic model suggests the restoration of seagrass beds over salt marsh restoration, based on estimates of primary production and benthic faunal production after re-establishment.

McCleneghan, Kim; Reitter, Gary A.; Hardwick, James E.; McGovern, Patrick T. **Management of oil spill response and cleanup in a river under severe winter conditions.** *Spill Science & Technology Bulletin* . 2002; 7 (3-4):163-172. ISSN: 1353-2561.
This paper describes recovery after an oil spill into the East Walker River near Bridgeport, California, during the winter months. Issues concerning the safety of workers, equipment and legal issues surrounding the recovery are also addressed.

McGirk, Jan. **'Incalculable damage' as oil spills into sea off Galápagos.** *Independent (London)*. London: Newspaper Publishing PLC; January 22, 2001; 13.
Off the coast of San Cristobal island, 1,000 gallons of heavy fuel known as IFO-120 began to leak from a crack in the wrecked diesel tanker *Jessica* into the fragile ecosystem of the archipelago. A US Coast Guard team rushed to the Galápagos Islands to help prevent the stricken tanker from polluting the pristine waters of the remote archipelago.

McMillan, John. **Texaco to settle suit for $10 million; details being finalized, official says.** *Advocate*. Baton Rouge, La.: Capitol City Press; October 20, 2000;B 07.
In 1997 a suit was filed against Texaco and its subsidiary, Texaco Exploration and Production Inc., by the Lafourche Basin Levee District for environmental damages that occurred in the Bay de Chene area of Lafourche Parish. It is noted that Texaco had 130 oil wells operating in the area at one time, and had been operating on several thousands of acres in the area since the early 1940s.

McStay, D. et al. **A multi-capability sensor for hydrocarbons, synthetic-based fluids and heavy metals: applications for environmental monitoring during removal of drill cutting piles.** *Underwater Technology*. 2002; 25 (2):69-75. ISSN: 0141-0814.

Means, Steve R.; Mehdizadeh, Parviz. **New technology improves portable well testing units.** *Oil & Gas Journal*. 2000; 98 (44):36-38. ISSN: 0030-1388
Over the last 2 years, the portable well testing trailer device was compared with the performance of conventional automatic well-testing measurements. The portable well testing device allows an operator to optimize a field's performance by shutting in wells, working them over or stimulating them. Conventional well testing involves gravity separation of the production stream into oil, water, and gas. This new multiphase measurement technology for on line determination of oil, water and gas volumes are accurate and consistent.

Mearns, Alan; Watabayashi, Glen; Lankford, Jeff. **Dispersing oil near shore in the California Current region.** *California Cooperative Oceanic Fisheries Investigations Reports*. 2001; 42;97-109. ISSN: 0575-3317.
Results of mathematical models of different oil spill responses were revealed to ecological risk assessment workshops, in order to arrive at a consensus between competing interests. It was determined that chemical dispersion models showed the best results for survivability of the marine community.

Mendelssohn, Irving A.; Slocum, Matthew G. **Relationship between soil cellulose decomposition and oil contamination after an oil spill at Swanson Creek, Maryland.** *Marine Pollution Bulletin*. 2004; 48 (3-4):359-370. ISSN: 0025-326X.
In a brackish intertidal marsh, the decay of organic matter as measured by cellulose decomposition was not found to be affected by concentrations of oil components that remained from a recent spill.

Meyer, J. F. C. A.; Cantão, R. F.; Poffo, I. R. F. **Oil spill movement in coastal seas; modeling and numerical simulations.** *In* Garcia-Martinez, R.; Brebbia, C. A. (Eds.). *Oil and Hydrocarbon Spills, Modelling, Analysis and Control*. Billerica, Ma.: Computational Mechanics, Inc.; 1998; p. 23-32. ISBN: 1-85312-526-1.
Results from the research of oil spill modelling and simulation in Brazil are presented in this paper.

Michel, Jacqueline. **Assessment and recommendations for the oil spill cleanup of Guanabara Bay, Brazil.** *Spill Science & Technology Bulletin*. 2000; 6 (1):89-96. ISSN: 1353-2561.

Michel, Jacqueline; Henry, Charles B., Jr.; Thumm, Stephen. **Shoreline assessment and environmental impacts from the M/T *Westchester* oil spill in the Mississippi River.** *Spill Science & Technology Bulletin*. 2002; 7 (3-4):155-161. ISSN: 1353-2561.
Authors review possible reasons for a successful recovery after an oil spill, including rapid deployment of booms, and environmental and meteorological events that kept the oil contained and easily accessible by recovery personnel.

Moritis, Guntis. **North Sea giant gas field approaches final months.** *Oil & Gas Journal*. 2002; 100 (28):42-46. ISSN: 0030-1388.
The Frigg field, located on the median line between the Norwegian and UK sectors of the North Sea, poses a complex decommissioning and abandonment challenge. Production is expected to cease as early as 2003, with the decommissioning process lasting another 8 years.

Morrison, R. D. **An environmental forensics focus on petroleum hydrocarbons.** *Environmental Forensics*. 2002; 3 (3-4):203. ISSN: 1527-5922.

Mostafawi, Nasser. **How severely was the Persian Gulf affected by oil spills following the 1991 Gulf War?** *Environmental Geology*. 2001; 40 (10):1185-1191. ISSN: 0943-0105.
After studying fauna in the northwestern part of the Persian Gulf, it was concluded that contamination from oil spills had greatly impacted the biological community in that area.

Mudge, Stephen M. **Reassessment of the hydrocarbons in Prince William Sound and the Gulf of Alaska: identifying the source using partial least-squares.** *Environmental Science & Technology*. 2002; 36 (11):2354-2360. ISSN: 0013-936X.
Assessment of data from two sources indicates that the pre-spill background of hydrocarbons in Prince William Sound comes from mixed sources (coal and oil seeps), although there is considerable variation within the geographic area.

Mudge, Stephen. M.; Miller, N. **Removing mineral oil residues from beaches with vegetable oils.** *In* Garcia-Martinez, R.; Brebbia, C. A. (Eds.). *Oil and Hydrocarbon Spills, Modelling, Analysis and Control*. Billerica, Ma.: Computational Mechanics, Inc.; 1998; p. 323-332. ISBN: 1-85312-526-1.
Biodiesel derived from rapeseed oil was shown to dissolve heavy fractions of weathered Brent crude oil in artificial sand columns. In addition, periodic washing with clean seawater also lifted more crude oil from the sediment than untreated sands.

Mueller, Danica C. et al. **The use of toxicity bioassays to monitor the recovery of oiled wetland sediments.** *Environmental Toxicology and Chemistry*. 2003; 22 (9):1945-1955. ISSN: 0730-7268.
Investigators compared assays for predicting toxicity in petroleum-contaminated wetland sediments. Of the six assays tested, the best results came from the Mictotox 100% test, the Microtox Solid Phase Test, and an amphipod assay.

Mullin, Joseph V.; Lane, James S. **R & D users guide to the Ohmsett oil spill response test facility.** *Spill Science & Technology Bulletin*. 2000; 6 (1):77-87. ISSN: 1353-2561.
The world's largest oil spill response test facility, Ohmsett, is used to test advanced state-of-the-art response technology and to provide independent performance testing and assessment of oil containment and mechanical collection systems.

Munawar, M. et al. **Aquatic ecosystem health of the Arabian Gulf: status and research needs.** *In* Khan, N. Y.; Munawar, M.; Price, A. R. G. (Eds.) *Gulf Ecosystem: Health and Sustainability (Series: Ecovision World Monograph Series)*. Leiden, Netherlands: Backhuys; 2002; p. 303-325. ISBN: 90-5782-106-0.

Muniz, Pablo et al. **Assessment of contamination by heavy metals and petroleum hydrocarbons in sediments of Montevideo Harbour (Uruguay).** *Environment International*. 2004; 29 (8):1019-1028. ISSN: 0160-4120.
Samples of contaminated sediments were collected at eight locations within Montevideo Harbor, Uruguay, during summer and winter of 1998 to establish the spatial distribution of anthropogenic pollutants.

Muschenheim, D. K.; Lee, Kenneth. **Removal of oil from the sea surface through particulate interactions: review and prospectus.** *Spill Science & Technology Bulletin*. 2002; 8 (1):9-18. ISSN: 1353-2561.
Using laboratory and field studies, researchers investigated the role of oil-particle interactions in the removal of petroleum hydrocarbons to determine the influence of environmental factors within a short time of the spill event.

Myers, Phil; Engelhardt, Jerry. **New spill rule for US tank management due out this year.** *Oil & Gas Journal*. 2002; 100 (29):56-65. ISSN: 0030-1388.
The Spills Prevention Control and Countermeasures (SPCC) response plan invokes industry standards as a requirement for implementation at most petroleum distribution facilities, in an effort to prevent spills and improve response.

Nagashima, H.; Ono, Y.; Sekiguchi, M. **Evaluation of aquatic environment by polyaromatic hydrocarbon concentration and induction of EROD activity in HepG2 cells.** *Chemistry Letters*. 2002; (10):1070-1071. ISSN: 0366-7022.

Naidenko, V. V.; Grechkanev, O. M. **The state of components of the biota as an indicator of disturbances in natural ecosystems exposed to petrochemical pollution.** *Russian Journal of Ecology*. 2002; 33 (1):62-64. ISSN: 1067-4136.
Morphological variability was analyzed in ground beetles (*Pterostichus cupreum*) and fruit flies (*Drosophila melanogaster*) near the NORSI Oil Company plant, Russia. A reduction in body size of the ground beetle was discovered, as were morphological changes in the fruit flies over generations when compared to control groups. It is believed that high levels of air pollution recorded around the oil-refining plant are affecting the normal development of animal populations in the area.

Najar, A. M.; Turner, J. T. **Enhanced oil recovery using the rotating-disc skimmer.** *Proceedings of the Institution of Mechanical Engineers, Part E: Journal of Process Mechanical Engineering*. 2000; 214 (4):271-282. ISSN: 0954-4089.
In an effort to improve recovery rates of disc skimmers, experiments were carried out exploring the effects of disc spacing, disc thickness, rotational speeds and oil viscosity on the amount of oil recovered. Authors note that the addition of a rim scoop significantly enhanced recovery rates.

Nam, Kyoungphile; Kukor, Jerome J. **Combined ozonation and biodegradation for remediation of mixtures of polycyclic aromatic hydrocarbons in soil.** *Biodegradation*. 2000; 11 (1):1-9. ISSN: 0923-9820.

Nature works in cleanup crews' favor in Galápagos. *Los Angeles Times*. Los Angeles, Ca.: Times Mirror Company; January 24, 2001;A 01.
As cleanup crews continued to contain the oil spill caused by the wrecked tanker *Jessica*, favorable ocean currents spared one of the world's most significant and sensitive ecosystems from an ecological disaster. According to the Ecuadorian president's office, the 160,000-gallons of oil and diesel fuel was partially dissipated by wind and ocean currents, and had pushed out into the Pacific Ocean, away from the islands.

Neff, Jerry M. **Environmental Impacts of Synthetic-based Drilling Fluids.** New Orleans, La.: U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region; 2000; OCS Study MMS 2000-064; 121 pp.

Nelson, Paul. **Australia's national plan to combat pollution of the sea by oil and other noxious and hazardous substances overview and current issues.** *Spill Science & Technology Bulletin*. 2000; 6 (1):3-11. ISSN: 1353-2561.
A Research Development and Technology Assessment steering committee is responsible for implementing a computer-based National Oil Spill Response Atlas, which will be used as strategy for research and development associated with ship-sourced marine pollution and response.

Nelson, Rob; Turni, Karen. **Spill floods river with oil.** *New Orleans Times-Picayune*. New Orleans, La.: Times-Picayune Publishing Company; November 30, 2000; A 01, 06-07.
On November 27, 2000, a 26-mile stretch of the Mississippi River near Port Sulphur and Plaquemines Parish was shut down to ship traffic, due to an oil spill. A half-million gallons of oil flooded the lower Mississippi River after a tanker lost power and ran aground. Hundreds of environmentalist and marine workers descended on the area near Port Sulphur and Plaquemines Parish to keep an watchful eye on wildlife.

Nicholson, Benjamin L.; Perakis, Anastassios N.; Bulkley, Jonathan W. **Seaborne petrochemical spill analysis within the United States, 1992-1999.** *Environmental Management*. 2003; 31 (4):532-545. ISSN: 0364-152X.
To understand the causes of petrochemical spills, researchers provide a logical and organizational outline capable of presenting a hierarchical progression of events leading up to an oil spill.

Northcott, Grant L.; Jones, Kevin C. **Validation of procedures to quantify nonextractable polycyclic aromatic hydrocarbon residues in soil.** *Journal of Environmental Quality*. 2003; 32 (2):571-582. ISSN: 0047-2425.
Three extraction methods were used on different soil mass ratios, degrees of dryness, and hours of exposure to discover the optimum procedure for removal of PAHs.

Norwegian vessel fined for dumping oily bilge water off Nova Scotia. *AP Worldstream*. April 23, 2001.
Operators of the Bahamian-registered vessel, the *Sandviken*, pleaded guilty to the charge of spilling thousands of liters of oily bilge water off the coast of Nova Scotia in October 2000. The vessel was fined $25,600. An 8-mile slick coated an area about 35 miles southwest of Yarmouth, Nova Scotia, an area frequented by thousands of migratory birds.

Ogus, Ayla. **Three Essays on Accidental Oil Spills.** Thesis (Ph. D.): Boston College; 1999; 111 leaves.

O'Harra, Doug. **Scientists still finding oil after 1989 *Exxon Valdez* spill.** *The Nando Times*. Anchorage Daily News: Nando Media; July 16, 2001.
In a project funded by the *Exxon Valdez* Oil Spill State/Federal Trustee Council, a team of scientists is surveying some of the most oiled beaches around the Sound by digging pits randomly at selected locations to determine how much surface and subsurface oil remains.

Oil leaks from cargo ship on rocks off Norway. *Reuters News Service*. December 27, 2000.
Norwegian anti-pollution authorities rushed to clean up a spill after the *John R* ran aground on rocks off the coast. The spill was roughly 3 km by 3 km in size.

Oil rigs jostle sperm whales in the Gulf of Mexico. *Environment News Service*. May 24, 2001.
Researchers conducted studies to determine the effects of increased deepwater offshore oil and gas exploration on endangered sperm whales in the Gulf of Mexico.

Oil spill concerns linger after Brazil platform disaster. *Oil & Gas Journal*. 2001; 99 (13):24-25. ISSN: 0030-1388.
Brazilian governmental officials were concerned about 1.2 million liters of diesel fuel in storage tanks aboard a Petrobas platform. Petrobas reported that the entire diesel had already leaked from the tanks, because storage tanks would have ruptured before the entire platform came to rest on the seabed 1,350 meters below.

Oil spill found in Mississippi River. *The Associated Press State & Local Wire*. August 29, 2001.
Coast Guard officials discovered an oil spill stretching for about 10 miles in the Mississippi River near New Orleans. Plans were made to survey the spill from the air and a cleanup crew was summoned to the area. No estimate had been made on how much oil had spilled.

Oil spill moves to center of Galápagos ecosystem. *New York Times*. New York, NY: New York Times Company; January 23, 2001;A 06.
Dispersants and absorbents were being used to recover and lessen the effects of the spill that was caused by the oil tanker *Jessica*, which ran aground on January 16, 2001, off the coast of San Cristobal.

Oil spill off Oregon could hit California. *Los Angeles Times*. Los Angeles, Ca.: Times Mirror Company; August 11, 2001; B 10.
Twelve thousands gallons of fuel oil was spilled during a transfer from one tank to another aboard the vessel *MS Tristan*. The vessel was 35 miles off Newport, Oregon, heading north to Tacoma, Washington.

Oil Spill Risks From Tank Vessel Lightering. Washington, D.C.: National Academy Press; 1998; 125 pp. ISBN: 0309061930.

Oil spill threatens Kazakh Caspian sector. *BBC Worldwide Monitoring*. March 30, 2001.
Local rescuers cleaned up an oil patch 20 meters wide and 1.5 km long by hand in the southwest Kazakh sector of the Caspian Sea. The oil had been frozen, but as the ice and snow melted oil was discovered leaking from the surface. Ecologist believe that a combination of heavy oil and shallow water will lead to a build up of contaminated sediments for years to come.

Oil tanker threats environmental disaster in the Gulf. *Euronews (Online)*. April 15, 2001.
A tanker smuggling Iraqi oil sank in the Persian Gulf, threatening pollution along Dubai's coast.

Olivera, N. L.; Commendatore, M. G.; Moran, A. C.; Esteves, J. L. **Biosurfactant-enhanced degradation of residual hydrocarbons from ship bilge wastes.** *Journal of Industrial Microbiology & Biotechnology*. 2000; 25 (2):70-73. ISSN: 1367-5435.
Researchers tested the effectiveness of *Bacillus subtilis* as a biosurfactant ("surfactin") and its role in bioaugumentation in the degradation of hydrocarbons found in bilge wastes. Authors note that this biosurfactant can be produced cheaply and easily, and has promise in the degradation process.

Omar, M. et al. **Distribution of radium in oil and gas industry wastes from Malaysia.** *Applied Radiation and Isotopes*. 2004; 60 (5):779-782. ISSN: 0969-8043.
Investigation of 470 samples from oil and gas industry waste found that radium levels within normal range of concentrations found in soils in Malaysia. However, some of the platform sludge samples were found to have much higher radium concentrations.

Otsuka, N. et al. **Basic study on recovery of spilled oil in the sea by the use of buckets.** *In* Rodriguez, G. R.; Brebbia, C. A. (Eds.) *Oil and Hydrocarbon Spills, Modelling, Analysis and Control II*. Billerica, Ma.: Computational Mechanics Inc.; 2000; p. 155-164. ISBN: 1-85312-828-7.
During a response cleanup of the *Nakhodka* oil spill, a technique was proposed by utilizing a bucket with holes for the recovery of the spilled oil. A series of experiments were conducted with different viscosity to find the optimal hole configuration.

Owens, Edward H. **Response strategies for spills on land.** *Spill Science & Technology Bulletin* . 2002; 7 (3-4):115-117. ISSN: 1353-2561.
Strategy, methods and equipment for spill response operations are primarily associated with operational factors as one variable and levels of cleanup versus natural attenuation as another. Knowledge and response practices are transferred from one scenario to another.

Owens, Edward H.; Henshaw, Tony. **The OSSA II pipeline oil spill: the distribution of oil, cleanup criteria, and cleanup operations.** *Spill Science & Technology Bulletin* . 2002; 7 (3-4):119-134. ISSN: 1353-2561.
Cleanup operations for the OSSAII pipeline spill were developed based on aerial videotape surveys made to assist in oil residue removal operations. In order to respond to specific environmental conditions, four sets of cleanup end points were established. Within three months, the oil removal was considered a success.

Owens, Edward H.; Lee, Kenneth. **Interaction of oil and mineral fines on shorelines: review and assessment.** *Marine Pollution Bulletin*. 2003; 47 (9-12):397-405. ISSN: 0025-326X.
This paper explains the importance of fine mineral particles as they transform stranded oil into oil-mineral aggregate OMA formations, which naturally remove and relocate oiled sediments from sheltered coastal environments.

Owens, Edward H.; Sergy, Gary A. **The development of the SCAT process for the assessment of oiled shorelines.** *Marine Pollution Bulletin*. 2003; 47 (9-12):415-422. ISSN: 0025-326X.
The use of the Shoreline Cleanup Assessment Team process to assess oiled shorelines has greatly improved the protocol for spill response management over the past decade. As the program has evolved, data from the program has become invaluable to planners and decision makers regarding shoreline treatment options.

Owens, Edward. H. **Comment on "The West Falmouth oil spill after thirty years: the persistence of petroleum hydrocarbons in marsh sediments".** *Environmental Science & Technology*. 2003; 37 (9):2020. ISSN: 0013-936X.
The author of this correspondence argues that data from a single core sample used in a previous study by Reddy et al. is too narrow to make an implication that an entire spill area still suffers from residual effects 30 years later.

Paganie, David. **Deepwater presents new construction opportunities.** *Offshore*. 2002; 62 (11):28. ISSN: 0030-0608.
The author describes current developments in the offshore construction industry, including company mergers, the rise of floating production units, subsea production systems, and a potential rise in decommissioning and removal of older platforms.

Page, Cheryl A.; Bonner, James S.; McDonald, Thomas J. **Behavior of a chemically dispersed oil in a wetland environment.** *Water Research*. 2002; 36 (15):3821-3833. ISSN: 0043-1354.
Although there was no reported difference in loss or biodegradation rates between chemically dispersed oil and oil control, dispersed oil was observed to flush off sediments more readily than the oiled control.

Pahl, James W.; Mendelssohn, Irving A.; Henry, Charles B., Jr.; Hess, Thomas. J. **Recovery trajectories after *in situ* burning of an oiled wetland in coastal Louisiana, USA.** *Environmental Management*. 2003; 31 (2):236-251. ISSN: 0364-152X.
This article examines the *in situ* burning of a marshland in the Rockefeller Wildlife Refuge area, Cameron Parish, Louisiana, and its long-term effect on the recovery and restoration of the marsh.

Paige, D.; Park, Nich; Posner, J. **Modeling pipeline spill determines impact on HCAs.** *Oil & Gas Journal*. 2003; 101 (12):72-77. ISSN: 0030-1388.
Hazardous-liquid pipeline operators are being required to develop and follow an integrity-management program, recently passed by the US Office of Pipeline Safety. The program requires operators to maintain a continual assessment of the integrity of all pipeline segments for areas deemed as high consequence areas HCAs.

Parga-Lozano, C. H.; Marrugo-González, A. J.; Fernández-Maestre, R. **Hydrocarbon contamination in Cartagena Bay, Colombia.** *Marine Pollution Bulletin*. 2002; 44 (1):71-74. ISSN: 0025-326X.
Data gathered from sediments and bivalves enabled researchers to construct a hydrocarbon contamination profile of Cartagena Bay, an important tourist attraction and port area.

Pastor, D.; Sanchez, J.; Porte, C.; Albaigés, Joan. **The *Aegean Sea* oil spill in the Galicia coast (NW Spain). I. Distribution and fate of the crude oil and combustion products in subtidal sediments.** *Marine Pollution Bulletin*. 2001; 42 (10):895-904. ISSN: 0025-326X.
Chemical markers that remained detectable in coastal sediments following the *Aegean Sea* grounding, were used to monitor and fingerprint the oil source and weathering. Presence of oil was recognized one year later in the sediments and was found preserved in the subsurface layers.

Patin, Stanislav. **Environmental Impact of the Offshore Oil and Gas Industry.** East Northport, N.Y.: Ecomonitor; 1999; 425 pp. ISBN: 096718360X.

Peachey, Rita B. J. **Tributyltin and polycyclic aromatic hydrocarbon levels in Mobile Bay, Alabama: a review.** *Marine Pollution Bulletin*. 2003; 46 (11):1365-1371. ISSN: 0025-326X.
Sampling sites were mapped in Mobile Bay, Alabama, to analyze spatial and temporal trends in PAH and TBT contamination in sediments and oysters.

Pearce, B.; Jones, D.; McIlvaine, H. **An oil spill model for Cook Inlet and Shelikov Strait, Alaska.** *In* Garcia-Martinez, R.; Brebbia, C. A. (Eds.). *Oil and Hydrocarbon Spills, Modelling, Analysis and Control*. Billerica, Ma.: Computational Mechanics, Inc.; 1998; p. 349-358. ISBN: 1-85312-526-1.
A model has been developed which allows a user to input a number of parameters, including location of spill, duration, time, and update information such as wind speed and direction.

Pearce, Fred. **When is an oil spill an environmental disaster?** *New Scientist*. 2002; 176 (2371):9. ISSN: 0262-4079.
Following the loss of the oil tanker *Prestige*, disagreements among scientists and the Spanish government regarding the decision to tow the tanker out into the deep Atlantic rekindled concerns for the environmental impact of oil spills at sea.

Pecseli, M. et al. **Polycyclic aromatic compounds in the Greenland marine environment.** *Polycyclic Aromatic Compounds*. 2002; 22 (3-4):689-702. ISSN: 1040-6638.

Penn, Tony; Tomasi, Theodore. **Calculating resource restoration for an oil discharge in Lake Barre, Louisiana, USA.** *Environmental Management*. 2002; 29 (5):691-702. ISSN: 0364-152X
Texaco's transmission pipeline discharged 6,561 barrels of crude oil into Lake Barre, Louisiana in May 1997. The objective of this study was to quantify resource impacts and determine the scale of restoration needed.

Penrose, Justin. **Oil spill in channel after ships collide.** *Press Association Newsfile*. April 23, 2001.
The collision of a French fishing boat and an oil tanker occurred in the English Channel on April 23, 2001. The oil tanker was carrying 26,000 tons of oil. About 110 tons of oil spilled into the English Channel.

Pereira, M. Glória; Mudge, Stephen M. **Cleaning oiled shores: laboratory experiments testing the potential use of vegetable oil biodiesels.** *Chemosphere*. 2004; 54 (3):297-304. ISSN: 0045-6535.
A set of experiments were created to determine the effectiveness of using vegetable oil and waste cooking oil biodiesels in cleaning oiled shorelines. Batch experiments showed that vegetable oil biodiesels, comprising rapeseed and soybean oils, were most effective at cleaning oiled sands. In microcosm and mesocosm experiments, oil-contaminated sediments were sprayed with oil biodiesels and subjected to simulated tides. In these experiments, effectiveness of each test was measured in ratios of biodiesel to crude oil.

Peruzzo, P. J.; Porta, A. **Application of multimedia patterns to the study of a case of oil spill in the coast of Rio de la Plata (Argentina).** *Afinidad*. 2003; 60 (504):169-176. ISSN: 0001-9704.

Peterson, Charles H. et al. **Long-term ecosystem response to the *Exxon Valdez* oil spill.** *Science*. 2003; 302 (5653):2082-2086. ISSN: 0036-8075.
This review condenses results of studies that point out the persistence of toxic subsurface oil found in the ecosystems of Prince William Sound. Of special importance to scientists are long-term chronic exposures, some at sublethal levels, which continue to impact the recovery of wildlife and other organisms.

Peterson, Charles H. **The "*Exxon Valdez*" oil spill in Alaska: acute, indirect and chronic effects on the ecosystem.** *Advances in Marine Biology, v.39*. 2001; p. 1-103. ISBN: 0-12-026139-1.
Peterson condenses the results of over two hundred investigations into a comprehensive report on the effects of the oil spill on the Prince William Sound biological community, from intertidal and subtidal species to vertebrates that use shoreline habitats.

Pezeshki, S. Reza; DeLaune, Ronald D.; Jugsujinda, Aroon. **The effects of crude oil and the effectiveness of cleaner application following oiling on US Gulf of Mexico coastal marsh plants.** *Environmental Pollution*. 2001; 112 (3):483-489. ISSN: 0269-7491.
Field studies were conducted in marsh habitats in Louisiana coastal wetlands that consisted of brackish marsh covered by *Spartina patens*, and freshwater marsh covered by *Sagittaria lancifolia*. These two wetland habitats were used to evaluate the effectiveness of COREXIT 9580 in removing oil from plant canopies. Results are discussed.

Pierce, S. E. **Oil signs alluring, but commercial find still elusive in Dominican Republic.** *Oil & Gas Journal*. 2002; 100 (12):40-46. ISSN: 0030-1388.

Pikovskii, Y. I.; Gennadiev, A. N.; Chernyanskii, S. S.; Sakharov, G. N. **The problem of diagnostics and standardization of the levels of soil pollution by oil and oil products.** *Eurasian Soil Science*. 2003; 36 (9):1010-1017. ISSN: 1064-2293.
This study investigated the setting of standards for classifying oil-based soil pollution by different degrees from a method employing multiple data inputs.

Ponti, Massimo; Abbiati, Marco; Ceccherelli, Victor Ugo. **Drilling platforms as artificial reefs: distribution of macrobenthic assemblages of the "*Paguro*" wreck (northern Adriatic Sea).** *ICES Journal of Marine Science*. 2002; 59 (Supplement):S316-S323. ISSN: 1054-3139.
Sampling was used by researchers to investigate a platform that sank in 1965 to determine the structure's support of macrobenthic assemblages. The wreck provides data for overall species richness, based on depth and prevailing currents.

Porte, C.; Bosca, X.; Pastor, D.; Solé, M.; Albaigés, Joan. **The *Aegean Sea* oil spill. 2. Temporal study of the hydrocarbons accumulation in bivalves.** *Environmental Science & Technology*. 2000; 34 (24):5067-5075. ISSN: 0013-936X.

Prego, Ricardo; Cobelo-Garcia, Antonio. **Zinc concentrations in the water column influenced by the oil spill in the vicinity of the *Prestige* shipwreck.** *Ciencias Marinas*. 2003; 29 (1):103-108. ISSN: 0185-3880.
Following the *Prestige* tanker spill, researchers established a sampling regime in the surrounding water column to evaluate the concentrations of zinc contamination, and to determine if the traces of zinc could be used to detect the presence of fuel in areas free of oil.

Price, James M.; Marshall, Charles Francis; Lear, Eileen M. **Oil-Spill Risk Analysis: Use of Floating Production, Storage, and Offloading (FPSO) Systems in the Gulf of Mexico.** Herndon, Va.: U.S. Department of the Interior, Minerals Management Service; Environmental Division; 2000; MMS 2000-059; 269 pp.

Product helps remove oil spills. *Oil & Gas Journal*. 2000; 98 (39):94. ISSN: 0030-1888.
A new nontoxic substance, called Petrotech, encapsulates petroleum spills on contact. This new product creates a "microbial food" that attracts as much as 100% of natural indigenous bacteria to accelerate the biodegredation process of oil.

Pulsipher, Allan G.; Tootle, Deborah; Pincomb, Richard. **Economic and Social Consequences of the Oil Spill in Lake Barre, Louisiana.** New Orleans, La.: U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region; 1998; OCS Study MMS 99-0028; 32 pp.
Short-term social and economic impacts of the spill were very limited, and long-term impacts difficult to guage so soon after this oil spill. Authors note, however, that owners of oyster leases in the vicinity were bringing suit for damages to oyster beds.

Purpura, Paul. **Meeting targets oil spill planning: scenarios designed to challenge officials.** *New Orleans Times-Picayune*. New Orleans, La.: Times-Picayune Publishing Company; April 29, 2002; B 1.
In an effort to organize oil spill response plans for the Gulf of Mexico region, officials gathered for a meeting to challenge information and then worked through exercises of worst case scenario spills.

Qian, Yaorong; Wade, Terry L.; Sericano, Jose L. **Sources and bioavailability of polynuclear aromatic hydrocarbons in Galveston Bay, Texas.** *Estuaries*. 2001; 24 (6A):817-827. ISSN: 0160-8347.
Oysters and sediment were collected from several sites in Galveston Bay between 1986 and 1998. After analyzing concentrations of PAHs and comparing data between the two subjects, researchers conclude that oysters tend to accumulate four to six ring PAHs. Petroleum-based PAHs are not likely to be the primary source of pollution in that system.

Qiao, B. **Oil spill model development and application for emergency response system.** *Journal of Environmental Sciences*. 2001; 13 (2):252-256. ISSN: 1001-0742.

Qiao, B.; Chu, J. C.; Zhao, P.; Yu, Y.; Li, Y. **Marine oil spill contingency planning.** *Journal of Environmental Sciences - China*. 2002; 14 (1):102-107. ISSN: 1001-0742.

Rabalais, Nancy N.; Smith, Lorene E.; Henry, Charles B., Jr.; Roberts, Paulene O.; Overton, Edward B. **Long-Term Effects of Contaminants From OCS Produced-Water Discharges at Pelican Island Facility, Louisiana.** New Orleans, La.: U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region; 1998; OCS Study MMS 98-0039; 88 pp.
Sedimentary analysis of this area in 1989 and 1996 showed that total target aromatic hydrocarbons had been reduced by weathering. However, hydrocarbon concentrations were found deeper in the sediment than before. Also, the effect of hydrocarbons on the benthic community is discussed.

Radetic, Maja M.; Jocic, Dragan M.; Jovancic, Petar M.; Petrovic, Zoran L. J.; Thomas, Helga F. **Recycled wool-based nonwoven material as an oil sorbent.** *Environmental Science & Technology*. 2003; 37 (5):1008-1012. ISSN: 0013-936X.
The sorption properties of recycled wool-based nonwoven material were ascertained for potential use in the cleanup of oil spills. Researchers note that the material may be a viable alternative to commercially available synthetic materials.

Raia, Joseph C.; Blakley, Calvin R.; Fuex, Anthony N.; Villalanti, Dan C.; Fahrenthold, Paul D. **Evaluation of environmental samples containing heavy hydrocarbon components in environmental forensic investigations.** *Environmental Forensics*. 2004; 5 (1):21-32. ISSN: 1527-5922.
This paper describes an analytical technique that combines high-temperature simulated distillation with a mathematical regression to approximate amounts of compounds present in PAHs found in environmental samples. Distributions of hydrocarbons are arrived at by use of GC-MS with nitric oxide ionization spectrometry.

Rain or shine... *Independent (London)*. London: Newspaper Publishing PLC; 2.
This article contains a brief description of an oil spill which endangered the Lungkeng coral reef off the coast of Taiwan. Weather conditions made clean up efforts difficult.

Readman, J. W. et al. **Petroleum and PAH contamination of the Black Sea.** *Marine Pollution Bulletin*. 2002; 44 (1):48-62. ISSN: 0025-326X
Sediments from the Black Sea were analyzed for concentrations of PAHs. Results indicate that the Black Sea is no more contaminated than the Mediterranean Sea, and less contaminated than areas like Hong Kong, Taiwan, or New York Bight.

Reddy, Christopher. M. et al. **Response to comment on ''The West Falmouth oil spill after thirty years: the persistence of petroleum hydrocarbons in marsh sediments".** *Environmental Science & Technology*. 2003; 37 (9):2021. ISSN: 0013-936X.
Authors reply to correspondence, published in Environmental Science & Technology, volume 37 (2003), by addressing concerns about the scope of their study and whether the conclusions could be extrapolated to the entire area originally affected by the spill.

Reddy, Christopher. M.; Quinn, J. G. **The *North Cape* oil spill: hydrocarbons in Rhode Island coastal waters and Point Judith Pond.** *Marine Environmental Research*. 2001; 52 (5):445-462. ISSN: 0141-1136.
During a severe winter storm, the *North Cape* oil barge ran aground near Moonstone Beach, South Kingstown, Rhode Island, spilling approximately 2700 metric tons of No. 2 fuel oil into local coastal waters and salt ponds. The focus of this research was to determine the amount and distribution of PAHs and observe the behavior of PAHs and TPHs relative to each other in the water column after the spill.

Reddy, Chrostopher M. et al. **The West Falmouth oil spill after thirty years: the persistence of petroleum hydrocarbons in marsh sediments.** *Environmental Science & Technology*. 2002; 36 (22):4754-4760. ISSN: 0013-936X.
Sediment cores taken from marshes impacted by the *Florida* spill of 1969 were analyzed by GC and GC x GC. Results show that *n*-alkanes had completely degraded, but other hydrocarbons, including different alkanes, were still present in layers of the sediment.

Reed, Mark; Ekrol, Marve. **Quantifying environmental implications of alternative oil spill contingency and response plans.** *In* Garcia-Martinez, R.; Brebbia, C. A. (Eds.). *Oil and Hydrocarbon Spills, Modelling, Analysis and Control*. Billerica, Ma.: Computational Mechanics, Inc.; 1998; p. 3-22. ISBN: 1-85312-526-1.
Using the SINTEF Oil Spill and Contengency and Response model system, the authors investigate physical, chemical, and toxicological measures of mitigation success.

Reef pollution fears deepen as dead dolphin found off Taiwan. *Agence France Presse*. February 15, 2001.
On January 14, 2001, the *Amorgos* tanker ran aground on Taiwan's "Great Barrier Reef". Shortly after the spill, dead fish, crabs, shrimp and clams washed ashore. One month later as soldiers were still combatting the oil spill, a dolphin was found dead in the polluted reef. EPA officials warn that the pollution could had been worse than originally anticipated.

Refinery completes revamp to accommodate Venezuelan crude. *Oil & Gas Journal*. 2000; 98 (43):30. ISSN: 0030-1388.
A revamp of the Sweeny, Texas refinery to process heavier crude was completed with the help of the Bechtel Corperation, Phillips Petroleum, and Petroleos de Venezuela SA. The new unit gives the refinery the ability to process Merey 16, a blend of heavy crude oil found in eastern Venezuela. The new project gives the refinery the ability to produce fuel-grade petroleum coke, which it can sell as a ingredient for cement or a fuel for electric generation.

Reynolds, John G.; Coronado, Paul R.; Hrubesh, Lawrence W. **Hydrophobic aerogels for oil-spill cleanup: intrinsic absorbing properties.** *Energy Sources*. 2001; 23 (9):831-843. ISSN: 0090-8312

Reynolds, John G.; Coronado, Paul R.; Hrubesh, Lawrence W. **Hydrophobic aerogels for oil-spill clean up - synthesis and characterization.** *Journal of Non - Crystalline Solids*. 2001; 292 (1-3):127-137. ISSN: 0022-3093
Preliminary tests were conducted with Prudhoe Bay crude oil mixed with salt water and aerogel to determine the absorbing capacity of the solid aerogel.

Richardson, K. **Anthropogenically induced changes in the environment: effect on fisheries.** *In* Sinclair, M.; Valdimarsson, G. (Eds.) *Repsonsible Fisheries in the Marine Ecosystem*. New York: Oxford University Press; 2003; p. 275-289. ISBN: 0-85199-633-7.

Rig accident spills crude oil into sea. *Los Angeles Times*. Los Angeles, Ca.: Times Mirror Company; April 13, 2001; A 11.
Seventy-five miles off the southeastern coast of Brazil, an explosion on a Brazilian offshore oil rig dumped more than 3,400 gallons of crude oil into the sea. The oil workers union reported that the spill was six miles long.

Roberts, J. M.; Harvey, S. M.; Lamont, P. A.; Gage, J. D.; **Humphrey, J. D. Seabed photography, environmental assessment and evidence for deep-water trawling on the continental margin west of the Hebrides.** *Hydrobiologia*. 2000; 441 (1-3):173-183. ISSN: 0018-8158.
Photographic images were taken covering a known area of seabed and used to describe the substratum, estimate near bed current direction from sediment bedforms, and estimate the density and composition of any epifaunal megabenthos. Major resources targeted were hydrocarbon reserves and non-quota deep-water fish stocks. The impact of these activities on the deep-water ecosystem remains poorly understood.

Rogers, Howard R. **Assessment of PAH contamination in estuarine sediments using the equilibrium partitioning-toxic unit approach.** *Science of the Total Environment*. 2002; 290 (1-3):139-155. ISSN: 0048-9697.
Equilibrium partitioning-toxic unit testing (EqP-TU) was used to identify sediments from several UK estuaries for the highest potential for toxicity on local fauna. In the course of this investigation, limitations of the EqP-TU approach were discovered.

Rosen, Yereth. **Oil spill concerns spur curbs at BP Alaska field.** *Reuters News Service*. October 18, 2000.
Following the failure of several oil spill tests, the state of Alaska imposed seasonal restrictions on drilling at the offshore Northstar field, where production was expected to begin in 2001.

Rotella, Sebastian; Kraul, Chris. **Oil platform off Brazil sinks and starts leaking.** *Los Angeles Times*. Los Angeles, Ca.: Times Mirror Company; March 21, 2001; A 09.
Despite efforts to save the crippled Brazilian oil platform, the 40-story rig tipped and sank rapidly. Some of the fuel aboard the structure began to leak into the Atlantic Ocean. Cleanup crews that were stationed around the rig contained the relatively small amount of oil and removed it from the surface water.

Rowland, Steven; Donkin, Peter; Smith, Emma; Wraige, Emma. **Aromatic hydrocarbon "humps" in the marine environment: unrecognized toxins?** *Environmental Science & Technology*. 2001; 35 (13):2640-2644. ISSN: 0013-936X.
Monoaromatic components of an unresolved complex mixture (UCM) of hydrocarbons were found to cause a sublethal toxic response in the mussel *Mytilus edulis*. Authors note the resistant nature of UCMs and potential sublethal toxicological effects in the environment.

Rye, H.; Brandvik, P. J.; Strom, T. **Field experiments with subsurface releases of oil.** *In* Garcia-Martinez, R.; Brebbia, C. A. (Eds.). *Oil and Hydrocarbon Spills, Modelling, Analysis and Control*. Billerica, Ma.: Computational Mechanics, Inc.; 1998; p. 277-287. ISBN: 1-85312-526-1.
In June of 1996, field experiments were carried out to chart the behavior of oil and gas during a subsurface blowout. In addition, experiments were carried out by releasing dyed water and gas. Results of the experiments are discussed.

Rytkönen, Jorma; Liukkonen, Seppo; Riipi, Timo. **Laboratory tests of oil spreading under the ice cover.** *In* Garcia-Martinez, R.; Brebbia, C. A. (Eds.). *Oil and Hydrocarbon Spills, Modelling, Analysis and Control*. Billerica, Ma.: Computational Mechanics, Inc.; 1998; p. 155-164. ISBN: 1-85312-526-1.
Four types of oil were tested to judge spreading capabilities in level and rough ice conditions. Authors discovered that the final thickness of the oil slicks did not necessarily depend on the oil type, and also that the rough ice experiments resulted in a thinner, wider slick of oil than level ice experiments.

Sadiq, R.; Husain, T.; Bose, N.; Veitch, B. **Distribution of heavy metals in sediment pore water due to offshore discharges: an ecological risk assessment.** *Environmental Modelling and Software*. 2003; 18 (5):451-461. ISSN: 1364-8152.
This study uses a theoretical case study to assess water quality impacts from various concentrations of synthetic and oil based drilling fluids used in bore hole pressure drilling operations.

Salomone, Monica. **Ecological riches threatened as oil-spill history repeats itself.** *Nature*. 2002; 420 (6914):347. ISSN: 0028-0836.
Nearly 20 species of birds, as well as the Finisterrae Aquarium, were threatened by the spill of heavy oil from the sinking of the *Prestige* in November 2002.

Salter, E.; Ford, J. **Holistic Environmental Assessment and offshore oil field exploration and production.** *Marine Pollution Bulletin*. 2001; 42 (1):45-58. ISSN: 0025-326X.
The Holistic Environmental Assessment is a goal-orientated process that utilizes knowledge from all available sources and disciplines. It attempts to give an accurate account of the total environmental risk to society arising from all phases of oil production and development.

Sassen, Roger et al. **Free hydrocarbon gas, gas hydrate, and authigenic minerals in chemosynthetic communities of the northern Gulf of Mexico continental slope: relation to microbial processes.** *Chemical Geology*. 2004; 205 (3-4):195-217. ISSN: 0009-2541.
Chemical and geological processes are described by researchers investigating the role of microbes and free gas in the development of mineral deposits and chemosynthetic communities around sea floor vents.

Sebastião, P.; Guedes Soares, C. **Weathering of oil spills accounting for oil components.** *In* Garcia-Martinez, R.; Brebbia, C. A. (Eds.). *Oil and Hydrocarbon Spills, Modelling, Analysis and Control*. Billerica, Ma.: Computational Mechanics, Inc.; 1998; p. 63-72. ISBN: 1-85312-526-1.
A model is described that assesses crude oil in eight fractions, formulates the weathering properties of the fractions, and then compares results against a model which predicts weathering of the crude as a whole.

Serret, Pablo; Álvarez-Salgado, Xosé Antón; Bode, Antonio. **Spain's earth scientists and the oil spill.** *Science*. 2003; 299 (5606):511. ISSN: 0036-8075.
Spanish scientists blamed authorities for the region's environmental disaster following the *Prestige* tanker oil spill, because of the lack of scientific and technical consultation protocols.

Seys, J. et al. **Long-term changes in oil pollution off the Belgian coast: evidence from beached bird monitoring.** *Belgian Journal of Zoology*. 2002; 132 (2):111-118. ISSN: 0777-6276.

Sharma, Virender K.; Hicks, Steven D.; Rivera, Wayne; Vazquez, Felipe G. **Characterization and degradation of petroleum hydrocarbons following an oil spill into a coastal environment of south Texas, USA.** *Water, Air, & Soil Pollution*. 2002; 134 (1-4):111-127. ISSN: 0049-6979.
Bank and deep sediments were observed for a year following a spill of light crude oil in a coastal environment. Concentrations of aliphatic and aromatic hydrocarbons were monitored, and degradation rates were compared to known rates based on published research.

Ship with Iraq oil sinks in Gulf fleeing patrol. *Reuters News Service*. August 2, 2001.
A ship smuggling 900 tons of Iraqi oil sank in the Persian Gulf after being intercepted by a U.S.-led naval force monitoring U.N. sanctions against Baghdad. The Bahrain-based Marine Emergency Mutual Centre said the oil posed no danger to any nearby countries.

Short, Jeffrey W. **Estimate of oil persisting on the beaches of Prince William Sound 12 years after the *Exxon Valdez* oil spill.** *Environmental Science & Technology*. 2004; 38 (1):19-25. ISSN: 0013-936X.
Results from estimates of surface and subsurface oil from beach samples indicate that oil remaining from the *Exxon Valdez* spill constitutes the vast majority of biologically available PAHs on beaches and that organisms that rely on these areas for survival face continued exposure to contaminants.

Shriadah, M. A. **Tar contamination on beaches of the United Arab Emirates.** *Bulletin of Environmental Contamination and Toxicology*. 2003; 70 (4):680-687. ISSN: 0007-4861.
Tar balls along the shores of the Arabian Gulf and the Gulf of Oman coastline are being used as indicators to estimate levels of offshore oil pollution.

Small oil spill being cleaned near Eloi Bay. *New Orleans Times-Picayune*. New Orleans, La.: Times-Picayune Publishing Co.; September 10, 2000; B 03.
On September 9, 2000, 275 gallons of oil leaked into Eloi Bay, Louisiana. The bay is rich with shrimp and oyster beds. The company responsible for the spill, which was not identified, was ordered to hire a firm to clean up the oil immediately.

Smircic, A.; Vilibic, I.; Leder, N.; Grzetic, Z. **Diffusion experiment in the Split harbour (middle Adriatic Sea).** *In* Garcia-Martinez, R.; Brebbia, C. A. (Eds.). *Oil and Hydrocarbon Spills, Modelling, Analysis and Control*. Billerica, Ma.: Computational Mechanics, Inc.; 1998; p. 267-276. ISBN: 1-85312-526-1.
An oil spill was created and tracked using chemical, physical, and biological means to determine the diffusion of waste material in the Split harbor area.

Smith, E.; Hegazy, S.; El-Assar, N. **Pond treatment and effluent reuse of sewage from an oil production site in an arid coastal environment.** *Water Science and Technology*. 2003; 48 (2):45-52. ISSN: 0273-1223.

Soldal, Auld Vold; Svellingen, Ingvald; Jørgensen, Terje; Løkkeborg, Svein. **Rigs-to-reefs in the North Sea: hydroacoustic quantification of fish in the vicinity of a "semi cold" platform.** *ICES Journal of Marine Science*. 2002; 59 (Supplement):S281-S287. ISSN: 1054-3139.
Transects were set up around a “semi-cold” platform and carried out 5 nautical miles to estimate the extent to which decommissioned platforms in the North Sea attract fish. Researchers also anchored acoustic transducers from three sides of the platform to monitor fish density at different times of the day and season.

Solorzano, I. et al. **EG injection, gas plant relocation-expansion highlight offshore storage plans.** *Oil & Gas Journal*. 2001; 99 (49):62-64. ISSN: 0030-1388.
A plan to expand an underground natural gas storage area, located in the Gaviota offshore reservoir, northern Spain, is under consideration. The gas treatment and compression facilities are onshore, connected by a subsea pipeline to the Gaviota platform. By expanding the storage area onshore, the Goviota production platform would be re-certified as an unmanned wellhead platform.

Sperduto, Molly B.; Powers, Sean P.; Donlan, Michael. **Scaling restoration to achieve quantitative enhancement of loon, seaduck, and other seabird populations.** *Marine Ecology - Progress Series*. 2003; 264;221-232. ISSN: 0171-8630.
Scaling restoration methods were used to assess recovery for seabird species affected by the *North Cape* oil spill. Results of scaling calculations estimated the optimal number of nest sites and years of protection to bring populations back to pre-spill levels.

Standing, T. H. **Climate change projections hinge on global CO_2, temperature data.** *Oil & Gas Journal*. 2001; 99 (46):20-26. ISSN: 0030-1388.
Concerns and issues over increasing concentrations of atmospheric CO_2 is placing the energy industries in a predicament. This article examines the relationship between hydrocarbon fuels and carbon dioxide emissions, and addresses many points in the global warming debate.

Staniloac, Dumitru; Petrescu, Bogdan; Patroeseu, Constantin. **Pattern recognition based software for oil spills identification by gas-chromatography and IR spectrophotometry.** *Environmental Forensics*. 2001; 2 (4):363-366. ISSN: 1527-5922.
A software application has been designed for quick identification of spill sources based upon data gathered from gas chromatography and infrared spectroscopy. The database uses existing data from known spill sources, including oils and fuels, to match against the unknown source data for quick identification of the source of a spill.

Stejskal, I. V. **Obtaining approvals for oil and gas projects in shallow water marine areas in Western Australia using an environmental risk assessment framework.** *Spill Science & Technology Bulletin*. 2000; 6 (1):69-76. ISSN: 1353-2561.
Increasing public concern about the protection of coastal and marine environments has resulted in the development of statutory and administrative processes. More stringent environmental assessment and operating conditions and greater scrutiny on the issue of access of proposals to marine acreage will be used to evaluate the risk of a project on obtaining government approval of adjacent resources.

Stout, Scott A.; Uhler, Allen D.; McCarthy, Kevin J. **A strategy and methodology for defensibly correlating spilled oil to source candidates.** *Environmental Forensics*. 2001; 2 (1):87-98. ISSN: 1527-5922.
In this report, gas chromatography/mass spectrometry operating in the selected ion monitoring mode was used to investigate 66 candidate sources for a heavy fuel spill. 19 chemical indices were identified based on PAHs and biomarkers that were precise and not weathered, and then analyzed using primary component analysis. This strategy and methodology can be applied to other environmental forensic investigations.

Study could reduce chance of offshore oil leaks. *Marine Pollution Bulletin*. 2001; 42 (10):796. ISSN: 0025-326X.
To detect pipeline releases, pressure safety alarms are installed to indicate a possible leak or break in the pipe. Recommendations for improving the monitoring system's reliability are discussed.

Suderman, Keith; Thistle, David. **Spills of fuel oil #6 and Orimulsion can have indistinguishable effects on the benthic meiofauna.** *Marine Pollution Bulletin*. 2003; 46 (1):49-55. ISSN: 0025-326X.
Researchers placed benthic organisms into microcosms treated with Orimulsion and fuel oil #6. The organisms were assessed for a three-month period using a variety of indicators to determine if the hydrocarbon treatments showed any significant differences.

Sumrow, Mike. **Synthetic-based muds reduce pollution discharge, improve drilling.** *Oil & Gas Journal*. 2002; 100 (52):43-48. ISSN: 0030-1388.
The development and use of synthetic based fluids (SBFs) was determined by a reliable biodegradation test and approved by the EPA. The quantity of SBFs cuttings discharge is limited and controlled through base-fluid stock. By strictly enforcing base-fluid stock, EPA can regulate sediment toxicity and biodegradation of contaminants.

Sun, Xiao-Feng; Sun, Run Cang; Sun, Jing-Xia. **Acetylation of rice straw with or without catalysts and its characterization as a natural sorbent in oil spill cleanup.** *Journal of Agricultural and Food Chemistry*. 2002; 50 (22):6428-6433. ISSN: 0021-8561.
Not only is acetylated straw hydrophobic, but also in laboratory experiments it has been found to have a greater sorption capacity than synthetic sorbents.

Sundararaghavan, Harikrishnan. **Analysis of Oil Containment Failure and Spreading.** Thesis (M.S.): University of Hawaii; 2000; 271 leaves.

Sverdrup, Line E.; Nielsen, Torben; Krogh, Paul Henning. **Soil ecotoxicity of polycyclic aromatic hydrocarbons in relation to soil sorption, lipophilicity, and water solubility.** *Environmental Science & Technology*. 2002; 36 (11):2429-2435. ISSN: 0013-936X.
Authors propose obtaining a dataset from the results of toxicity tests of PAHs on *Folsomia fimetaria*, a soil-dwelling springtail. Results indicate that low toxicity for individual hydrocarbons is attributed to low water solubility.

Takahashi, S.; Ohshima, K.; Kawai, K.; Watanabe, Y.; Saeki, H. **Control and recovery of spilled oil by using ice boom.** *In* Garcia-Martinez, R.; Brebbia, C. A. (Eds.). *Oil and Hydrocarbon Spills, Modelling, Analysis and Control*. Billerica, Ma.: Computational Mechanics, Inc.; 1998; p. 333-345. ISBN: 1-85312-526-1.
The exploration of oil in frozen waters, and the behavior of oil in cold water prompted authors to identify characteristics of oil beneath ice sheets and describe research to develop recovery methods of oil trapped beneath ice floes.

Terek, B. **Dispersants and their use in sea oil spillage cleanup.** *Hrvatske Vode*. 2001; 9 (37):409-422. ISSN: 1330-1144.
This article focuses on the role of surfactants in oil spill cleanup, with special attention to environmental aspects and potential harmful effects of dispersants on the ecosystem.

Teruhisa, Komatsu; Masahiro, Nakaoka; Hiroshi, Kawai; Tomoko, Yamamoto; Kouichi, Ohwada. **Impacts of the *Nakhodka* heavy-oil spill on an intertidal ecosystem: an approach to impact evaluation using geographical information system**. *Marine Pollution Bulletin*. 2003; 47 (1-6):99-104. ISSN: 0025-326X.
Using a geographical information system, topographic images were taken for a period of three years to assess the impact and recovery of flora and fauna of an intertidal ecosystem following the *Nakhodka* heavy-oil spill.

The Americas: Brazilian oil spill threatens beach. *Wall Street Journal*. Chicopee, Ma.: Dow Jones and Company Incorporated; November 26, 2001; A 10.
An underwater pipeline at the Manguinhos refinery near Rio de Janeiro leaked 26,000 gallons of oil, threatening nearby beaches.

Thibault, Marc; Blaney, Sonia. **The oil industry as an underlying factor in the bushmeat crisis in Central Africa.** *Conservation Biology*. 2003; 17 (6):1807-1813. ISSN: 0888-8892.
The bushmeat trade, an illegal activity in Gabon, has grown in large part due to population growth from the oil industry in once-protected areas. Authors believe that the effect of oil industry operations is having a larger impact on forested areas than logging activities. Also, the economic influence of the oil industry can impede legislative attempts to remedy environmental crises.

Tolosa, Imma et al. **Aliphatic and aromatic hydrocarbons in coastal Caspian Sea sediments.** *Marine Pollution Bulletin*. 2004; 48 (1-2):44-60. ISSN: 0025-326X.
Data collected from PAHs in sediments from several areas of the Caspian Sea suggest various origins for the hydrocarbons, depending on sample location. In the South Caspian Sea, where there is considerable offshore oil development, the majority of PAHs are believed to be from fossil sources.

Trofimov, S. Y.; Rozanova, M. S. **Transformation of soil properties under the impact of oil pollution.** *Eurasian Soil Science*. 2003; 36 (Supp. 1):S82-S87. ISSN: 1064-2293.
Authors review studies dealing with oil pollution of soils and, from these, develop a set of standards to distinguish degrees of contamination by oil and oil products.

Tsvetnenko, Yuri; Evans, Louis. **Improved approaches to ecotoxicity testing of petroleum products.** *Marine Pollution Bulletin*. 2002; 45 (1-12):148-156. ISSN: 0025-326X.
This paper describes the evaluation of a revision of steps in the standard protocol for the testing of crude oil toxicity.

Turni, Karen. **Oil tanker moved for repairs.** *New Orleans Times-Picayune*. New Orleans, La.: Times-Picayune Publishing Company; December 13, 2000; B 01-02.
The *Westchester* oil tanker ran aground on the Mississippi River as the result of an explosion in the engine, which caused the vessel to lose power. The tanker dumped 550,000 gallons of crude oil into the Mississippi River. Cleanup crews had recovered approximately 523,000 gallons of emulsified oil from the river. Contractors expected full recovery of the oil to take another two weeks.

TWRI project seeks to find ways to use waters generated by oil and gas production. *New Waves*. College Station, Tx.: Texas Water Resources Institute; 2000; 13 (3):6.
A team of interdisciplinary researchers from Texas A&M University and a group of professional staff from the Texas Agricultural Extension Service are taking steps toward addressing critical water resources and environmental issues. According to the Texas Water Resources Institute, roughly seven barrels of water are produced for each barrel of oil that comes out the ground. In West Texas, more than 400 million gallons of water are produced daily. The researchers will need to figure out how to treat these produced waters and make them suitable for irrigation and revitalizing the ecosystems.

Uninvited guests. *New Orleans Times-Picayune*. New Orleans, La.: Times-Picayune Publishing Company; November 29, 2000; C 01,07.
As divers descended onto the Pan Producer oil rig, which was coming back from Brazil to its home off the Texas coast, they encountered a tropical paradise. Colonies of strange species native to the southern Atlantic Ocean--organisms never before seen in the Gulf of Mexico--were encrusted in the struts of the rig. Scientists say oilrigs that move from foreign waters into the Gulf bring with them an assortment of exotic marine life that could be trouble for the Gulf's delicate ecological balance.

Urban, R.; Hanlon, W. **The application of remote sensing techniques to create a Black Sea coastal response strategy for oil spill response.** *In* Garcia-Martinez, R.; Brebbia, C. A. (Eds.). *Oil and Hydrocarbon Spills, Modelling, Analysis and Control*. Billerica, Ma.: Computational Mechanics, Inc.; 1998; p. 303-311. ISBN: 1-85312-526-1.
Remote satellite imaging, combined with GIS technology, resulted in the creation of a coastal mapping system which identifies and accurately locates various ecosystems along the Black Sea. This will aid in the prioritization of the protection of ecosystems in response to an oil spill.

van Bernem, K. H. et al. **Dispersants as an option in oil-spill combating.** *Hydrologie und Wasserbewirtschaftung*. 2000; 44 (6):290-301. ISSN: 0012-0235.
Investigators note that the physical characterization of the German North Sea coast had led to aggravated environmental damage when field trials were undertaken with older dispersants. However, new generation dispersants, which are less harsh on the environment, could be used in that ecosystem.

van Bernem, K. H.; Bluhm, B.; Krasemann, H. **Sensitivity mapping of particularly sensitive areas.** *In* Rodriguez, G. R.; Brebbia, C. A. (Eds.) *Oil and Hydrocarbon Spills, Modelling, Analysis and Control II*. Billerica, Ma.: Computational Mechanics Inc.; 2000; p. 229-238. ISBN: 1-85312-828-7.
A data system with metadata input points was developed to catalog the ecosystem types of the Wadden Sea estuary and the benthic community by its vulnerability to oil. The maps are now used as part of the German contingency plan for oil spill response.

Varlamov, S. M.; Yoon, J.-H.; Hirose, N.; Kawamura, H. **The oil spill modelling in the Sea of Japan: application to the tanker '*Nakhodka*' 1997 incident.** *In* Garcia-Martinez, R.; Brebbia, C. A. (Eds.). *Oil and Hydrocarbon Spills, Modelling, Analysis and Control*. Billerica, Ma.: Computational Mechanics, Inc.; 1998; p. 359-370. ISBN: 1-85312-526-1.
An oil spill model was developed which included an ocean circulation model and particle tracking technique. Authors believe this model will evolve into a real-time simulation in the future.

Varney, James. **La. oil firm forced to wait in Costa Rica: spate of delays stalls offshore drilling project.** *New Orleans Times-Picayune*. New Orleans, La.: Times-Picayune Publishing Company; February 11, 2002; A 4.
A proposed offshore exploration site six miles of the cost of Costa Rica, is causing tremendous controversy. Opponents argue that Costa Rica doesn't have the capacity to refine the oil experts expect to find. Environmentalists criticize the plan, saying the oil exploration would endanger tourism along the country's coast. Supporters anticipate the much-needed revenue that the project would generate and contribute to this economically depressed area.

Vaughan, Shari L.; Mooers, Christopher N. K.; Gay, Shelton M. **Physical variability in Prince William Sound during the SEA study (1994-98).** *Fisheries Oceanography*. 2001; 10 (Supp. 1):58-80. ISSN: 1054-6006.

Veguería, Sergio F. Jerez; Godoy, José M.; Miekeley, Norbert. **Environmental impact in sediments and seawater due to discharges of Ba, Ra-226, Ra-228, V, Ni and Pb by produced water from the Bacia de Campos oil field offshore platforms.** *Environmental Forensics*. 2002; 3 (2):115-123. ISSN: 1527-5922.
Sediment and seawater samples were taken at distances between 250 to 1000 meters from two offshore platforms in order to evaluate the environmental impact of trace metals found in produced waters. Data indicates that even at close sampling distances, concentrations were similar to local background levels, possibly due to dispersal from strong local currents.

Verma, Dave K.; des Tombe, Karen. **Benzene in gasoline and crude oil: occupational and environmental implications.** *AIHA Journal*. 2002; 63 (2):225-230. ISSN: 1529-8663.
Benzene levels in gasoline have been reduced in North America and Europe to approximately 1% by volume. This trend is reflective of the known impact of this chemical, both to the environment and to occupational exposure to workers in the petrochemical industry.

Verrhiest, G. V.; Clément, B.; Volat, B.; Montuelle, B.; Perrodin, Y. **Interactions between a polycyclic aromatic hydrocarbon mixture and the microbial communities in a natural freshwater sediment.** *Chemosphere*. 2002; 46 (2):187-196. ISSN: 0045-6535.
A PAH mixture was tested on freshwater sediment-based microbial communities to determine toxicity and effects on community structure. PAHs were found to impact microbial population densities and metabolism. Some microorganisms effectively degraded specific hydrocarbons in the PAH mixture.

Verweij, J. M.; Simmelink, H. J. **Geodynamic and hydrodynamic evolution of the Broad Fourteens Basin (the Netherlands) in relation to its petroleum systems.** *Marine and Petroleum Geology*. 2002; 19 (3):339-359. ISSN: 0264-8172.

Vinnem, Jan Erik. **Offshore Risk Assessment: Principles, Modeling and Applications of QRA Studies.** Boston, Ma.: Kluwer Academic Publishers; 1999; 480 pp. ISBN: 0792358600.
All elements of Quantified Risk Assessment (QRA) are detailed in this exhaustive study of hazards encountered in offshore operations. Descriptions of different types of QRA software tools are also included in this book.

Volckaert, F. A. M.; Kayens, G.; Schallier, R.; Jacques, T. G. **Aerial surveillance of operational oil pollution in Belgium's Maritime Zone of Interest.** *Marine Pollution Bulletin*. 2000; 40 (11):1051-1056. ISSN: 0025-326X.
Between 1991 and 1995, remote-sensing aircraft observed 228 oil spills and their patterns. Meteorological and oceanic conditions were then analyzed to discover any correlation between sea conditions and oil slick patterns.

Von Wedel, R. **CytoSol-cleaning oiled shorelines with a vegetable oil biosolvent.** *Spill Science & Technology*. 2000; 6 (5-6):357-359. ISSN: 1353-261.
A new product, CytoSol biosolvent, is used to aid in the removal of crude or fuel oil from shorelines. The use of this minimizes physical and chemical impacts to marine organisms, cleans oiled surfaces effectively, and allows the oiled ecosystem to recover with less mortality than conventional methods.

Wade, Michael J. **Age-dating diesel fuel spills: using the European empirical time-based model in the USA.** *Environmental Forensics*. 2002; 2 (4):347-358. ISSN: 1527-5922.
The Christensen and Larsen empirical time-based petroleum-contamination model was used to evaluate U.S. investigations assessing the date of a diesel fuel spill, and age dating of subsurface petroleum contamination.

Wang, J. R.; Xu, C. **Cleaning method of the oil field wastewater treatment by UF process.** *Journal of Environmental Sciences - China*. 2001; 13 (3):365-367. ISSN: 1001-0742.

Wang, Xiulin et al. **Contribution of biological processes to self-purification of water with respect to petroleum hydrocarbon associated with No. 0 diesel in Changjiang Estuary and Jiaozhou Bay, China.** *Hydrobiologia*. 2002; 469;179-191. ISSN: 0018-8158.
Authors attempt to quantify the scientific basis required for estimating the capacity of environmental factors in the self-purification of diesel-contaminated water. To this end, they incorporate mesocosm and parallel laboratory experiments, and design a conceptual model for predicting petroleum hydrocarbon distribution in multiphase environments.

Watkinson, Captain John. **Oil spill prevention and response initiatives in the Great Barrier Reef.** *Spill Science & Technology Bulletin*. 2000; 6 (1):31-44. ISSN: 1353-2561.
The intent of this paper is to examine the prevention and response initiatives to marine oil spills, and discuss prevention and control measures in place within the Great Barrier Reef.

Webster, Lynda et al. **Aliphatic hydrocarbons and polycyclic aromatic hydrocarbons (PAHs) in sediments collected from the 110 mile hole and along a transect from 58 degrees 58.32'N 1 degrees 10.38'W to the inner Moray Firth, Scotland.** *Journal of Environmental Monitoring*. 2003; 5 (3):395-403. ISSN: 1464-0325.
Geochemical biomarker profiles were used to identify PAHs found in different sections of Moray Firth. Authors identified triterpanes often associated with Middle Eastern oils in small amounts throughout a majority of the sediments from the Firth.

Wei, Q. F.; Mather, R. R.; Fotheringham, A. F.; Yang, R. D. **Evaluation of nonwoven polypropylene oil sorbents in marine oil-spill recovery.** *Marine Pollution Bulletin*. 2003; 46 (6):780-783. ISSN: 0025-326X.
In this study, various types of nonwoven polypropylene materials were investigated to evaluate their initial oil-sorption capacities and oil-retention properties for the removal of spilled petroleum from the marine environment.

Wertheim, Peter Howard. **Brazil interested in exploring deepwater GOM off Cuba.** *Oil & Gas Journal*. 2003; 101 (32):40-41. ISSN: 0030-1388.
As foreign companies participate in the development of Cuba's ultra deepwater oil extraction, US-based oil companies may seek authorization from the US government to compete for exploration rights.

White Rose approval changes focus off Newfoundland. *Oil & Gas Journal*. 2002; 100 (3):58-61. ISSN: 0030-1388.
Steel Floating, Production, Storage, and Offloading vessels (FPSOs), designed for unusual environmental conditions, are being considered for use in the future development off Newfoundland. A field development concept is presented for the FPSO to process, store, and offload production from wellheads into holes buried 10-12 ft below the seabed.

White, Daniel M.; Ask, Ingegerd; Behr-Andres, Christina. **Laboratory study on dispersant effectiveness in Alaskan seawater.** *Journal of Cold Regions Engineering*. 2002; 16 (1):17-27. ISSN: 0887-381X.

Whitfield, John. **How to clean a beach.** *Nature*. 2003; 422 (6931):464-466. ISSN: 0028-0836.
This article discusses the application of technology as a result of decades of research into oil spill cleanup following the wreck of the *Prestige*, as well as the reaction of Spanish scientists to their government's response to the spill and overall commitment to environmental protection.

Wilcoxen, Steven E.; Meier, Peter G.; Landrum, Peter F. **The toxicity of fluoranthene to *Hyalella azteca* in sediment and water-only exposures under varying light spectra.** *Ecotoxicology and Environmental Safety*. 2003; 54 (1):105-117. ISSN: 0147-6513.
Researchers studied the phototoxicity of fluoranthene on a freshwater amphipod using a light regimen for sediment toxicity testing specified by the US Environmental Protection Agency. In sediment experiments, mortality levels were reduced by amphipods burrowing into the sediment to avoid UV light.

Williams, Bob. **Peak-oil, global warming concerns opening new window of opportunity for alternative energy sources.** *Oil & Gas Journal*. 2003; 101 (32):18-28. ISSN: 0030-1388.
Renewable energy sources will play a larger role in overall world consumption in the future, leading to growing business opportunities for companies usually associated with oil and gas exploration and development.

Wilson, Vicky. **Norwegian pollution authority improves oil spill detection by 50%.** *Offshore*. 1999; 59 (7):112. ISSN: 0030-0608.
The MSS 5000 software performs real time geo-correction of the sensor images to produce overlays on the digital map and also incorporates (GIS).

Wiseman, Alan; Goldfarb, Peter; Redgway, Tim. **Aquatic-environment xenoestrogens and phytoestrogens: no clean ecorestoration without biointervention?** *Journal of Chemical Toxicology and Biotechnology*. 1999; 74 (7):597-598. ISSN: 0268-2575.
Authors state that in some cases, post-spill environmental remediation attempts may do more harm than good to the affected ecosystems.

Wittlingerova, Z.; Landa, I. **Evaluation of old environmental loads of soils contaminated by petroleum products.** *Rostlinna Vyroba*. 2001; 47 (8):339-343. ISSN: 0370-663X.

Woodall, Debra W.; Gambrell, Robert P.; Rabalais, Nancy N.; DeLaune, Ronald D. **Developing a method to track oil and gas produced water discharges in estuarine systems using salinity as a conservative tracer.** *Marine Pollution Bulletin*. 2001; 42 (11):1118-1127. ISSN: 0025-326X.
The authors establish a sampling design to assess the impact of drilling discharges and the behavior of the discharged effluents in a small, semi-enclosed bay located at the Empire and Manilla Village sites.

Xu, Ran; Obbard, Jeffrey P. **Biodegradation of polycyclic aromatic hydrocarbons in oil-contaminated beach sediments treated with nutrient amendments.** *Journal of Environmental Quality*. 2004; 33 (3):861-867. ISSN: 0047-2425.
Three nutrient amendments were tested to determine their effects on biodegradation rates by microbial action. Osmocote, a slow-release fertilizer, yielded the best results on target PAHs after 45 days.

Yamamoto, Tomoko; Nakaoka, Masahiro; Komatsu, Teruhisa; Kawai, Hiroshi; Ohwada, Kouichi. **Impacts by heavy-oil spill from the Russian tanker *Nakhodka* on intertidal ecosystems: recovery of animal community.** *Marine Pollution Bulletin*. 2003; 47 (1-6):91-98. ISSN: 0025-326X.
The present study examined population dynamics of individual benthic species and their ability to recover following a heavy oil spill.

Yang, L.; Chen, L. S.; Li, C. F. **Biological cleanup of oil spills on sandy beaches by land farming techniques.** *In* Rodriguez, G. R.; Brebbia, C. A. (Eds.) *Oil and Hydrocarbon Spills, Modelling, Analysis and Control II*. Billerica, Ma.: Computational Mechanics Inc.; 2000; p. 165-175. ISBN: 1-85312-828-7.
The technique of landfarming (raking sandy soil periodically to aerate it), in combination with the use of fertilizers, was found to be effective in the bioremediation of contaminated sandy beach.

Yapa, Poojitha D.; Zheng, Li; Chen, Fanghiu. **A model for deepwater oil/gas blowouts.** *Marine Pollution Bulletin*. 2001; 43 (7-12):234-241. ISSN: 0025-326X.
A computer model was developed to simulate the behavior of oil and gas when released from deepwater locations. The model can account for hydrates moving through different water pressures, and effects of hydrates on the jet and plume of the spilled materials.

Youssef, T.; El-Amry, M.; Youssef, A. **Post-spill behavior in an oil contaminated mangrove stand *Avicennia marina* (Forssk.) Vierh. in UAE.** *Arab Gulf Journal of Scientific Research*. 2000; 18 (2):102-109. ISSN: 1015-4442.

Zenetos, A. et al. **The *Eurobulker* oil spill: mid-term changes of some ecosystem indicators.** *Marine Pollution Bulletin*. 2004; 48 (1-2):122-131. ISSN: 0025-326X.
Eight months after an oil spill, researchers found that the impact on the benthic community was more indirect and delayed than environmental assessments had predicted, possibly due to the geography of the site.

Zheng, L.; Yapa, Poojitha D. **Modeling gas dissolution in deepwater oil/gas spills.** *Journal of Marine Systems*. 2002; 31 (4):299-309. ISSN: 0924-7963.

Zhou, J. L.; Maskaoui, K. **Distribution of polycyclic aromatic hydrocarbons in water and surface sediments from Daya Bay, China.** *Environmental Pollution*. 2003; 121 (2):269-281. ISSN: 0269-7491.

Zhu, L. Z.; Chiou, C.T. **Water solubility enhancements of pyrene by single and mixed surfactant solutions.** *Journal of Environmental Sciences-China*. 2001; 13 (4):491-496. ISSN: 1001-0742.

1971 oil pollution compensation fund wound up. *Marine Pollution Bulletin*. 2000; 40 (12):1068. ISSN: 0025-326X.
A protocol was recently signed for the ending of the IOPC Fund, which is replaced by a Fund agreed on in 1992. The latter Fund allows for higher compensation for parties affected by oil pollution.

A string of misfortune with oil spills continues for Petrobras. *Oil & Gas Journal*. 2000; 98 (32):9. ISSN: 0030-1388.
In a month's time, Petrobras has reported three incidents involving leakage or spills of oil or products. One incident reported a 4,000 litre crude oil spill from an oil tanker off the coast of Rio de Janeiro state. During the same month, the company reported a 4 million-liter crude oil leak from a pipeline at a refinery in Parana state, and recently the company reported that a processing unit at one of its refineries in Rio de Janeiro state had leaked 1,000 liters of the substance MTBE.

Aalund, Leo R. **Offshore conference focuses on rising oil demand.** *Oil & Gas Journal*. 2002; 100 (37):40-41. ISSN: 0030-1388.
Speakers attending the Offshore Northern Seas Conference in Stavanger voiced their differences of opinion regarding predicted shortages of the world's energy resources.

American rig sinks in Mediterranean, 84 rescued. *Reuters*. December 4, 2001.
Due to rough seas, an American oil drilling rig began breaking up and sinking out of Egyptian waters toward the coast off Tel Aviv on Tuesday, December 3, 2001. An international rescue operation airlifted all 84 people aboard the rig and brought them to safety. The drilling rig is owned and operated by Global Santa Fe, the world's second-largest offshore oil and natural gas driller.

Analysts claim early peak in world oil production. *Oil & Gas Journal*. 2002; 100 (34):33-36. ISSN: 0030-1388.
An energy industry consulting firm predicts a peak in world oil production by 2010, resulting in the doubling or trebling of oil prices shortly thereafter.

Anderson, Alison G. **The media politics of oil spills.** *Spill Science & Technology Bulletin*. 2002; 7 (1-2):7-15. ISSN: 1353-2561.
The author argues that particular interests shape media coverage of oil spills as companies compete against one another for market share and influence the public. Media coverage will often feature images for the purposes of entertaining the public rather than relaying important information.

Anderson, Roger N.; Boulanger, Albert. **Enterprise-wide systems integration needed in ultradeepwater operations.** *Oil & Gas Journal*. 2003; 101 (45):48-54. ISSN: 0030-1388.
This article presents lean energy management scenarios that would benefit industries involved in ultradeepwater development, by providing methods that cut costs and predict reservoir performance variability over time.

Antosh, Nelson. **Offshore technology finds deepwater oil; getting it to shore a problem.** *Houston Chronicle*. Houston, Tx: Houston Chronicle Publishing Company; April 29, 2001; 2.
An estimated 10 billion barrels of recoverable oil exists in the Gulf of Mexico, but only 3.6 billion barrels have been developed thus far. Deepwater exploration is outpacing the industry in its ability to extract the oil out of the ground and then transport it to shore.

Appeals court throws out $5 billion punitive-damage award against Exxon. *Houma Daily Courier*. Houma, La.: Houma Daily Courier; November 8, 2001; A 9.
Following the 1989 *Exxon Valdez* oil spill, family owned fishing permits lost more than 3/4 of their value. In an attempt to have Exxon pay for the destroyed leases, the fisherman filed a $5 billion dollar punitive-damage suit against Exxon. A federal appeals court in Juneau, Alaska threw out the suit saying that while damages were justified to punish the company for the 1989 oil spill, $5 billion was an excessive amount.

Arata, Catalina M.; Picou, J. Steven; Johnson, G. David; McNally, T. Scott. **Coping with technological disaster: an application of the conservation of resources model to the *Exxon Valdez* oil spill.** *Journal of Traumatic Stress*. 2000; 13 (1):23-39. ISSN: 0894-9867.

Austin, Diane. **Social and Economic Impacts of Outer Continental Shelf Activities on Individuals and Families.** New Orleans, La: U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region; 2002; OCS Study MMS 2002-022 & 023; various pages.

Auty, Richard. **Natural resources and 'gradual' reform in Uzbekistan and Turkmenistan.** *Natural Resources Forum*. 2003; 27 (4):255-266. ISSN: 0165-0203.
This study argues that in two resource-rich developing nations, excessive reliance upon natural resource rents have created a condition whereby capital is used to consolidate political power rather than being allocated towards economic reform to market-based systems.

Bainbridge, Keith. **World markets speeding change for LNG shipping.** *Oil & Gas Journal*. 2004; 102 (17):98-100. ISSN: 0030-1388.
The author takes a retrospective look at the functionality of LNG carriers from their inception in 1964 to the present time.

Bakhtiari, A. M. Samsam. **North Sea oil reserves: half full or half empty?** *Oil & Gas Journal*. 2003; 101 (33):24-32. ISSN: 0030-1388.
This article recounts the history of North Sea oil production, and provides evidence that the six UKCS giant reserves are in decline.

Bakhtiari, A. M. Samsam. **World oil production capacity model suggests output peak by 2006-07.** *Oil & Gas Journal*. 2004; 102 (16):18-20. ISSN: 0030-1388.
Results from a model estimating recoverable hydrocarbons from conventional oil reserves suggest that global oil production will peak well before the end of the decade, leading to an irreversible decline of oil production.

Banasak, Sara; Traxler, Franz. **Public resistance narrowing LNG options in North America.** *Oil & Gas Journal*. 2004; 102 (22):20-24. ISSN: 0030-1388.
The construction of proposed LNG regasification terminals around the United States and Mexico are facing public opposition because of environmental implications.

Barbosa, F. **Mexico's new government launches major projects to boost oil production.** *Oil & Gas Journal*. 2001; 99 (19):66-69. ISSN: 0030-1388.
The new administration of Mexican President Vicente Fox recently approved the upstream investment program by Petroleos Mexicanos to increase output of heavy and light crude oil. Priorities outlined for the projects are: to boost oil and gas recovery in fields in the Bay of Campeche; and to boost production in the Delta del Grijalva region.

Barrow, C. W.; Sweeney, S. E. **Beyond crisis science and emergency legislation: what do we really know about oil spills.** *Spill Science & Technology Bulletin*. 2002; 7 (1-2):3-6. ISSN: 1353-2561.
According to the authors, enforcement of the US Oil Pollution Act of 1990 has exceeded the estimated economic benefits of the legislation. Critics argue that the legislation does not account for non-economic losses, such as the disruptive impact to the culture of local communities.

BC investigates lifting West Coast exploration ban. *Oil & Gas Journal*. 2002; 100 (3):62-63. ISSN: 0030-1388.
British Columbia's new Liberal government has appointed a three member scientific panel to examine technical and scientific issues related to offshore exploration in the Queen Charlotte basin off Canada's West Coast. This area is subject to both British Columbia and federal moratoria on industry activity. Supporters for the removal of the ban claim that renewed exploration would be a major boost for the economy.

Behm, Ed; Brett, J. Ford. **Analysis used to assess, improve drilling performance.** *Oil & Gas Journal*. 2004; 102 (9):43-48. ISSN: 0030-1388.
The authors give an explanation of perfect-well analysis, which assesses drilling performance as a way to identify areas that need cost savings.

Behm, Ed; Brett, J. Ford. **Measure drilling performance objectively.** *Oil & Gas Journal*. 2004; 102 (11):39-43. ISSN: 0030-1388.
Perfect-well analysis is a new technique used to evaluate performance standards and improve well-cost estimates.

Behr, Peter. **BP Amoco reviews safety at Prudhoe Bay; foes of Arctic drilling say shutoff valve failures endanger the land.** *Washington Post*. Washington, D.C.: Washington Post Company; July 15, 2001; A 13.
A review of safety systems at the Prudhoe Bay oil field in Alaska began after BP Amoco PLC acknowledged an increase in test failures of emergency shutoff valves designed to stop oil spills and prevent gas explosions at the field.

Behr, Peter. **Chevron to acquire Texaco; deal creates no. 4 oil firm in world.** *Washington Post*. Washington, D.C.: Washington Post Company; October 16, 2000; A 01. ISSN: 0740-5421.
Aspects of the merger, including a possible loss of 4,000 jobs and scrutiny from the U. S. Federal Trade Commission, are discussed.

Behr, Peter. **High court denies *Exxon Valdez* review.** *Washington Post*. Washington D.C.: Washington Post Company; October 3, 2000; A 02. ISSN: 0740-5421.
Exxon Mobil Corporation lost a bid for a Supreme Court review of a $5 billion punitive damage award for the 1989 *Exxon Valdez* oil spill. The court refused to consider Exxon Mobil's argument concerning alleged irregularities, which occurred during deliberations.

Biers, John M. **Gulf oil, gas firms to merge.** *New Orleans Times-Picayune*. New Orleans, La.: Times-Picayune Publishing Company; October 31, 2000; C 01-02.
Stone Energy Corp., a natural gas company, announced its purchase of Basin Exploration Inc. The purchase of the Rocky Mountain-based rival combines two Gulf Coast operators that specialize in natural gas production, boosting production at a time of strong commodity prices. This purchase will improve reserves, production rates, enhance its exploratory prospects, as well as adding to the cash flow.

Biers, John M. **The deepening debate; new oil vessels may be headed deep into the gulf. But critics say the massive rigs are environmental hazards.** *New Orleans Times-Picayune*. New Orleans, La.: Times-Picayune Publishing Co.; December 31,2000; Money; 01.
The use of FPSOs has been approved off the coasts of Louisiana and Florida, with some restrictions. Industry officials and environmental advocates weigh in on either side of the issue.

Birch, C. **Achieving maximum crude oil value depends on accurate evaluation.** *Oil & Gas Journal*. 2002; 100 (2):54-56. ISSN: 0030-1388.
To achieve accurate crude oil value, several key issues such as distillation yield, bulk property, refining value and supply and demand can influence the market and price differentials.

Birkland, Thomas A.; Lawrence, Regnia G. **The social and political meaning of the *Exxon Valdez* oil spill.** *Spill Science & Technology Bulletin*. 2002; 7 (1-2):17-22. ISSN: 1353-2561.
The attention received by the *Exxon Valdez* oil spill was due to a cultural tension between an identification with the wilderness versus the need for exploitation of natural resources, according to the authors.

Born, Abraham F.; Espinoza, Eduardo; Murillo, Juan Carlos; Nicolaides, Francis; Edgar, Graham J. **Effects of the *Jessica* oil spill on artisanal fisheries in the Galápagos.** *Marine Pollution Bulletin*. 2003; 47 (7-8):319-324. ISSN: 0025-326X.
Reports of total catches of fishes hauled from sites near the grounding of the oil tanker *Jessica* indicated no significant changes after the spill. However, large boats tended to avoid the areas directly impacted by the accident. A decline in fishing by small boat operators were recorded and later noted that the vessels were used in clean up operations.

Boughton, Bob; Horvath, Arpad. **Environmental assessment of used oil management methods.** *Environmental Science & Technology*. 2004; 38 (2):353-358. ISSN: 0013-936X.
This paper reviews the Used Oil Management Methods program, to assess the environmental impact and benefits based on the product end-of-life scenario.

Bourdelande, J. L.; Marquet, J.; Herance, J. R.; Balduzzi, U. **Cleaning-up of oil taint stones by using H_2O_2, metallic salts and light.** *Photochemical & Photobiological Sciences*. 2004; 3 (4):329-330. ISSN: 1474-905X.
Authors describe a process whereby oiled stones were cleaned by a solution of hydrogen peroxide and metallic salts. Tests were carried out in both sunlight and dark conditions.

Brown Jeffrey. **Sputtering Asia-Pacific oil demand to improve in 2002.** *Oil & Gas Journal*. 2001; 99 (48):24-26. ISSN: 0030-1388.
In this review of the changing patterns of oil demands in the Asia-Pacific region, the effects on past, present, and future Asia-Pacific oil demands is examined in a global context.

Bruso, Joseph M., Jr.; Getz, Steven L.; Wallace, Ronald L. **Geology will support further discoveries in Gulf of Guinea's Golden Rectangle.** *Oil & Gas Journal*. 2004; 102 (7):30-38. ISSN: 0030-1388.
This paper reviews current geological information that suggests additional oil discoveries in the area over the next five years.

Burke, Bruce F. **China's crude imports disrupt global supply.** *Oil & Gas Journal*. 2001; 99 (8):64-65. ISSN: 0030-1388.
Analysts note that China was the main recipient of OPEC crude in 2000 rather than Europe or the US. China's crude imports increased more than 700,000 b/d, implying a crude oil inventory buildup of 71 million bbl in the first 9 months of 2000.

Canada prosecutes oil polluting ship. *Marine Pollution Bulletin*. 2001; 42 (5):337. ISSN: 0025-326X.
In February 2000, Oak Maritime (Canada) Inc., owners of the vessel *M. V. Donau Ore*, pleaded guilty to the charge of illegal dumping of oily bilge waste. The vessel was observed by aerial surveillance, and was seen trailing a seven-kilometer long oil slick. The slick was approximately 40 miles from the Cape St. Mary's Ecological Reserve in southeast Newfoundland.

Canadian ship fined $450,000 for dumping oil. *Marine Pollution Bulletin*. 2004; 48 (5-6):416. ISSN: 0025-326X.
A Canadian company operating the Philippine-flagged cargo ship *Emerald Banker* offered a guilty plea on November 14, 2003 for violating the Act to Prevent Pollution from Ships by dumping oil in the Pacific Ocean. The company was sentenced to 4 years probation and fined $450,000.

Castle, Jack. **Custom designed bits improve efficiency, lower costs.** *Oil & Gas Journal*. 2003; 101 (49):60-62. ISSN: 0030-1388.
Drilling operators evaluate custom designed bits for specific applications to improve drilling performance and save money.

Cautious optimism characterizes Gulf of Mexico activity. *World Oil*. 2001; 222 (1):111-113. ISSN: 0043-8790.
The Gulf of Mexico E&P activity appears healthy, with strong indications that it will remain active at least during the next year. However, some analysts warn of jackup rig reduction due to a decline in shelf reserves.

Chang, Thi. **Sincor to offer Zuata Sweet crude in 2002.** *Oil & Gas Journal*. 2001; 99 (29):52-54. ISSN: 0030-1388.
The company Sincor will complete and commission its heavy oil upgrader at Venezuela's Jose industrial complex by the end of 2001. The oil upgrader will transform heavy oil from Orinoco to Zuata Sweet crude oil. This crude is mainly targeted for the US markets in the early months of 2002.

China expects offshore production to buttress overall output target. *Oil & Gas Journal*. 2001; 99 (51):58-65. ISSN: 0030-1388.
Analysts predict that by 2005 China's offshore oil production will double the level set in 2001. As China becomes more and more reliant on offshore supplies of crude oil, exploration opportunities are promising for foreign companies.

Clark, Judy. **Government, industry forge partnerships for security enhancement.** *Oil & Gas Journal*. 2003; 101 (24):20-24. ISSN: 0030-1388.
A network of federal departments and agencies are working together with the US Department of Homeland Security to provide a secure infrastructure for the energy industry and personnel as the risks of terrorism continue.

Cuba's oil output rises, other projects loom absent sanctions. *Oil & Gas Journal*. 2002; 100 (1):38-39. ISSN: 0030-1388.
Two senior diplomats from the US administration, working as independent consultants, conducted a study showing the continued increase of foreign companies interested in oil and gas exploration in Cuba. These consultants believe that lifting the embargo against Cuba would provide US energy firms between $2 billion and $3 billion per year in additional revenues.

Cueille, Jean-Philippe; Rodriguez, Jesus F. de Miquel. **Large US independent petroleum firms emerging as viable competitors to majors.** *Oil & Gas Journal*. 2003; 101 (8):22-30. ISSN: 0030-1388.
Competition from small independent companies that are merging to become one major company is growing significantly. This article identifies features and assesses these companies on the world oil and gas scene.

Dauterive, Les. **Rigs to Reefs Policy, Progress, and Perspective.** New Orleans, La.: U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region; 2000; OCS Study MMS 2000-073; 8 pp.
This report emphasizes the Rigs-to-Reefs policy, which provides the oil industry with rig disposal alternatives and options for the reduction of abandonment costs and the preservation of associated reef organisms. This creates an incentive to convert platforms to reefs. These platforms provide the largest artificial reefs complex in the world.

Davis, Michael. **In *Erika's* wake, capacity sinks; oil companies abandoning older tankers, precipitating shipping-capacity shortage.** *Houston Chronicle*. Houston, Tx.: Houston Chronicle Publishing Company; December 3, 2000; Business – 01.
Following the grounding of the *Erika*, a 25-year old Maltese tanker, off the western coast of France, stricter standards are being enforced regarding the transport of oil on old tankers. Analysts predict that phasing out the vintage tankers, and having to charter newer tankers will result in higher oil prices.

de Mora, Stephen J.; Turner, Tim. **The Caspian Sea: a microcosm for environmental science and international cooperation.** *Marine Pollution Bulletin*. 2004; 48 (1-2):26-29. ISSN: 0025-326X.
An overview of the Caspian Sea region touches upon hydrology, environmental sciences, industrial development, and the formation of various treaties and protocols by international bodies and regional governments to protect the ecosystem.

Deepwater Gulf of Mexico Environmental and Socioeconomic Data Search and Literature Synthesis Volume I: Technical Narrative and Volume II: Annotated Bibliography. New Orleans, La.: U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region; OCS Study MMS 2000-049 & 50; various pages.

Deepwater testing center proposed off French Riviera. *Oil & Gas Journal*. 2002; 100 (36):25-26. ISSN: 0030-1388.
The world's first deepwater testing facility, located off Toulon on the French Riviera, is in submission to possible financial bidders. The facility will provide information regarding equipment needed for deepwater hydrocarbon exploration, development, and production facilities testing.

Diller, S. **Risk assessment and cost-benefit techniques as management tools for oil spill prevention.** *In* Garcia-Martinez, R.; Brebbia, C. A. (Eds.). *Oil and Hydrocarbon Spills, Modelling, Analysis and Control*. Billerica, Ma.: Computational Mechanics, Inc.; 1998; p. 253-263. ISBN: 1-85312-526-1.
Concepts and examples in risk prevention and risk assessment are presented to show the link between oil spill prevention options and the management finance decision-making process.

Dittrick, Paula. **Pioneer working to develop oil, gas businesses in South Africa.** *Oil & Gas Journal*. 2002; 100 (11):48-51. ISSN: 0030-1388.
An anticipated startup of Sable field, off the coast of South Africa, is expected in the first quarter of 2003. Pioneer Natural Resources Co., Dallas, is attempting to develop a future gas market in South Africa. Pioneer is the first outside company to produce oil off the coast of South Africa.

Dittrick, Paula. **Industry likely to keep pace with LNG vessel demand.** *Oil & Gas Journal*. 2004; 102 (22):30. ISSN: 0030-1388.
Increased demands for larger LNG carriers to be built will double by 2015. Although a strong LNG trade and transport are expected for many years to come, the shipping industry is concerned that not enough people will be available to operate all the anticipated vessels.

Doering, Christopher. **US advisory panel urges outer shelf drilling.** *Reuters News Service*. May 24, 2001.
A report issued by the Interior Department advisory panel is recommending the federal government move forward with a plan that could open protected American shorelines for future oil and gas exploration. Environmental groups believe that coastal waters off California, North Carolina, Georgia, and Florida could be studied.

Drieu, Michael D.; Nourse, Peter C.; MacKay, Ronald; Cooper, David A.; Hvidbak, Flemming. **Latest update of tests and improvements to US Coast Guard viscous oil pumping system.** *Marine Pollution Bulletin*. 2003; 47 (9-12):470-476. ISSN: 0025-326X.
The US Coast Guard and several maritime working groups are sharing ideas and techniques to safely transport and improve the pumping technology of viscous oil products.

Ebeku, Kaniye S. A. **Nigerian Supreme Court and ownership of offshore oil.** *Natural Resources Forum*. 2003; 27 (4):291-299. ISSN: 0165-0203.
A decision by Nigeria's Supreme Court negated a constitutional provision requiring that 13% of mineral royalties go to states from which resources were extracted. In this study, the author argues that the decision granting the national government all offshore royalties failed to consider the legislative history of the provision, as required by law. Further, the decision is likely to inflame sentiments in the delta region, where there is already widespread discontent over environmental damage from oil extraction and perceptions about the relationship between the oil industry and government on economic matters.

Eggeling, T.W. **Government perspective, statutory protection and the direction of future research and co-operation in the context of the marine environment.** *Aquatic Conservation-Marine and Freshwater Ecosystems*. 2002; 12 (1):153-159. ISSN: 1052-7613.
Future oil exploration in the Falkland Islands will be considered within the framework of a broad environmental policy incorporating several interest groups and governmental agencies.

Eleven companies to draw crude from SPR. *Oil & Gas Journal*. 2000; 98 (42):46. ISSN: 0030-1388.
The Clinton administration has authorized the US Department of Energy to accept bids from 11 companies seeking 30 million bbl of oil from the Strategic Petroleum Reserve. DOE has estimated that the release of the 30 million bbl of crude this fall could result in additional production of 3-5 million bbl of heating oil. The Energy Department is not releasing the individual amounts to be returned by individual companies at this time. Disclosing the specific exchange ratios at the point could bias future offers should the exchange process be repeated.

Emerson, S. **SPR drawdowns trigger law of unintended consequences.** *Oil & Gas Journal*. 2001; 99 (50):24-30. ISSN: 0030-1388.
As the US continues a global campaign against terrorism, the risk of disruption of oil imports continues to grow. This article reflects on the three drawdowns from the Strategic Petroleum Reserve (SPR) over time, and describes the unintended consequences that the US has faced from these actions. The author also reiterates the SPR's original emergency preparedness mission.

Enger, S.; Logan, A. **Ultradeepwater play paces gulf, North America.** *Oil & Gas Journal*. 2001; 99 (45):80-85. ISSN: 0030-1388.
As several recent discoveries come on line in the next few years, oil and gas output from deepwater fields is set to grow at an increasing rate. The industry appears to have found approximately 4 billion barrels of oil in nine discoveries.

Environmental effects of the *Erika* oil spill. *Marine Pollution Bulletin*. 2003; 46 (5):530. ISSN: 0025-326X.
A joint program was set up between the French Research Institute for Exploitation of the Sea and the National Institute for the Industrial Environment and Risks to coordinate projects addressing the environmental impact of an oil spill caused by the tanker *Erika* in the Bay of Biscay, France.

EPA files complaints for lack of oil spill measures. *Marine Pollution Bulletin*. 2002; 44 (11):1320. ISSN: 0025-326X.
Complaints were filed by the EPA against facilities in New England that have not implemented a Spill Prevention Control and Countermeasure Plan. Facilities were fined for storm water collection systems that were found to drain into water bodies, and for storing large amounts of oil on site.

Eskew, Blake T.; Jones, Stephen L. **Gulf deepwater crude impacts downstream disposition.** *Oil & Gas Journal*. 2001; 99 (18):80-90. ISSN: 0030-1388.
The rapid growth of deepwater exploration in the Gulf of Mexico poses economic and logistic challenges associated with marketing the new production. Clearly, new infrastructure and new supply relationships must be established to develop future production.

ExxonMobil drops Trinidad deepwater blocks, looks to Gulf of Paria venture. *Oil & Gas Journal*. 2003; 101 (5):44-45. ISSN: 0030-1388.
Despite a recent withdrawal from an exploration commitment off the East Coast of Trinidad, ExxonMobil has negotiated with government officials to forego penalties as part of an agreement to invest into a joint geotechnical study in an area in the Gulf of Paria.

Fall, James A.; Ultermohle, Charles J.; Brown, Louis A. **Subsistence Harvests and Uses in Eight Communities Ten Years After the *Exxon Valdez* Oil Spill.** Juneau, Ak: Alaska Department of Fish and Game, Division of Subsistence; 1999.

Fatica, Al. **Gas-quality debate heats up as more US LNG imports loom.** *Oil & Gas Journal*. 2004; 102 (22):69-74. ISSN: 0030-1388.
US natural gas processing plants are closing because of unfavorable economic conditions for the extraction of natural gas liquids (NGLs), allowing unacceptable accumulations of heavier NGLs to flow through transmission pipelines. Developments of large gas projects outside the US are gaining momentum and prompting the demand for more US LNG import terminals.

Field, Lawrence J. **Evaluating and Communicating Subsistence Seafood Safety in a Cross-Cultural Context: Lessons Learned from the *Exxon Valdez* Oil Spill.** Pensacola, Fl.: SEATAC Press; 1999; 338 pp. ISBN: 1880611295.
This book is dedicated to the people of Prince William Sound, Lower Cook Inlet, Kodiak Island, and the Alaska Peninsula whose subsistence food resources and traditional way of life were affected by the 1989 *Exxon Valdez* oil spill.

Fla. drilling rights plea rejected by U.S. *Los Angeles Times*. Los Angeles, Ca.: Times Mirror Company; April 18, 2001; A 8.
An appeal to stop the planned auction of offshore oil and gas leases in the eastern Gulf of Mexico was rejected by the Bush Administration. Florida's governor, Jeb Bush led the effort to block the sale of converted offshore oil and gas leases.

Fleming, Michael; Fleming, R. Farley. **Workers identify hazards through energy source recognition.** *Oil & Gas Journal*. 2002; 100 (29):42-47. ISSN: 0030-1388.
Authors identify energy sources as the origin of hazards in the workplace. One case study demonstrates how a safety-training program stressing this concept has been successfully implemented.

Fletcher, Sam. **Industry ponders if oil production can rise to meet demand.** *Oil & Gas Journal*. 2001; 99 (9):30-31. ISSN: 0030-1388.
Analysts predict that in order to meet future demands for oil, a worldwide average of a 7% increase in production rate is required. Worldwide, the industry has discovered more than the equivalent of 700 billion barrels of oil not yet developed. To bring future supplies online in a timely manner, governments of oil and gas-producing countries must first establish regulatory and fiscal policies that encourage rather than discourage access to exploration prospects.

Fletcher, Sam. **MMS ups Gulf of Mexico deep gas reserves estimate.** *Oil & Gas Journal*. 2003; 101 (46):29-30. ISSN: 0030-1388.
To project future reserves, MMS analysts have reinterpreted data estimates of deepwater natural gas reservoirs on the Outer Continental Shelf of the Gulf of Mexico.

Fletcher, Sam. **Senate asks Interior to halt new drilling off California.** *Oil & Gas Journal*. 2002; 100 (41):30. ISSN: 0030-1388.
The US Senate unanimously approved a bill that will prohibit new drilling activities in undeveloped leases off the coast of California.

Freudenburg, William R.; Gramling, Robert. **How crude: advocacy coalitions, offshore oil, and the self-negating belief.** *Policy Sciences*. 2002; 35 (1):17-41. ISSN: 0032-2687.
The Advocacy Coalition Framework (ACF) theory of policy formulation was tested by applying it to the offshore leasing program under the Reagan Administration. The authors believe that the ACF needs refining if it is to be a standard methodological tool.

Frumkes, D. R. **The status of the California rigs-to-reefs programme and the need to limit consumptive fishing activities.** *ICES Journal of Marine Science*. 2002; 59 (Supplement):S272-S276. ISSN: 1054-3139.
Portions of decommissioned rigs are evaluated for their value to marine habitats, but consumptive fishing could hamper enhancement potential. An enhancement trust fund has been established, with the program receiving a minimum of 40% of the savings from decommissioned rigs.

Gaddy, Dean. **Russian oil companies improve.** *Oil & Gas Journal*. 2001; 99 (8):30-34. ISSN: 0030-1388.
Despite low levels of direct foreign investment, Russian oil companies continue to improve operational and financial efficiencies. The introduction of modern business practices, and new organizational structures, influenced aggregate output, which has risen for the first time in 11 years.

Galil, N. I.; Levinsky, Y. **Reuse of industrial wastewater effluent in the petrochemical industry.** *In* Rubin, H.; Nachtnebel, P.; Shamir, U.; Furst, J. (Eds.) *Water Resources Quality*. Berlin: Springer Verlag; 2002; p. 331-345. ISBN: 3-540-43148-9.

Gallagher, John J. **The application of strict criminal liabilities to spillage of oil: the practical impact on effective spill response.** *Spill Science & Technology Bulletin*. 2002; 7 (1-2):39-44. ISSN: 0030-1388.
The author argues that the Federal Water Pollution Control Act and the Oil Pollution Act of 1990 provide an adequate means to prosecute and incarcerate intentional polluters, if criminal penalties are strict enough.

Gillan, Audrey. **Exxon accused of rights abuses; Esso parent group cited in US case over Indonesian violations.** *The Guardian*. London: Guardian Publications, Ltd.; June 22, 2001; 23.
Villagers from the impoverished Aceh region of western Indonesia allege that ExxonMobil was complicit in murder, rape, torture and kidnapping during the recent campaign by the Indonesian military to squash insurgency by separatists. A Washington-based organization filed the lawsuit against ExxonMobil on behalf of the villagers. An ExxonMobil spokesman said that the company had not been served with the lawsuit and he did not have confirmation that it had been filed.

Godec, Michael L.; Kuuskraa, Vello A.; Bank, Greg. **Future gulf supplies: role of the federal government.** *Oil & Gas Journal*. 2002; 100 (36):32-38. ISSN: 0030-1388.
This article describes topics affecting the stability of domestic oil and gas supplies, as well as factors that will impact the future of Gulf of Mexico deepwater oil and gas production.

Godec, Michael L.; Kuuskraa, Vello A.; Kuck, Brian T. **How US Gulf of Mexico development, finding, cost trends have evolved.** *Oil & Gas Journal*. 2002; 100 (18):52-56. ISSN: 0030-1388.
To assess the potential accuracy of projections of future declines in production, historical trends and projections of output in the Gulf of Mexico are analyzed. The authors look at recent production data in deepwater fields and technological advances in the industry as factors necessary to appraise the accuracy of recent projections.

Gottinger, Hans W. **Econometric modelling, estimation and policy analysis of oil spill processes.** *International Journal of Environment and Pollution*. 2001; 15 (3):333-363. ISSN: 0957-4352.
Before designing a stochastic model that addresses oil spill processes, the author identifies parameters suitable for inclusion. Effects of economic incentive measures on the frequency of spills, spill size, volume of oil spilled and enforcement effort are incorporated into the model.

Gulf plays move deeper. *Harts E & P*. 2001; 74 (1):15. ISSN: 0164-8322.

Haeberle, Frederick. R. **Porosity and permeability effects in Texas Gulf Coast reservoirs.** *Oil & Gas Journal*. 2004; 102 (11):30-35. ISSN: 0030-1388.
This article describes a method that provides an understanding of reservoir and fluid properties and how they react to geological changes.

Hamer, M. **Spy on board - like aircraft, oil tankers may soon have to record their voyages.** *New Scientist*. 2000; 167 (2249):11. ISSN: 0262-4079.
Voyage data recorders will be fitted on all ships built from 2002 into the future. There is, however, resistance to the idea of fitting present cargo ships with the black boxes.

Harrison, Bob; Warnock, Andrew. **Technique forecasts production from waterflooded reservoirs.** *Oil & Gas Journal*. 2003; 101 (45):55-59. ISSN: 0030-1388.
An analytical method provides fast, efficient forecasting for future production in a variety of mature shallow marine reservoirs.

Hart, Alan. **Court order represents more delays for drilling programs off California.** *Oil & Gas Journal*. 2001; 99 (30):43-44. ISSN: 0030-1388.
Drilling programs off coastal California face more delays after the US Minerals Management Service issued a draft environment impact statement for proposed delineation drilling on 36 leases off Santa Barbara County, Houston's Nuevo Energy Company reports that the leases contain more than 1 billion barrels of oil.

Heath, C. P. M. **Geological, geophysical, and other technical and soft skills needed by geoscientists employed in the North American petroleum industry.** *AAPG Bulletin*. 2003; 87 (9):1395-1410. ISSN: 0149-1423.
A survey was used to rank the educational skills needed by petroleum geoscientists, from the perspective of a number of American and Canadian oil companies. From this data, the author lists a number of suggestions for curriculum reform in the geosciences.

Heavy penalties for Washington oil spill cover up. *Marine Pollution*. 2003; 46 (3):273. ISSN: 0025-326X..
Companies responsible for the dumping of waste oil in Commencement Bay, Washington plead guilty to crimes related to a recent oil spill. The responsible parties will have to collectively pay $750,000 and are required to develop and implement a comprehensive environmental management plan.

Hiett, Robert L. **Economic Impact of Recreational Fishing and Diving Associated with Offshore Oil and Gas Structures in the Gulf of Mexico.** New Orleans, La.: U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region; 2002; OCS Study MMS 2002-010; various pages.

Holden, Roger; Soria, Ernesto. **Pipeline study aims at benchmarking operators' performances.** *Oil & Gas Journal*. 2002; 100 (42):64-68. ISSN: 0030-1388**.**
A preliminary study authored by a group of European oil pipeline companies initiated comparisons of resource consumption and performance analysis of pipeline operations to identify areas for improving operating efficiency.

Hull, Jennifer P. **40 rigs at work in water depths over 1,000 feet.** *Offshore*. 2001; 61 (2):16. ISSN: 0030-0608.
The Minerals Management Service sees the amount of deepwater drilling activity as a good indication for potential economic growth in the Gulf of Mexico.

Hull, Jennifer Pallanich. **Deepwater discovery survey shows increase from 2001.** *Offshore*. 2003; 63 (1):36. ISSN: 0030-0608.
Survey results show that 17 offshore discoveries in waters greater than 1,0000 feet were added to the deepwater discovery list in 2002 for the Gulf of Mexico.

Hull, Jennifer Pallanich. **FPSO risks no different from other deep systems.** *Offshore*. 2001; 61 (3):18. ISSN: 0030-0608.
The Minerals Management Service has published the final environmental impact statement, reporting that floating production, storage, and offloading vessels in the Gulf of Mexico deepwater pose similar potential impacts as other deepwater development and production systems.

Hull, Jennifer Pallanich. **Future of FPSOs in the Gulf of Mexico.** *Offshore*. 2000; 60 (7):20. ISSN: 0030-0608.
The approval of floating production, storage, and offloading vessels is imminent. The Minerals Management Service is expected to approve as early as February, 2001.

Hull, Jennifer Pallanich. **GoM yards deal with competitors, tight budgets.** *Offshore*. 2002; 62 (11):25-26. ISSN: 0030-0608.
Competition by larger overseas fabrication yards and construction cost increases have forced smaller production facilities along the Gulf of Mexico region to reduce their workforces and focus more on efficiency.

IMO raises oil pollution compensation limits. *Marine Pollution Bulletin*. 2001; 42 (1):3. ISSN: 0025-326X.
The International Maritime Organization is establishing an international fund for compensation for oil pollution damage. Limits of compensation payable to victims of pollution by oil tankers will be raised by 50%. This amendment was drawn up to ensure that the burden of compensation is spread more evenly between shipowner and cargo interests.

Janssen, Onno; Feuerhelm, H. Thomas. **Measurement uncertainty and trade: an example from the petroleum industry.** *Accreditation and Quality Assurance*. 2003; 8 (12):576-578. ISSN: 0949-1775.
The petroleum industry serves as a model for how measurement uncertainties can be used by other industries involved in global commerce when determining the impacts of product pricing.

Johnson, Christina S. **Rigs to reefs?** *California Coast and Ocean*. 2001; 17 (1):22-23. ISSN: 1052-5823.
The debate over the conversion of abandoned oil rigs to artificial reefs is still a heated topic. Marine biologists say that the rigs have altered the local habitat for marine life. Opponents contend that the massive steel structures will pose a hazard to navigation, and the state would be left liable for any accidents.

Kaiser, Mark J.; Pulsipher, Allan G. **Meta-modeling system applied to gulf's Na Kika fields group.** *Oil & Gas Journal*. 2003; 101 (44):43-45. ISSN: 0030-1388.
This article presents a fiscal development scenario for Na Kika fields in the Gulf of Mexico based on four models that project the volatility of hydrocarbon prices.

Kaiser, Mark J.; Pulsipher, Allan G. **New approach offered to smooth fiscal system analysis and design.** *Oil & Gas Journal*. 2003; 101 (43):42-46. ISSN: 0030-1388.
A procedure that uses "meta-modeling" to demonstrate a cash flow model approach is used to evaluate the design and implementation of a field governed under a specific fiscal system analysis.

Kallaur, Carolita U. **US offshore oil and gas policy: a fresh look is needed.** *Oil & Gas Journal*. 2002; 100 (32):28-29. ISSN: 0030-1388.
Author argues that the federal government should be seeking more, not less, offshore development due to a reduction in foreign supply and the improved safety of current extraction techniques.

Kaplan, A.; Marshall, Graham. **World LNG trade responding to increased natural gas demand.** *Oil & Gas Journal*. 2003; 101 (45):74-76. ISSN: 0030-1388.
Analysts predict a significant rise in LNG exports over the next 20 years to the United States and Europe as construction for independent liquefaction plants increase and the production process becomes affordable.

Keeble, John. **Out of the Channel: the *Exxon Valdez* Oil Spill in Prince William Sound.** (*2nd Edition*); Cheney, Wa.: Eastern Washington University Press; 1999; 363 pp. ISBN: 0910055548.
A detailed account of events leading up to the spill, and the effects, both social and economic, on the communities surrounding Prince William Sound.

Kelley, William R. **Socioeconomic and Environmental Issues Analysis of Oil and Gas Activity on the Outer Continental Shelf of the Western Gulf of Mexico.** New Orleans, La.: U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico UCS Region; 2002; OCS Study MMS 2002-011; 66 pp.

Kelly, Andrew. **Oil firms urged to fund whale-friendly seismic study.** *Reuters News Service*. April 30, 2001.
Oil companies are being encouraged to make funds available to researchers in order for them to study the effects of seismic surveying on whales and other marine mammals. Seismic surveying is utilized by the oil and gas industry to map underground structures to see if they might contain oil or gas.

Kemp, Alexander G.; Stephen, Linda. **The economics of petroleum exploration and development west of Scotland.** *Continental Shelf Research*. 2001; 21 (8-10):1095-1120. ISSN: 0278-4343.
After looking at the costs of exploration and the returns in discoveries, authors conclude that many areas off the west coast of Scotland aren't economically viable for production at present oil and gas prices.

Kempster, Norman. **Oil firms sign human rights pact.** *Los Angeles Times*. Los Angeles, Ca.: Times Mirror Company; December 21, 2000; A 01.
An agreement among Chevron, Texaco, Conoco, Royal Dutch/Shell and BP Amoco was signed after a year of negotiations. The pact is intended to prevent human rights abuse, that oil and mining companies have been accused of committing, especially in developing nations. In addition to the oil companies, mining companies, Freeport-McMoRan Copper & Gold and Rio Tinto, signed the agreement.

Ketkar, Kusum W. **The Oil Pollution Act of 1990: a decade later.** *Spill Science & Technology Bulletin*. 2002; 7 (1-2):45-52. ISSN: 0030-1388.
US Coast Guard data on oil spills was compared to data collected before passage of the Oil Pollution Act of 1990. Results show that quantities of oil spilled since 1990 are correlated with amount of oil imported, and that there has been a significant reduction in the quantity of oil spilled from accidental releases.

Khan, Faisal I.; Amyotte, Paul R. **Inherent safety in offshore oil and gas activities: a review of the present status and future directions.** *Journal of Loss Prevention in the Process Industries*. 2002; 15 (4):279-289. ISSN: 0950-4230.
The inherent safety approach to hazard and risk management is applied to the offshore petroleum industry in this paper. The role of technology in the present and future applications of inherent safety is discussed.

Kim, Inho. **Ten years after the enactment of the Oil Pollution Act of 1990: a success or a failure.** *Marine Policy*. 2002; 26 (3):197-207. ISSN: 0308-597X.
The author notes several reasons why it is too early to determine if the Oil Pollution Act of 1990 has been successful in preventing spills or aiding in the response of a major oil spill.

Kjersem, G. **Floaters in the offshore industry - a brief perspective.** *Naval Architect*. 2002; (Supplement):35-36. ISSN: 0306-0209.

Knight, Roger; Robertson, Steve; Harbinson, Dominic. **Deep water: how West Africa compares with Gulf of Mexico.** *Oil & Gas Journal*. 2003; 101 (18):42-48. ISSN: 0030-1388.
Analysts compare West Africa and North America both in terms of their deepwater reserve prospects and in levels of capital expenditures.

Kuuskraa, Vello; Godec, Michael L.; Kuck, Brian T. **Shallow water gulf oil, gas supply: a glass half full or half empty?** *Oil & Gas Journal*. 2002; 100 (26):34-40. ISSN: 0030-1388.
The authors present the history of production and development in shallow waters less than 200 miles offshore in the Gulf of Mexico. The sharp decline in shallow water developments and the potential impacts on economy and energy security are studied.

Labelle, Robert. **Overview of US Minerals Management Service activities in deepwater research.** *Marine Pollution Bulletin*. 2001; 43 (7-12):256-261. ISSN: 0025-326X.
To enforce safe and environmentally sound management offshore, the US Minerals Management Service is presenting an outline that will assess these activities in deepwater resources.

Latvia demands Lithuanian compensation for losses from oil spill. *BBC Worldwide Monitoring*. Great Britain: British Broadcasting Corporation; April 20, 2001.
The Latvian Environmental Maritime Administration demanded that the Lithuanian joint-stock oil company Mazeikiu Nafta compensate for losses from the March 6 accident at the Butinge Oil Terminal, where 3,427 liters of oil spilled into the Baltic Sea.

Leahy, Kevin; Lawrence, Steve; Thrift, John. **Caribbean source rocks may point toward buried treasure.** *Oil & Gas Journal*. 2004; 102 (8):35-39. ISSN: 0030-1388.
Exploration teams are identifying and appraising samples of source rocks collected from offshore basins in the Caribbean in search of potential oil and gas deposits.

LeBlanc, Leonard. **U. S. Gulf of Mexico deepwater discoveries on record pace.** *Offshore*. 2000; 60 (10):36. ISSN: 0030-0608.
Deepwater drilling rates in the Gulf of Mexico scaled up substantially during 2000, as more deepwater vessels were launched. A combination of excellent prospects, outstanding reservoir structural features, and strong 3D seismic technology improved the discovery rate in many areas by over 50%.

Lehr, William J.; Overstreet, Roy. **Smoke plume screening tool for *in-situ* burning.** *In* Garcia-Martinez, R.; Brebbia, C. A. (Eds.). *Oil and Hydrocarbon Spills, Modelling, Analysis and Control*. Billerica, Ma.: Computational Mechanics, Inc.; 1998; p. 121-129. ISBN: 1-85312-526-1.
Authors present different mathematical formulas, adapted from Briggs' Gaussian smoke-stack model, to estimate the plume resulting from burning oil at sea under different conditions.

Leschine, Thomas M. **Oil spills and the social amplification and attenuation of risk.** *Spill Science & Technology Bulletin*. 2002; 7 (1-2):63-73. ISSN: 1353-2561.
Much has been learned from the aftermaths of major oil spills in the past several decades. Nevertheless, both social amplification and attenuation of information from the media and others have not translated into public acceptance of the continued risk of oil production and oil transport by sea.

Li, Y.; Brimicombe, A. J.; Ralphs, M. P. **Spatial data quality and coastal spill modeling.** *In* Garcia-Martinez, R.; Brebbia, C. A. (Eds.). *Oil and Hydrocarbon Spills, Modelling, Analysis and Control*. Billerica, Ma.: Computational Mechanics, Inc.; 1998; p. 53-62. ISSN: 1-85312-526-1.

Lichtblau, John; Goldstein, Larry; Gold, Ron. **Commonalities, uniqueness of oil as commodity explain crude oil, gasoline price behavior.** *Oil & Gas Journal*. 2004; 102 (24):18-24. ISSN: 0030-1388.
Analysts focus on newly implemented federal and state regulations on supply availability for gasoline, accounting for the growing imports due to minimal growth in refining capacity within the US. Then they compare the continued upward price movement in oil, and how oil prices compare to nonfuel commodities.

Literathy, P.; Khan, N. Y.; Linden, O. **Oil and petroleum industry.** *In* Khan, N. Y.; Munawar, M.; Price, A. R. G. (Eds.) *Gulf Ecosystem: Health and Sustainability (Series: Ecovision World Monograph Series)*. Leiden, Netherlands: Backhuys; 2002; p. 127-156. ISSN: 90-5782-106-0.

Loegering, Cory; Campbell, Tom; Winter, Karl; Maioli, Filippo. **King Kong- Yosemite illustrates smaller deepwater development techniques.** *Oil & Gas Journal*. 2004; 102 (2):41-50. ISSN: 0030-1388.
New technology allows companies to optimize larger projects more efficiently or make smaller deepwater projects profitable.

Lorenzetti, Maureen. **Norway outlines strategy to attract oil, gas investment.** *Oil & Gas Journal*. 2002; 100 (33):28-34. ISSN: 0030-1388.
To encourage foreign investment in Norway's oil and gas industry, new technology must be in place that can exploit old reserves, and new petroleum resources must be discovered.

Lorenzetti, Maureen. **OTC: Deepwater Gulf of Mexico still an industry draw.** *Oil & Gas Journal*. 2004; 102 (19):27-28. ISSN: 0030-1388.
Announcements made by MMS of significant deepwater discoveries in the Gulf of Mexico contradict data that suggest a decline in actual drilling. MMS believes that many factors are contributing to the findings in the data, but remain confident that there is no decline in exploration recoveries.

Lorenzetti, Maureen. **Senate Democrats file California-GOM oil lease swap bill.** *Oil & Gas Journal*. 2002; 100 (9):38-40. ISSN: 0030-1388.
Legislation was introduced by senators from Louisiana and California to close a decade-old billion-dollar dispute between industry and California over offshore oil leases. The bill would allow the swap of leases equivalent in value in the Gulf of Mexico within 30 days of the approval of the bill.

Lorenzetti, Maureen; Poruban, S. **Deepwater Gulf of Mexico takes center stage at OTC.** *Oil & Gas Journal*. 2002; 100 (19):22-27. ISSN: 0030-1388.
A recent MMS publication underscores the importance of deepwater exploration in the Gulf of Mexico to US energy supplies, and indicates that the Gulf will remain one of the world's premier oil and gas basins.

Luke, Ronald Thomas. **Socioeconomic Baseline and Projections of the Impact of an OCS Onshore Base for Selected Florida Panhandle Communities**. New Orleans, La.: U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region; 2002; OCS Study MMS 2002-024, 025, & 026; various pages.

MacMillan, Adrian. **Effective FPSO hull design uses combined approach.** *Oil & Gas Journal*. 2001; 99 (24):72-78. ISSN: 0030-1388.
This article provides designers and operators with background information and the applicability of tanker design requirements for FPSOs. It also evaluates loading issues, comparing the use of empirical formulas versus direct analysis methods, and provides recommendations for when to consider direct analysis methods.

Maher, Nora. **The application of a job exposure matrix in the natural gas industry.** *AIHA Journal*. 2004; 64 (6):806-814. ISSN: 1529-8663.
Results of a questionnaire regarding occupational exposure to hazardous material was compared against a list of known agents in the workplace to determine occupational risks associated with the natural gas industry.

Malavis, N. **Book Review: Oil and ideology: the cultural creation of the American petroleum industry.** *Journal of Southern History*. 2002; 68 (1):212-214. ISSN: 0022-4642.

Marsh, Roy. **A database of archived drilling records of the drill cuttings piles at the North West Hutton oil platform.** *Marine Pollution Bulletin*. 2003; 46 (5):587-593. ISSN: 0025-326X.
The author expresses the need for a network of archived data regarding drill cuttings and chemical products used during a platform's drilling history to establish a generic 'discharge profile' that can be accessible to the public.

Matthews, S.; Nix, William.; Berlack, Evan. **Internet privacy, security if next hurdle for oil and gas industry.** *Oil & Gas Journal*. 2001; 99 (25):82-84. ISSN: 0030-1388.
As technology grows in electronic commerce, the need to establish legal regimes for all elements of US society is needed to provide internet privacy and security.

McCaul, James R. **Special report: floating production systems; deepwater remote fields rely on floating production systems.** *Oil & Gas Journal*. 2001; 99 (24):68-71. ISSN: 0300-1388.
As deepwater exploration persists, floating production systems have proven to be a major breakthrough in expanding offshore oil and gas production. Utilizing this production technology has provided a solution to develop fields that otherwise would not have been cost-effective for fixed platforms.

McCutcheon, Hilary. **Mixed fortunes in the Caspian.** *Offshore*. 2003; 63 (6):48-49. ISSN: 0030-0608.
Efforts to attract interest and investment in the Caspian Sea are reflected in current levels of offshore activity. However, exploration surveys are more concentrated in the northern Russian Caspian, while little activity is going on at other offshore licensed areas.

McGregor, Karen. **Shell to face U. S. lawsuit for Saro-Wiwa execution.** *Independent (London)*. London: Newspaper Publishing PLC.; September 19, 2000; 13. ISSN: 0951-9467.
A suit alleging the complicity of Shell Oil in the torture and murder of Nigerian activists was allowed to go to trial recently in the state of New York.

Merrifield, John. **A general equilibrium analysis of the insurance bonding approach to pollution threats.** *Ecological Economics*. 2002; 40 (1):103-115. ISSN: 0921-8009.
The author identifies political and institutional obstacles to the idea of an insurance bonding approach to the economics of oil spill risk. An equilibrium analysis looks at the insurance bonding approach against the traditional command-and-control approach in order to compare effectiveness, and impacts on prices, output levels, and factor returns.

Merski, A. T. **Cooperative commercialization: finding alternate oil spill response tools.** *Spill Science & Technology Bulletin*. 2000; 6 (5-6):289-293. ISSN: 1353-2561.
Despite advancements in technology, the tools used in oil spill response have not changed in the past eleven years. Neither the public nor the private sectors have the leadership, incentives, or commitment to develop new tools for spill response.

Michels, Thomas J. **Innovations combine for big success in offshore industry.** *Sea Technology*. 2001; 42 (4):17-20. ISSN: 0093-3651.
With oil being the most prevalent energy source on the planet, the demand for discovering new reserves is imperative. New technologies that will enable deepwater discoveries in oil production have not shown as much promise for natural gas. Experts are saying that access to the eastern Gulf of Mexico and the Atlantic regions are becoming even more critical.

Miraglia, Rita A. **The cultural and behavioral impact of the *Exxon Valdez* oil spill on the native peoples of Prince William Sound, Alaska.** *Spill Science & Technology Bulletin*. 2002; 7 (1-2):75-87. ISSN: 1353-2561.
This article recounts the struggle of the Alu'utiq Native communities in Price William Sound, Alaska, as they survive the impact of the *Exxon Valdez* oil spill and its aftermath regarding disruption of their cultural values.

MMS okays FPSO use in Gulf of Mexico. *Oil & Gas Journal*. 2002; 100 (1):26. ISSN: 0030-1388.
The use of Floating Production, Storage, and Offloading systems in the central and western Gulf of Mexico have been approved by the US Minerals Management Service. An Environmental Impact Statement found no compelling reason why development and production plans should not be submitted by the oil and gas industry. Emission restrictions and mitigation requirements will be imposed to minimize negative impacts within the Breton National Wildlife Refuge.

MMS sees accelerating growth in Gulf of Mexico oil, gas production. *Oil & Gas Journal*. 2002; 100 (27):39. ISSN: 0030-1388.
Data confirms that deepwater production surpassed shallow-water oil production in March 2000. Deepwater oil and gas production are estimated to increase 160% by the end of 2006.

MMS sees deepwater Gulf as an expanding frontier. *Oil & Gas Journal*. 2004; 102 (22):45-48. ISSN: 0030-1388.
MMS reports on deepwater drilling activity in the Gulf of Mexico and the anticipated recovery of reserves.

Mobil faces fines up to $1 million over alleged oil spill. *AAP Newsfeed*. AAP Information Services Pty. Ltd.; June 13, 2001.
In December of 1999, the *Sylvan Arrow* tanker allegedly caused an oil spill approximately 30 to 40 meters wide off Wilson's Promontory, on Victoria's south-west coast in Australia. Mobil's shipping arm is now facing a fine of up to $1 million dollars for the spill.

Montgomery, David. **Protest on oil rig.** *The Scotsman*. Edinburgh: The Scotsman Publications, Ltd.; April 2, 2001; 1.
In a protest against the oil giant Jet, a handful of Greenpeace activists took action to bring light to the corporation's role in global warming and its alleged failure to use bio-diesel. Eleven people were arrested as activists attempted to stop the *Drill Star* from sailing to the North Sea.

Moody-Stuart, M. **The curse of oil?** *Proceedings of the Geologists Association*. 2004; 115 (1):1-5. ISSN: 0016-7878.
The author comments on the negative effects of oil on socioeconomic conditions in a number of developing countries, and possible remedies by those countries and international governmental organizations.

Moritis, Guntis. **Complexities challenge oil, gas production in 2002.** *Oil & Gas Journal*. 2002; 100 (1):74-77. ISSN: 0030-1388.
The oil and gas industry is developing new tools as well as mechanisms to aid with the complexity of oil and gas exploration.

Moritis, Guntis. **Hubs, new technologies provide access to more deepwater reserves.** *Oil & Gas Journal*. 2003; 101 (44):54-61. ISSN: 0030-1388.
Smaller deepwater facilities in the Gulf of Mexico are becoming more numerous because of advancements in new technologies, in addition to processing hub installations that make them economically feasible.

Moritis, Guntis. **New downhole technologies tackle multifaceted environments.** *Oil & Gas Journal*. 102 (8):41-46. ISSN: 0030-1388.
The article presents a new downhole technology which enables production of petroleum resources from wells with complex geometries and diverse environments to be mastered.

Moritis, Guntis. **New option lets operators eliminate facility disposal liability.** *Oil & Gas Journal*. 2002; 100 (28):39-41. ISSN: 0030-1388.
A new company has been formed that assumes the liability for well abandonment and decommissioning of rigs from commercial operators in the Gulf of Mexico by purchasing properties that are close to the end of their production life.

Moritis, Guntis. **New tools, services expand deepwater well testing options.** *Oil & Gas Journal*. 2003; 101 (44):62-64. ISSN: 0030-1388.
New tools provide on site analysis for determining deepwater reservoir fluids in previous drilled reservoirs, as well as performing flow assurance work for estimating a reservoir’s production potential.

Mozur, Carolina Guédez; Hernández, Desirée De Armas; Gil, Rosa Reyes; Rico, Luis Galván. **Environmental management systems in international petroleum industries.** *Interciencia*. 2003; 28 (9):528-533. ISSN: 0378-1844.

Mullin, J. V. **The U.S. Minerals Management Service - Oil Spill Response Research Program.** *In* Garcia-Martinez, R.; Brebbia, C. A. (Eds.). *Oil and Hydrocarbon Spills, Modelling, Analysis and Control*. Billerica, Ma.: Computational Mechanics, Inc.; 1998; p. 109-120. ISSN: 1-85312-526-1.
The program is described, as well as goals, results from recent research, and future research directions.

Neil, Chris. **2003 shows spot cargoes, tankers to dictate US LNG supplies, not terminal capacities.** *Oil & Gas Journal*. 2004; 102 (12):70-72. ISSN: 0030-1388.
Data presented in this article shows an increase in LNG spot cargo imports to the US for 2002 and 2003. Analysts predict that this trend will not continue for 2004 and 2005 based on the costs of regasification versus market prices for gas.

New DOE oil projects focus on long-term research. *Oil & Gas Journal*. 2003; 101 (15):54-55. ISSN: 0030-1388.
The US Department of Energy has selected several exploration, drilling, and production research projects in an effort to keep US oil and gas fields producing in the future.

Nigeria to get tough on oil polluters. *Marine Pollution Bulletin*. 2003; 46 (3):271-272. ISSN: 0025-326X.
In response to allegations of years of neglect to environmental damage from oil production and spills, the Nigerian government is imposing new penalties on oil and gas companies whose operations negatively impact the environment.

Nigerian governor accuses US oil group of neglect. *Agence France Presse*. April 25, 2001.
The US oil giant Mobil has been accused of neglect for an oil spill in the Niger delta and for refusing to pay for damages. A governor in Nigeria claimed that the entire coastline was damaged by the spill, and that he could provide evidence proving that Mobil was responsible for damages.

Northern route to remain open for Caspian Sea crude oil. *Oil & Gas Journal*. 2004; 102 (10):64-65. ISSN: 0030-1388.
The Ukrainian government has recommended that the flow of crude oil be reversed in the Caspian pipeline for 3 years, allowing the oil to flow southward to a new port along the Black Sea. This will result in establishing a direct connection into European markets and allowing an established port in Odessa to remain open.

Ofiara, D. D. **Natural resource damage assessments in the United States: rules and procedures for compensation from spills of hazardous substances and oil in waterways under US jurisdiction.** *Marine Pollution Bulletin*. 2002; 44 (2):96-110. ISSN: 0025-326X.
To assess economic losses that are a result of oil and/or hazardous substance spills, which occur in waterways under US jurisdiction, federal rules and procedures are being applied, and responsible parties are held accountable in court.

Øien, Knut. **Risk Control of Offshore Installations: a Framework for the Establishment of Risk Indicators**. Thesis (Ph. D.): Norwegian University of Science and Technology; 2001; 270 leaves.

Oil spill compensation set at 25.1 billion yen. *Daily Yomiuri*. Tokyo: Yomiuri Shimbun; February 22, 2002; pg. 2.
An award of 25.14 billion yen was to be dispersed to 6,000 claimants for damages caused by the Russian tanker *Nakhodka* in the Sea of Japan. It was reported that the settlement was the largest suit involving an oil tanker accident in Japan.

Oil tankers heading into rough waters in 2002; gas carriers' prospects bright. *Oil & Gas Journal*. 2001; 99 (52):62-66. ISSN: 0030-1388.
Very large crude tanker earnings have severely dropped since the start of 2001, because of slumping world economies and increased deliveries of new tankers. Analysts predict that in the first 6 months of 2002, shipping rates will decrease even further.

Okey, Thomas. **Lost Eden.** *E: the Environmental Magazine*. 2000; 11 (3):34-39. ISSN: 1046-8021.
This article is a personal reflection of Mr. Thomas Okey, a researcher and the author of this paper, as he first laid eyes on Prince William Sound following the *Exxon Valdez* oil spill in March 1989.

Olah, George A. **After oil and gas: methanol economy.** *Catalysis Letters*. 2004; 93 (1-2):1-2. ISSN: 1011-372X.
Author proposes converting hydrogen and carbon dioxide to methanol as a fuel source for the future.

Onu, N. Chukumeka Hemanachi. **The oil rich Niger delta region: a framework for improved performance of the Nigerian regulatory process.** *Ambio*. 2003; 32 (4):325-326. ISSN: 0044-7447.
In 1999, the Popoola Commission recommended the establishment of a regulatory body to address the many environmental and community crises caused by oil companies. These companies had no vested interest in setting or maintaining voluntary environmental standards in the Niger Delta region.

O'Rourke, Dara; Connolly, Sarah. **Just oil? The distribution of environmental and social impacts of oil production and consumption.** *Annual Review of Environment and Resources*. 2003; 28;587-617. ISSN: 1543-5938.
In this review, authors analyze the environmental, social and health impacts of the oil industry from extraction to consumption, and investigate the distribution of these burdens on populations from socioeconomic and ethnic groups to countries and ecosystems.

Pagano, Susan S. **Worldwide expansion of oil drilling activities.** *Sea Technology*. 2001; 42 (4):10-14. ISSN: 0093-3651.
As drilling activities expand into the promising deepwaters of the Gulf of Mexico, offshore Brazil and West Africa, fundamentals are in place to encourage exploration and boost field development activity for upcoming years, as long as crude prices remain high and natural gas prices hold steady.

Pagano, Susanne S. **Offshore oil/gas market outlook: momentum continues into the future.** *Sea Technology*. 2001; 42 (1):21-24. ISSN: 0093-3651.
With the high demand for natural gas, high commodity prices are boosting interest in deepwater prospects in the Gulf of Mexico and strategic targets offshore Brazil and West Africa. A high level of exploration and production activities were anticipated for 2001, with improved business conditions leading to more wells drilled and new field developments.

Paisie, John E. **Special Report: oil, gas and the internet; 'E-transformation' of oil companies offers unprecedented value-creation opportunities.** *Oil & Gas Journal*. 2001; 99 (25):66-68. ISSN: 0030-1388.
The emphasis on an e-transformed firm will shift from physical capital to human and brand capital. The Meta Capitalism principles will allow companies to effectively utilize e-business enablers, optimize their portfolio of assets, and capture efficiencies available from external service providers. The result will be a more efficient and dynamic company.

Pemberton, Mary. **Scientists study arctic drilling.** *Associated Press Newsfile*. January 11, 2001.
The National Research Council convened a panel of independent scientists to study the impact of 30 years of drilling on Alaska's North Slope. The study was expected to take 18 months.

Petrobras scandal grows in platform disaster aftermath. *Oil & Gas Journal*. 2001; 99 (14):32-33. ISSN: 0030-1388.
Brazil's Nation Oil Works Union released internal documents seized from Petrobras accusing the state firm of knowing about problems with the 40-story structure before it exploded and sank in March 2001. The explosion claimed the lives of 11 workers.

Petroleum shipping industry facing shortage, two studies say. *Oil & Gas Journal*. 2001; 99 (48):56-58. ISSN: 0030-1388.
By the end of 2004, as much as 28% of the US existing tank vessel capacity--including 45% of all large, ocean-going tank barges--will be lost during the phase out of single-hulled tank vessels. Analysts predict that the US will be faced with a shortage of tank vessels, which would have military and commercial implications.

Petzet, Alan. **Exploration opportunities abound in many of world's remote basins.** *Oil & Gas Journal*. 2004; 102 (10):38-43. ISSN: 0030-1388.
Revenues provided by high oil and gas prices over the past several months have allowed frontier exploration efforts and opportunities in many countries with remote basins.

Petzet, Alan. **US drilling to drop from 15-year high; smaller decline expected in Canada.** *Oil & Gas Journal*. 2001; 100 (4):86-87. ISSN: 0030-1388.
A forecasted decrease is expected in drilling in the US and Canada for 2002 and into 2003, compared to a strong showing in 2001. Declines in the price of crude oil and natural gas at the wellhead is said to be the problem. US operators have not exceeded 2001's overall drilling and completion spending since 1986.

Picou, J. Steven; Gill, Duane A.; (Eds.) ***Exxon Valdez* Disaster: Readings on a Modern Social Problem.** (*2nd Edition*). Dubuque, Ia.: Kendell/Hunt Publishing Company; 1999; 337 pp. ISBN: 0787256854.
This workbook contains several excerpts from books and reports that deal with the sociological impact of the *Exxon Valdez* oil spill on Alaskan residents.

Pinder, David. **Offshore oil and gas: global resource knowledge and technological change.** *Ocean & Coastal Management*. 2001; 44 (9-10):579-600. ISSN: 0964-5691.

Poruban, Steven. **Decommissioning advances made in Gulf of Mexico waters.** *Oil & Gas Journal*. 2001; 99 (3):58-62. ISSN: 0030-1388.
Advancements in technology have provided operators with a broader range of options for platform decommissioning and removal. The rigs-to-reef program offers a solution for the no longer operable platform, which converts the platform to a reef. The use of explosives to decommission a platform in the mature basins of the gulf is still a major environmental issue.

Poruban, Steven. **Oil and gas industry continues to grapple with technical personnel shortage.** *Oil & Gas Journal*. 2001; 99 (39):22-24. ISSN: 0030-1388.
Competition for skilled technical workers, such as petroleum engineers and geologists, has become a hurdle for some oil companies. In order to remain competitive, the oil industry needs to constantly reevaluate and evolve to remain attractive to technical talent.

Rach, Nina M. **Latin American drilling activity swells in past year.** *Oil & Gas Journal*. 2004; 102 (23):39-43. ISSN: 0030-1388.

Rach, Nina M. **Underbalanced, near-balanced drilling are possible offshore.** *Oil & Gas Journal*. 2003; 101 (46):39-44. ISSN: 0030-1388.
This article describes the use of underbalanced and near-balanced drilling methods, and describes how they with the use of lightweight drilling fluids, they can have practical applications offshore.

Radler, Marilyn. **US oil, gas demand to grow as economy recovers in 2002.** *Oil & Gas Journal*. 2001; 100 (4):70-83. ISSN: 0030-1388.
Economists predicted that the demand for oil and gas imports would depend on the recovery of the US economy in 2002. An estimated average of 10,000 b/d of crude oil was imported for the Strategic Petroleum Reserve in 2000, up from 8,000 b/d in the previous two years.

Radler, Marilyn. **Worldwide reserves grow; oil production climbs in 2003.** *Oil & Gas Journal*. 2003; 101 (49):43-47. ISSN: 0030-1388.
Statistics on oil production and reserve capacity by country and region show changes in production in 2003 compared to the previous year. Regions such as Eastern Europe, the Middle East, and Africa showed large increases in production, with slight decreases in the Western Hemisphere and the Asian Pacific, and a significant drop-off for Western Europe compared with 2002 data.

Rand, G. M.; Carriger, J. F. **US environmental law statutes in coastal zone protection.** *Environmental Toxicology & Chemistry*. 2001; 20 (1):115-121. ISSN: 0730-7268.
Authors review federal laws that impact the health of coastal ecosystems.

Rao, Ganga Prasad G. **The MACT for petroleum refinery FCCs is a fraud!** *International Journal of Environment and Pollution*. 2004; 21 (1):24-63. ISSN: 0957-4352.
In this paper, the author points out inadequacies and potential for abuse in the New Source Performance Standards that are part of the Fluid Catalytic Cracking particulate emission limits of the Maximum Achievable Control Technology edict.

Read, Roger. **North Sea evolution to track Gulf of Mexico model.** *Oil & Gas Journal*. 2002; 100 (34):40-44. ISSN: 0030-1388.
Large fields and major oil companies have dominated the North Sea oil market for years. However, as existing reserves become depleted, the market must change to attract independent E&P companies in order to develop the remaining small fields in this region.

Robertson, John. **Protesters ordered to quit oil rig.** *The Scotsman*. Edinburgh: The Scotsman Publications Ltd.; April 7, 2001; 2.
In a second attempt to stop the sailing of a North Sea oil rig 30 miles east of Aberdeen, Greenpeace activists boarded the platform and began their protest against the company's policy regarding global warming. Greenpeace activists were served with a Court order, demanding that the activists remove themselves from the platform.

Rosen, Yareth. **Alaskan natives sue to block Phillips oil project.** *Reuters News Service*. December 19, 2000.
The tribal organization of the Inupiat Community, which represents eight villages of the North Slope Borough of the Arctic Slope, has filed two lawsuits to try to block Phillips Petroleum's plans to explore an offshore prospect in the Beaufort Sea. The lawsuit challenges the U.S. Minerals Management Service decision to grant Phillips a permit to explore the McCovey prospect 12 miles north of Prudhoe Bay. Phillips has failed to meet the MMS regulations for oil-spill planning and meet state standards for disaster contingency at its offshore Northstar field.

Ryan, Robert G.; Bowkley, Colin.; Baruch, Peter. **Special Report: LNG's evolution, technology, commercial developments speed changes in world's LNG industry.** *Oil & Gas Journal*. 2001; 99 (29):60-67. ISSN: 0030-1388.
This article describes the main LNG industry themes after 4 decades as well as emerging developments that are shaping the industry's future. The LNG industry has evolved from a regional to global industry in a short amount of time.

Sandrea, Ivan; Buraiki, Osama Al. **Future of deepwater, Middle East hydrocarbon supplies.** *Oil & Gas Journal*. 2002; 100 (24):22-32. ISSN: 0030-1388.
Authors look at deepwater production in Egypt, Nigeria, and the Gulf of Mexico, as well as political and economic factors that could impact the flow of oil in the Middle East, to determine if projections of future oil and gas supply made by the International Energy Agency are likely to be met.

Sen, Colleen Taylor. **World's LNG industry surges, pushed by confluence of factors.** *Oil & Gas Journal*. 2004; 102 (22):58-68. ISSN: 0030-1388.
Surplus production, reduced costs, strong economic growth in India and China, and restructuring of energy industries in a number of countries have contributed to a surge in worldwide LNG demand.

Shaw, D. G.; Connor, M. S.; Schuble, J. R. **Petroleum development moratoria on Georges Bank: environmental decision making where values predominate.** *Environmental Science & Technology*. 2000; 34 (22):4677-4683. ISSN: 0013-936X.

Sherif, Yousif Ibrahim. **Influence of the Oil Pollution Act of 1990 on Structural Design and Economics of Oil Tankers.** Thesis (Ph. D.): Oklahoma State University; 1999; 99 leaves.

Sherritt boosts heavy oil output in northern Cuba. *Oil & Gas Journal*. 2000; 98 (41):38. ISSN: 0030-1388.
Sherritt International Corporation holds an indirect interest in seven exploration/production-sharing contracts with the Cuban government. Sherritt had developed heavy oil fields along the island's northern coast. Cuba's gross oil production rate in the quarter that ended June 30 averaged 31,818 b/d, compared with 18,801 b/d in the 1999 second quarter. Sherritt gets a percentage of the incremental oil production and accelerated recovery of its costs.

Single-hull tanker phase-out. *Marine Pollution Bulletin*. 2000; 40 (12):1068. ISSN: 0025-326X.
A global timetable for the accelerated phasing-out of single-hull oil tankers has managed to meet approval on proposed amendments to MARPOL 73/78. The approval paves the way for draft revisions with clear alternative schemes.

Skippins, J.; Johnson, D.; Davies, R. **Corrosion - mitigtion program improves economics for processing naphethenic crudes.** *Oil & Gas Journal*. 2000; 98 (37):64-67. ISSN: 0030-1388.
The return of profit for refineries capable of processing discounted high-acid crudes is discussed in this article.

Smith, Karen P.; Arnish, John J.; Williams, Gustavious P.; Blunt, Deborah L. **Assessment of the disposal of radioactive petroleum industry waste in nonhazardous landfills using risk-based modeling.** *Environmental Science & Technology*. 2003; 37 (10):2060-2066. ISSN: 0013-936X.
Authors conclude that disposal of technologically-enhanced NORM wastes in nonhazardous landfills pose a negligible risk to the environment.

Smith, Richard I.; Simpson, Mike; Wicker, Armin K. **Coordinated optimization, new well design reduce wellbore stability problems in Valhall field.** *Oil & Gas Journal*. 2004; 102 (1):42-44. ISSN: 0030-1388.
A new well design was used in a field-specific operation to refine welbore instability, lost circulation and stuck-pipe problems at a site in the North Sea.

Snieckus, Darius V. **UN moves to halt unauthorized Iraqi oil shipments.** *Oil & Gas Journal*. 2001; 99 (16):34-35. ISSN: 0030-1388.
The United Nations took action to halt unauthorized Iraqi oil exports. UN monitors worked together with tanker personnel to prevent the diversion of Iraqi crude oil to unauthorized destinations.

Solow, Steven P. **US pipelines face increased criminal threat from heightened environmental scrutiny.** *Oil & Gas Journal*. 2003; 101 (49):70-75. ISSN: 0030-1388.
US Department of Justice environmental enforcement authorities, armed with new prosecuting tools, are focusing their attention on the pipeline industry.

South African approval for offshore gas search. *Marine Pollution Bulletin*. 2002; 44 (4):267. ISSN: 0025-326X.
The energy company Sasoil has received permission to look for natural gas in a 28,395 km^2 area offshore of western South Africa, in waters up to 300 meters deep.

Speiss, Ben. **Slope borough ok's ice road.** *Anchorage Daily News*. Anchorage, Ak.: Anchorage Daily News; December 2, 2000; Business 01.
Phillips Alaska Inc., was granted a permit to begin construction of an ice road into the Beaufort Sea to explore for oil. The construction of the road would allow the company to reach the McCovey prospect, which sits 12 miles off the North Slope.

Stankiewicz, B. Arthur. **Integration of geoscience and engineering in the oil industry - just a dream?** *Nature*. 2003; 426 (6964):360-363. ISSN: 0028-0836.
This article discusses future technologies, trends, and demands related to the oil and gas industry as it branches out into management of other energy-related resources.

Stern, David. **International group hails big oil discovery in Kazakhstan.** *Financial Times (London)*. London: FT Information Ltd.; October 6, 2000;12.
An international consortium developing the Kashagan offshore oilfield in Kazakhstan's sector of the Caspian believe that if results of initial explorations are confirmed, the field could be one of the biggest finds in decades.

Study sees continued growth for floating production. *Oil & Gas Journal*. 2004; 102 (19):51. ISSN: 0030-1388.
The International Maritime Associates Inc., reports that a 250% increase for floating production systems will be required for future offshore projects in water deeper than 5,000 feet.

Suezmax caught in economic squeeze. *Oil & Gas Journal*. 2002; 100 (38):50-51. ISSN: 0030-1388.
Use of Suezmax tankers are increasing in terms of shipments going to Europe and the United States. Although these tankers are considered ideal in size by the oil and gas tanker industry, they are underutilized because of the world's economically depressed markets.

Suit seeks lease value where Florida denied drilling. *Oil & Gas Journal*. 2001; 99 (6):46. ISSN: 0030-1388.
A lawsuit was filed by Coastal Petroleum against Florida for the value of a state lease the company holds in the Gulf of Mexico. The State is denying the drilling permit, and Coastal is claiming that the state is taking its property without compensation.

Sumrow, Mike H. **Challenging wells require greater rig capabilities, enabling technologies.** *Oil & Gas Journal*. 2002; 100 (1):78-80. ISSN: 0030-1388.
Drilling contractors are faced with an increasingly difficult problem of older, less efficient drilling equipment performing in mature petroleum basins. Costly renovations and enhancements to drilling rigs ensure higher utilization rates in the long term. However, drilling contractors are expected to deliver efficient rigs at an economical rate in the face of economic recession, low commodity prices and plummeting rig counts.

Sumrow, Mike H. **Deepwater drilling activity remains steady.** *Oil & Gas Journal*. 2001; 99 (45):86-88. ISSN: 0030-1388.
At year's end in 2001, deepwater drilling continued to advance steadily in the Gulf of Mexico. Drilling activity in shallow water continued to decline due to depressed natural gas prices and many other factors. However, deepwater drilling has such a long lead time that significant changes are not expected in the near future.

Sumrow, Mike H. **Global staffing to reshape petroleum industry as current workforce ages.** *Oil & Gas Journal*. 2002; 100 (39):18-19. ISSN: 0030-1388.
The author stresses the need for an international work force of younger technical employees to replace the group of people who are approaching retirement in the oil industry. To effectively service the oil industry's worldwide operations, the industry must recruit engineering students from foreign universities.

Tariff accord clears way for Russian oil exports through Mediterranean Sea. *Oil & Gas Journal*. 2001; 100 (9):64-65. ISSN: 0030-1388.
The Russian publication *Commersant* reported that a tariff accord ratified in late 2001 by the Ukraine will allow Russian crude oil to be moved out of a deepwater terminal on the Mediterranean Sea and into world export markets.

Timko, Don. **How to use petrophysical data to determine deep prospectivity.** *Oil & Gas Journal*. 102 (9):32-42. ISSN: 0030-1388.
Petrophysical data is an efficient method used to evaluate the depth level of commercial oil and gas reservoirs. This technique is more feasible than conventional evaluations methods for well recovery, especially in deep reservoirs.

Toughill, Kelly. **Record fine for ocean polluter.** *Toronto Star*. Toronto, Canada: Toronto Star Newspapers, Ltd.; February 26, 2002; A 3.
A fine in the amount of $125,000 was levied against the Prime Orient Maritime Corporation for the illegal dumping of polluted bilge waste. Authorities hope this action will encourage other ships to dispose of the oil properly while in port.

True, Warren R. **Leap in worldwide pipeline construction plans lags industry downturn.** *Oil & Gas Journal*. 2001; 100 (5):64-82. ISSN: 0030-1388.
Data derived from a survey of world pipeline operators, industry sources, and published information reveal plans for an anticipated 65,000 miles of pipeline construction to be installed globally, beginning in 2001 year and extending into the next decade.

True, Warren R. **Pipeline safety progress noted at API pipeline conference.** *Oil & Gas Journal*. 2002; 100 (18):38-40. ISSN: 0030-1388.
In a speech by the chairman of the API Pipeline Committee, improved performance was stressed as a means of building public trust. The chairman noted that the number of incidents and amount of petroleum accidentally released in 2000 and 2001 was lower than previous years.

True, Warren R. **Recent studies show health, future of oil tanker industry.** *Oil & Gas Journal*. 2001; 99 (27):60-62. ISSN: 0030-1388.
Results from three studies provide information relating to petroleum and petroleum products tankers. The International Tanker Owners Pollution Federation Ltd. report that the 1990's witnessed a reduction in the volume and frequency of accidental oil spills from tankers. Studies also indicate that the agreement on of single-hull oil tankers will combine with a slowing global economy and low product trade growth to undermine current freight market strength.

Urquhart, Donald. **IMO to develop new US$1b oil spill fund.** *The Business Times Singapore*. Singapore: Singapore Press Holdings, Ltd.; November 28, 2001;SHIP-1.
A protocol to be drafted by the International Maritime Organization would address the issue of compensation to communities affected by oil spills in European waters.

US wetland oil spill results in fine. *Marine Pollution Bulletin*. 2001; 42 (9):708. ISSN: 0025-326X.
Deep River Oil, Inc., was fined $137,000 for an oil spill that polluted a wetland that flows into Platts Reed Pond, which connects to the Connecticut River two miles away. The facility did not have proper containment or diversionary equipment to lessen the effect of an oil spill or prevent it from getting into the wetland.

Usman, F.; Fernandes, T.; Fernie, J.; Read, P.; Hundal, J. **The prevention of oil and chemical pollution: proactive approaches in the UK and Canada.** *Journal of the Chartered Institution of Water and Environmental Management*. 2001; 15 (1):51-55. ISSN: 0951-7359.
In an attempt to develop a more concerted approach to non-regulatory initiatives, UK and Canadian agencies allocate substantial budgets toward education campaigns for the prevention of oil and chemical pollution.

Vahidy, Hassaan S.; Fesharaki, Fereidun. **Middle East crude oil trade: future directions and implications for formula pricing.** *Oil & Gas Journal*. 2001; 100 (7):56-65. ISSN: 0030-1388.
The Middle East's total production export availability of crude and the region's production capacity is forecasted to increase substantially over the next 4 years. However, maintaining a level price for the product across various regions has not been successful. Recently, Middle Eastern producers have implemented a formula-based pricing scheme, which involves the use of different markers and differentials based on destination.

Vahidy, Hassaan.; Fesharaki, Fereidun. **US solicits bids to fill strategic reserve with Gulf of Mexico royalty oil.** *Oil & Gas Journal*. 2002; 100 (4):34. ISSN: 0300-1388.
In an effort to fill the Strategic Petroleum Reserve to its 700 million bbl capacity, MMS solicited bids from prequalified companies. The royalty oil will be extracted from the Gulf of Mexico and delivered from offshore platforms to designated market centers.

Vallee, James E. **FERC Hackberry decision will spur more US LNG terminal development.** *Oil & Gas Journal*. 2003; 101 (43):64-68. ISSN: 0030-1388.
A decision made by the Federal Energy Regulatory Commission will allow LNG import terminals to operate without complying with open-access requirements for natural gas. This decision is expected to boost market competition, as well as reduce prices and price volatility.

Van Mourik, Maarten; Shepgerd, Shepherd. **Investment incentive concerns overlooked in peak-oil debate.** *Oil & Gas Journal*. 2004; 102 (10):18-23. ISSN: 0030-1388.
Investments are driven by short-term patterns, such as quarterly reports and current market performance. Presently, this results in an imbalance in investments in oil companies, which are considered long-term assets. This could lead to an unprecedented circumstance where underinvestment, not political or macroeconomic forces, causes higher prices.

Wertheim, Peter Howard. **Rio state studying $5 billion LNG, petrochemical complex.** *Oil & Gas Journal*. 2003; 101 (44):38-39. ISSN: 0030-1388.
A 20-year contract between Brazil and Bolivia will eventually lead to the production of 30 million cubic meters of natural gas per day, with exports to the United States via LNG carriers. Site evaluations are underway for a major LNG plant and an industrial complex south of the city of Rio de Janeiro.

Westwood, John. **Worldwide offshore sector offers major challenges.** *Oil & Gas Journal*. 2001; 99 (18):72-76. ISSN: 0030-1388.
The long-delayed response to the oil price increase is under way. Contractors report greatly increased business in long-lead items, ranging from front-end engineering and design to offshore vessel design. However, recovery differs by industry sector and the dynamics seem different from earlier cyclical upturns.

Westwood, John; Knight, Roger. **Looking at offshore Europe prospects in a global context.** *Oil & Gas Journal*. 2002; 100 (33):22-28. ISSN: 0030-1388.
There is a trend towards offshore exploration by small independent companies, although it is increasingly difficult for them to compete in this region, due to entrenched world-scale contractors presently serving the major oil companies.

Williams, Bob. **Oil industry adapting to evolving new paradigm on corporate governance, accountability.** *Oil & Gas Journal*. 2002; 100 (44):20-32. ISSN: 0030-1388.
The author describes what effect the new Sarbanes-Oxley Act will have on the way that the oil and gas industry handles financial disclosures and corporate reporting.

Williams, Bob. **Progress in IOR technology, economics deemed critical to staving off world's oil production peak.** *Oil & Gas Journal*. 2003; 101 (30):18-25. ISSN: 0030-1388.
This article outlines techniques for improving oil recovery, and provides insight in an effort to prepare for the decline in global oil production

Williams, Bob. **State oil company Petrotrin pushing foreign investment in bid to resuscitate Trinidad & Tobago petroleum sector.** *Oil & Gas Journal*. 2002; 100 (12):24-26. ISSN: 0030-1388.
To successfully move Petrotrin from a bureaucracy to a more externally focused company, Petrotrin is willing to interact with the various stakeholders in Trinidad and Tobago's petroleum industry.

Williams, James L.; Alhajji, A. F. **Parallels with earlier energy crises underscore US vulnerability to oil supply shocks today.** *Oil & Gas Journal*. 2003; 101 (5):20-24. ISSN: 0030-1388.
Analysts review and discuss the threat of an energy crisis in the U.S. and the possible impact on the nation's economy and national security.

Wold, Amy. **Lengthy trial centers on value of marshland.** *Bayou Business Review*. Houma, La.: Houma Daily Courier; September 4, 2000; 4 (7):19, 31.
Fina Oil and Chemical Company is under scrutiny for their alleged destruction of wetlands in Louisiana. 3-D seismic work done for Fina in 1995 provided data for likely places to explore for oil. This procedure damaged property to the tune of $40 million in restoration costs, according to landowners in Bobtown, Louisiana.

Wooley, Chris. **The myth of the "pristine environment": past human impacts in Prince William Sound and the northern Gulf of Alaska.** *Spill Science & Technology Bulletin*. 2002; 7 (1-2):89-104. ISSN: 1353-2561.
According to the author, Prince William Sound has a history of anthropogenic impacts to its environment prior to the *Exxon Valdez* oil spill. Although the spill was devastating to the area's ecosystem, the claim that the spill destroyed a "pristine environment" is false.

Wren, John. **Overview of the compensation and liability regimes under the international oil pollution compensation fund (IOPC).** *Spill Science & Technology Bulletin*. 2000; 6 (1):45-58. ISSN: 1353-2561.
This article provides key lessons and guidelines based on prior oil spills for administrations seeking to alleviate the impact of a major pollution incident, or those involved in helping or advising claimants with regards to the fund. Although each oil spill will present many different problems, there will also be many similarities to previous spills.

Wu, Chao. **Liability and compensation for oil pollution damage: some current threats to the International Convention System.** *Spill Science & Technology Bulletin*. 2002; 7 (1-2):105-112. ISSN: 1353-2561.
This paper proposes the creation of a fund of last resort, to be used regionally or nationally, for liability and compensatory relief for damages not currently covered under existing international Conventions that address oil pollution from ships.

Wu, Kang; Fesharaki, Fereidun. **Central Asia's potential as Asia-Pacific oil supplier limited for years to come.** *Oil & Gas Journal*. 2002; 100 (31):18-23. ISSN: 0030-1388.
The potential of Central Asia to supply the region and the rest of the world with oil will be hampered until political and economic stabilization make it possible for the safe transport of petroleum.

Wu, Kang; Fesharaki, Fereidun. **China's refining sector challenges: surging demand, rising imports of sour crude's, new business models.** *Oil & Gas Journal*. 2001; 99 (8):66-70. ISSN: 0030-1388.
China's aggressive strategy to revamp, upgrade and expand its refinery capabilities is due mainly to the projected rise in the use of sour crudes from the Middle East. If all revisions are successful to the refining plants, and it is predicted that China will greatly increase its sour crudes handling capability and the crude distillation capacity in coastal areas as planned.

Wu, Kang; Fesharaki, Fereidun. **Deregulation will change Taiwan's petroleum product market.** *Oil & Gas Journal*. 2001; 99 (52):58-61. ISSN: 0030-1388.
A new petroleum law, passed by China's parliament in September 2001, ended the monopoly of state-owned Chinese Petroleum Corporation in all phases of imports, refining, and product distribution. The implementation of this law would liberalize import restrictions on all petroleum products.

Yemen's oil production climbing, potential great. *Oil & Gas Journal*. 2001; 99 (10):82-84. ISSN: 0030-1388.
Yemen, one of the smallest countries in the Middle East in terms of oil reserves, has made remarkable progress in the past 15 years. Crude oil and condensate production has grown to 440,000b/d in 2000 from a minimal figure in 1986.

Zaykina, R. F.; Zaykin, Y. A.; Mirkin, G.; Nadirov, N. K. **Prospects for irradiation processing in the petroleum industry.** *Radiation Physics and Chemistry*. 2002; 63 (3-6):617-620. ISSN: 0969-806X.
Irradiation processing of heavy high-viscosity crude oil and heavy waste oil is discussed as a refining option for the petroleum industry. Different types of irradiation processing are compared to determine the most effective method for the industry.

The Department of the Interior Mission

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

The Minerals Management Service Mission

As a bureau of the Department of the Interior, the Minerals Management Service's (MMS) primary responsibilities are to manage the mineral resources located on the Nation's Outer Continental Shelf (OCS), collect revenue from the Federal OCS and onshore Federal and Indian lands, and distribute those revenues.

Moreover, in working to meet its responsibilities, the **Offshore Minerals Management Program** administers the OCS competitive leasing program and oversees the safe and environmentally sound exploration and production of our Nation's offshore natural gas, oil and other mineral resources. The MMS **Minerals Revenue Management** meets its responsibilities by ensuring the efficient, timely and accurate collection and disbursement of revenue from mineral leasing and production due to Indian tribes and allottees, States and the U.S. Treasury.

The MMS strives to fulfill its responsibilities through the general guiding principles of: (1) being responsive to the public's concerns and interests by maintaining a dialogue with all potentially affected parties and (2) carrying out its programs with an emphasis on working to enhance the quality of life for all Americans by lending MMS assistance and expertise to economic development and environmental protection.