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ABOUT THE COVER

Top: The seismic survey ship *Ramform Valiant* with streamers or cables with hydrophones extending from the stern. Photo courtesy of Petroleum Geo-Services.

Bottom: Authigenic (formed in place) carbonate rock outcrop on the seafloor of the Gulf of Mexico. Photo courtesy of H. Roberts.

All photos courtesy of Minerals Management Service unless otherwise noted.

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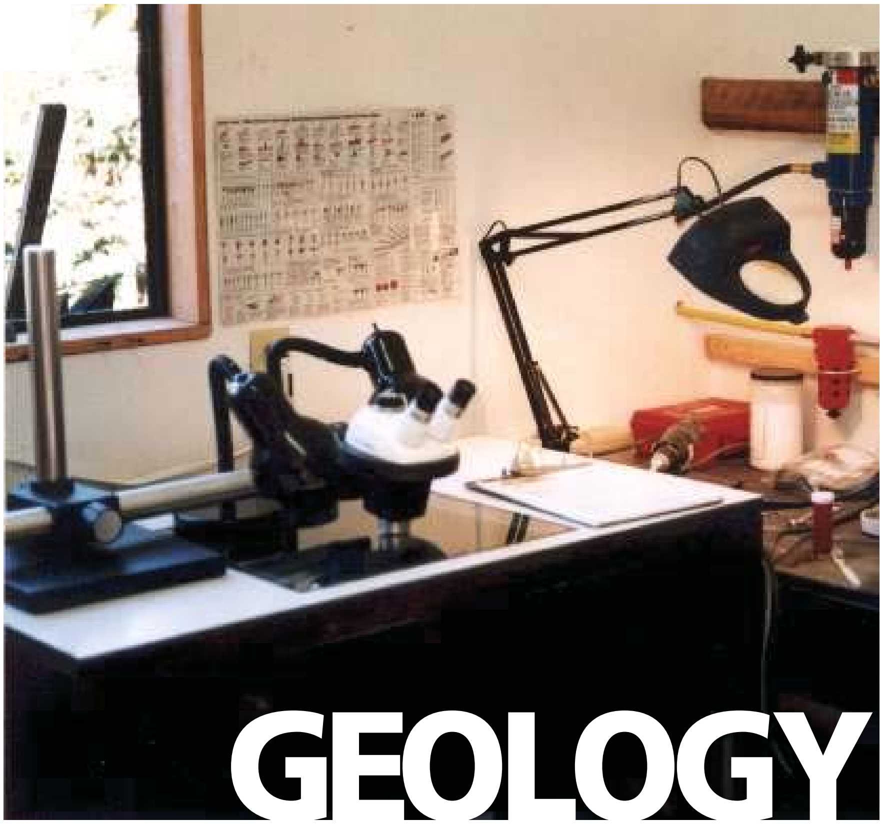
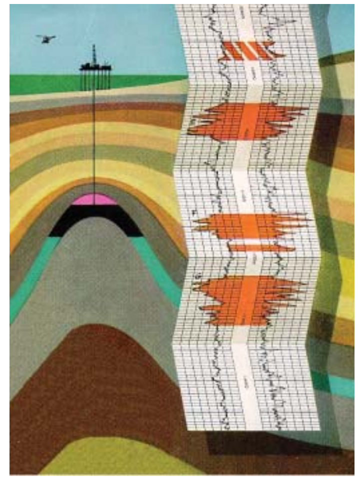
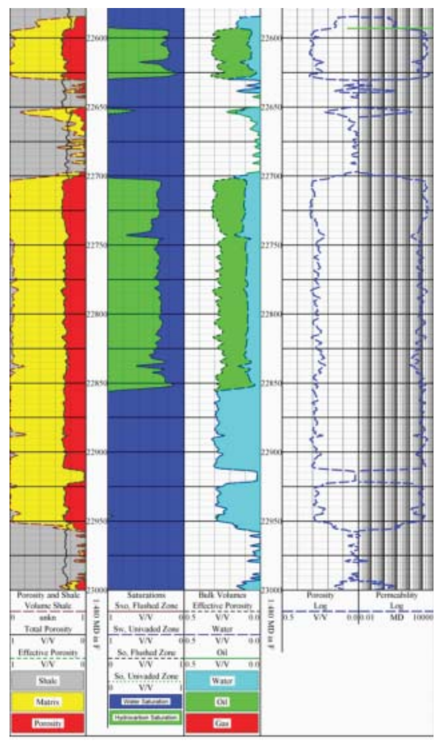


Left: Work area with microscope used to study microfossils (see story on p. 6).



Above: Strata or layers of sediment with a borehole from the surface to a layer with hydrocarbons. The corresponding chart represents data from the different strata used to determine the location of the oil or gas.

Below: Graphs of information collected from a variety of instruments or tools lowered into a borehole. The y-axis is depth below the seafloor. This type of information is used to determine where oil and gas are located.



GEOLOGY

DISCOVERING OUR ENERGY PAST AND FUTURE

Americans live in a mobile society, fueled by hydrocarbons. In fact, if all the passenger vehicles in the United States were lined up bumper to bumper, they would reach from the earth to the moon and back! The amount of fuel consumed in these vehicles each year is enough to fill a swimming pool as big as a football field 40 miles deep. Providing the fuel to power our mobile lifestyle and economy requires the exploration and development of the energy resources buried in the rocks and sediments beneath the earth's surface.

The search for petroleum and the science of geology are intertwined. The word "petroleum" itself comes from the Latin words petra, or rock, and oleum, oil. The Minerals Management Service (MMS) employs geologists, geophysicists, petroleum engineers, and other scientists and equips them with state-of-the-art technology to assist with identifying where resources are located, how to get to them, and how to manage them.

To emphasize the crucial role that geology plays in understanding how oil and gas resources were formed and to educate future generations about the geology of the Outer Continental Shelf (OCS), MMS has produced "Geologic Secrets Revealed," a poster available at no charge to teachers and educators. (See page 11 for reduced image.) The poster explains basic geological processes on the OCS, the mechanics and technologies of exploration, and where geologists are looking for future resources.

As our energy needs continue to rise, geologic information will continue to be important in the quest to discover new resources and to understand the processes of the past that made those resources possible. Advanced technology and geological research techniques will continue to add to the body of geological data, which will make future discoveries possible.

COMPILING DATA TO EVALUATE RESOURCES

FAIR MARKET VALUE AND OUR NATION'S ENERGY RESOURCES

Announcing the bids at a public lease sale on the Outer Continental Shelf (OCS) is just a part of the Minerals Management Service's (MMS) role in managing our natural energy resources and providing fair return to the American people. Even with the new technologies available, the search for oil still requires a lot of speculation and the evaluation of data collected by remote methods.

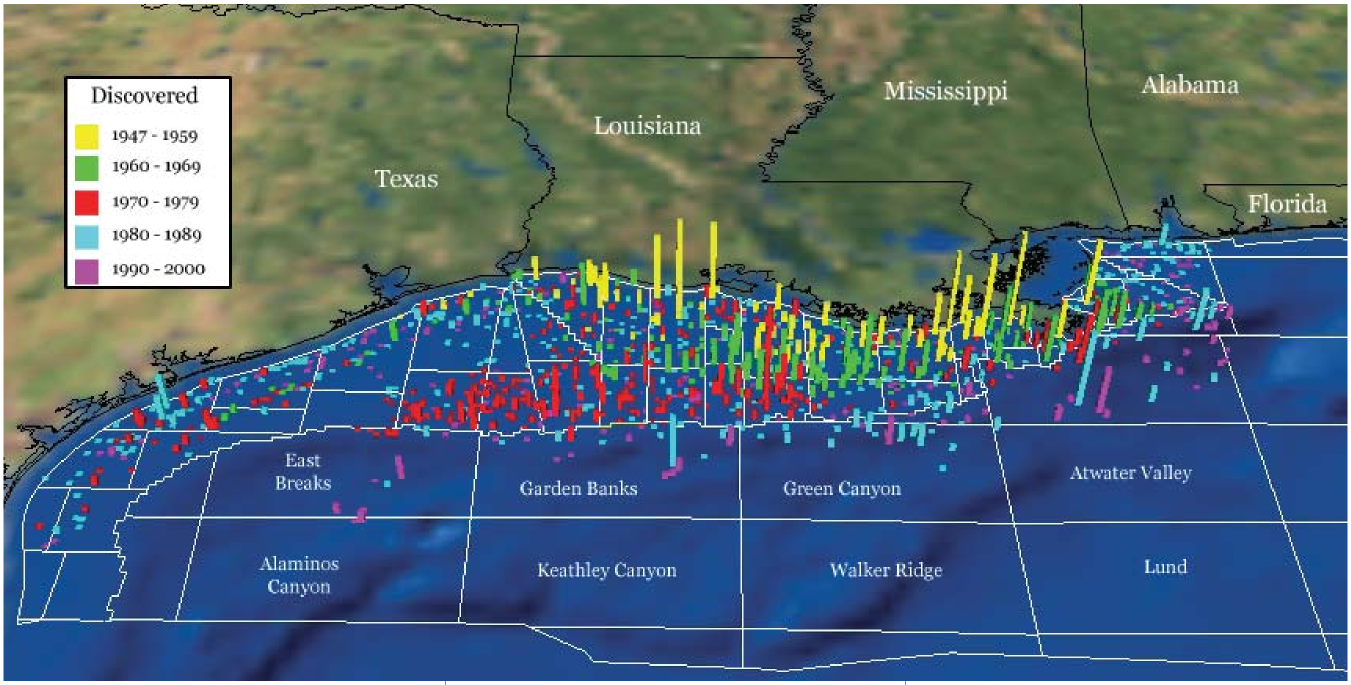
The Gulf of Mexico OCS Region, similar to the other Federal offshore areas, has been divided into thousands of three-mile by three-mile blocks. Twice a year at scheduled, public lease sales, interested oil and gas companies submit sealed bids for each nine-square-mile block they wish to lease. Bids for each block are announced and the highest bid noted. It is then that MMS's Resource Evaluation team must determine whether the fair market value is reflected in the highest bid. In 2004, MMS evaluated bids on 908 tracts in the Gulf of Mexico (GOM).

To determine the adequacy of bids received, MMS analyzes all data at its disposal. Just as the oil company evaluates the resource to determine its bid, MMS compiles geologic and seismic data into a database to evaluate the resource's location, depth, hydrocarbon type, trap, areal extent, and characterization of any potential hydrocarbon deposits according to age and thickness. On the basis of these components, the potential resource is rated and assigned a degree of risk. Costs of discovery and production are estimated on the basis of statistics from other discoveries, and an estimate of value is then assigned to the block.

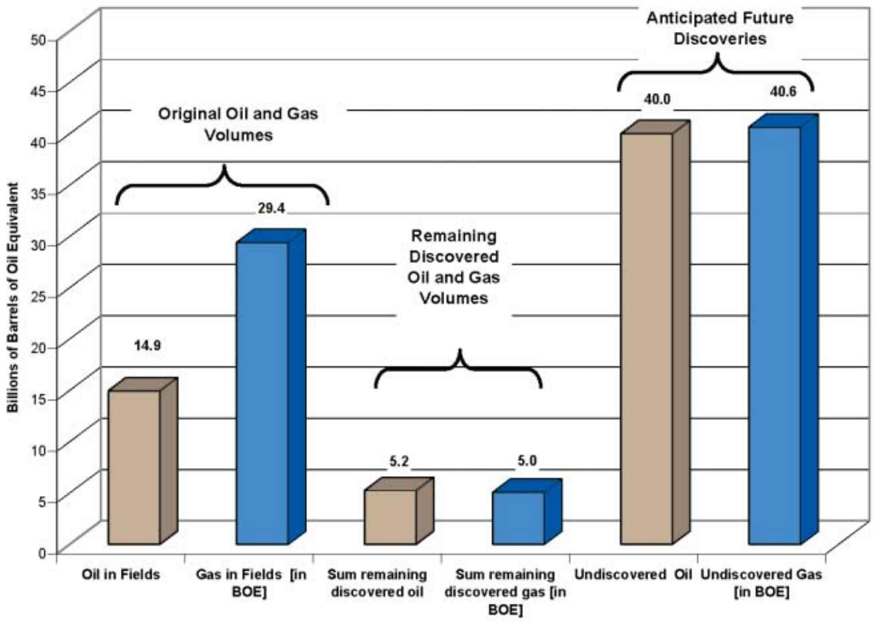
If the highest bid is consistent with competitive bids received in the sale and the MMS estimate of value, the company that submitted the high bid is awarded the lease. That company then has 5-10 years, depending on the water depth, to determine the oil and gas potential of their new lease. Exploratory wells are drilled to see what is really below the surface. If an oil and gas field is discovered within that period, the lease extends through the productive life of the field.

Annual reports issued by MMS assess the total amount of oil and gas found in existing fields, the cumulative amount of production from each field, and the estimated amount of oil and gas remaining to be produced. Relying on active exploration data and seismic mapping, MMS estimates the amount yet to be discovered in the lease areas. Current estimates indicate the amount of oil and gas remaining to be discovered is equivalent to approximately 22 years' worth of imported crude oil at current import rates. This demonstrates that the GOM will continue to play a significant role in the Nation's future energy needs for years to come.

Below: The location of the 1,050 fields (875 active and 175 depleted) in the Gulf of Mexico. The color of the bar indicates the period in which the field was discovered. Note the progression of field discoveries through time into the deeper waters of the Gulf of Mexico. Recent discoveries have occurred in water depth greater than 9,700 feet. Source: *Estimated Oil and Gas Reserves, Gulf of Mexico Outer Continental Shelf, December 31, 2001.* OCS Report MMS 2004-073.



Right: A summary of the Gulf of Mexico (GOM) oil and gas inventory. The first two bars on the left show the amount of oil and gas that has been drilled and discovered in the 1,050 GOM fields (875 active and 175 depleted). The middle set of two bars shows the discovered volumes of oil and gas still available for future production. This volume is equal to approximately 3 years' worth of imported crude oil. The final set of two bars shows MMS's estimate of the amount of oil and gas remaining to be discovered in the GOM. This volume is equal to approximately 22 years' worth of imported crude oil at current import rates. Source: MMS Publications 2001-087 and 2003-050.



THE GULF OF MEXICO'S PAST

HISTORY OF OFFSHORE OIL AND GAS DEVELOPMENT

The Minerals Management Service (MMS) announces the publication of, *History of the Offshore Oil and Gas Industry in Southern Louisiana: Interim Report.* This report is the first of many products that will flow from MMS's ongoing research effort "The Offshore Oil Oral History Project." The three-volume interim report is intended to showpiece some of the kinds of materials that will be developed.

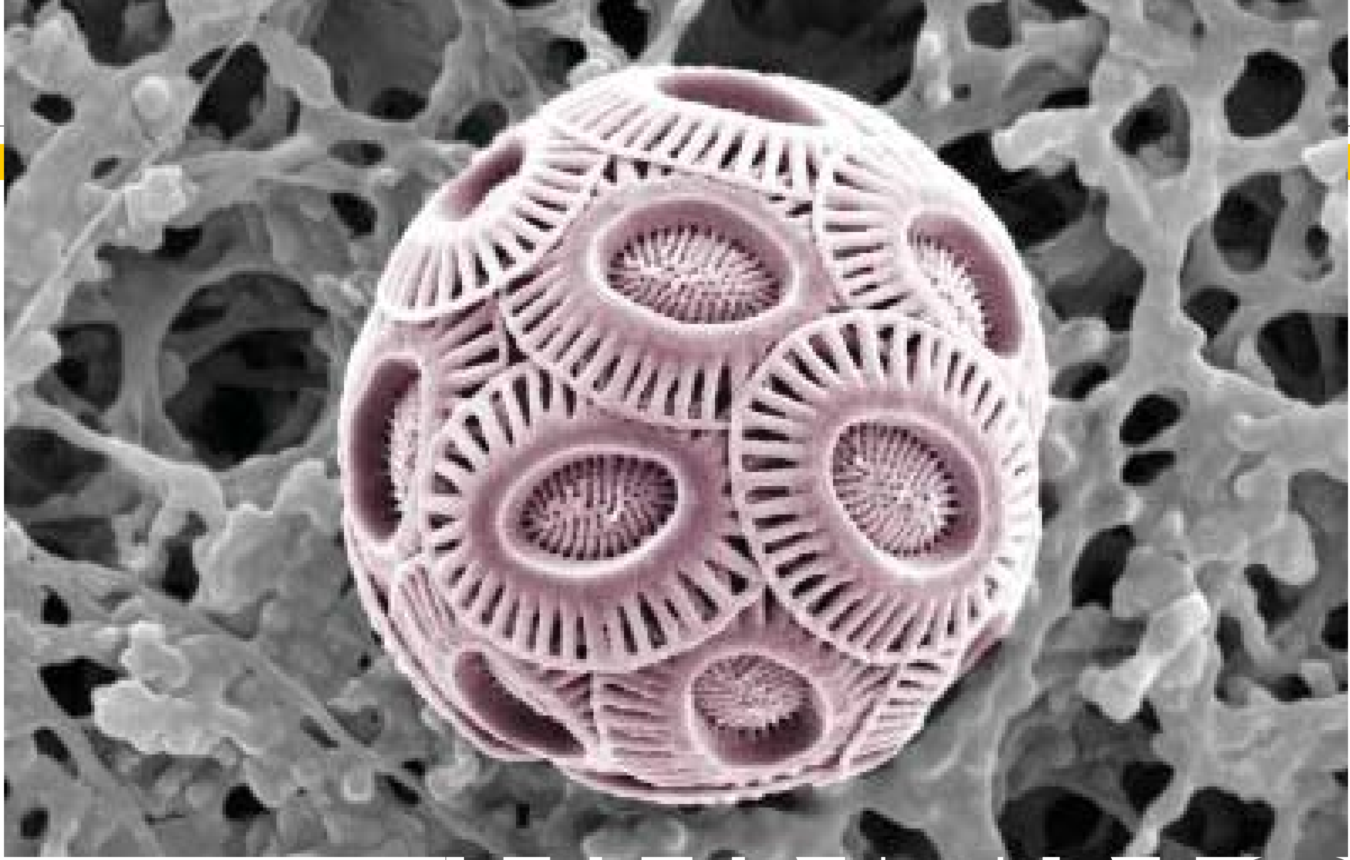
Volume I, *Papers on the Evolving Offshore Industry* (MMS Publication 2004-049), provides a short overview of the Oral History Project and its goals, as well as a series of short, focused, analytical papers on a variety of subjects that build a selection of the collected interviews. For example, in the paper "The Brave and the Foolhardy: Hurricanes in the Early Offshore Industry," Joseph Pratt discusses how the industry, by chance, moved into the Gulf during a period of relative calm in the Gulf. Nevertheless, even though major platform design criteria were wave height and force, these explorers learned through sad experience that they had underestimated the size of waves and failed to consider the threat of mudslides. In another example, "A Brief Look at Commercial Diving and the Role of People, Technology, and the Organization of Work," Diane Austin discusses how returning World War II veterans created modern commercial diving in the Gulf when they began to apply the tools and techniques of the U.S. Navy to the offshore oil industry.

Volume II, *Bayou Lafourche: An Oral History of the Development of the Oil and Gas Industry* (MMS Publication 2004-050), demonstrates the wealth of information contained in oral histories by constructing a history of the area's industry entirely from carefully selected quotations.

Today, the offshore petroleum industry is enormous and operates worldwide. However, it was born in the wetlands and coastal regions of Louisiana and its birth has been little documented. The Oral History Project is documenting this remarkable history through the eyes of the people who built it, worked in it, and lived with it. To date, approximately 400 interviews have been collected and hundreds of photographs have been digitized and catalogued.

Volume III of the interim report, *Samples of Interviews and Ethnographic Prefaces* (MMS Publication 2004-051), provides hints at the rich materials to be mined from these projects. This educational material will be made available to the public upon completion.

To read more about this exciting project, visit: http://www.gomr.mms.gov/homepg/regulate/environ/history_louisiana.html



HUNTING FOR OIL WITH MICROFOSSILS

By Robert B. Witrock, Paleontologist, Offshore Resource Evaluation, Gulf of Mexico OCS Region

The study of ancient fossil life, known as paleontology, is helping geoscientists at the Minerals Management Service (MMS) obtain a clearer picture of relative historical earth events and, in turn, making the search for hydrocarbon resources easier. As scientists ascertain the chronologic ages of paleontologic events, they can then describe the nature of geologic processes that occurred in the area.

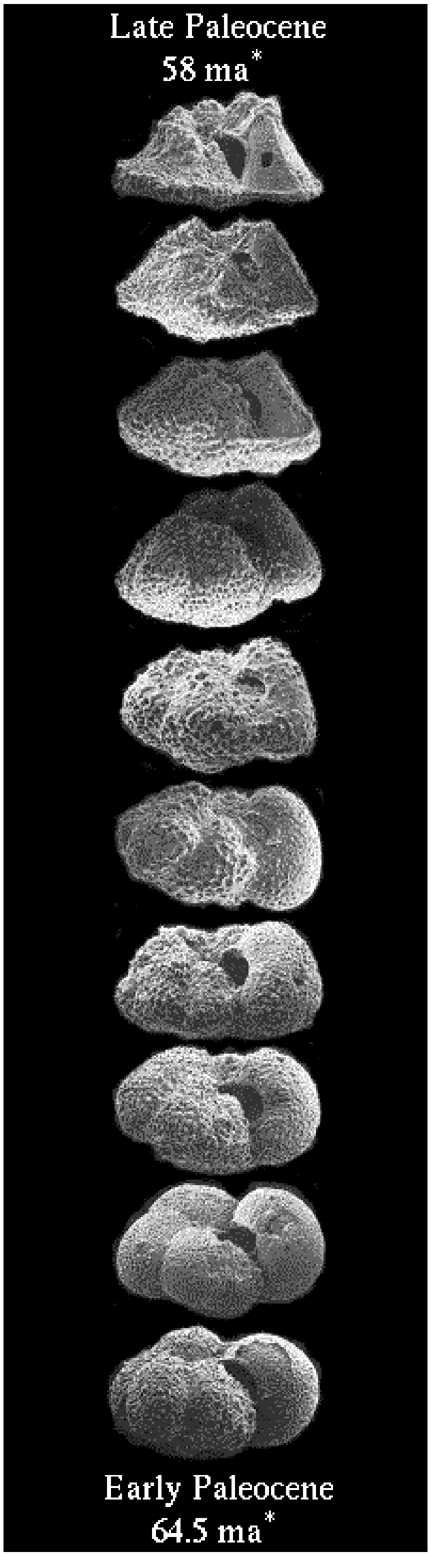
Fossils, which are found in the sediment layer or "strata," provide clues as to the depositional environment, where the organisms lived, and the geologic time when the surrounding sediment was deposited. Estimates of the age of fossils in the strata in which they are found, as well as in layers above and below, are calculated according to basic geologic principle – older strata and fossils are found below younger layers and fossils. Using this principle, geoscientists can determine the "relative age" of the fossil.

Once fossils are identified, the group of species found together at a given layer within the sediment or rock can be compared with other well-known successions of rocks. This analysis is known as biostratigraphy, the separation of rock units on the basis of the description and analysis of the fossil species they contain. Relating the fossils at one stratigraphic level in one area to those in another area at the same level is known as correlation. The ideal fossil for biostratigraphic correlation, known as the marker or index fossil species, is one that is easily identifiable, abundant, prevails over a wide geographic area, and evolves rapidly.

For biostratigraphic analysis, samples are collected from wells. The samples are labeled by well depth and location. While most fossils are destroyed during the drilling process, microfossils remain intact and are identified. A paleontological report is then made, listing the important foraminifera and coccoliths and the depth at which they were found.

Top: A scanning electron microscope (SEM) photo of the coccolith *Emiliania huxleyi*. Lower left: Reconstruction of a Middle Cambrian (505 million years ago) sea bottom based on fossils found in the Burgess Shale in British Columbia. Above: An early paleontologist contemplating a fossil trilobite.

The paleontologist transfers this fossil information into a database where the paleo information from a particular well

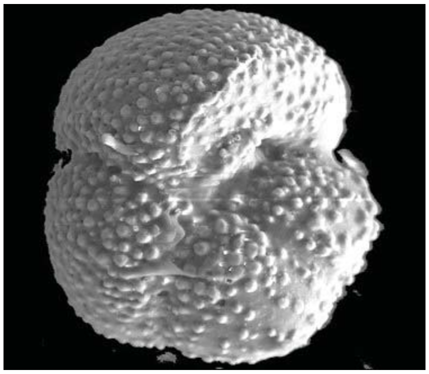


Above: An example of the rapid evolutionary changes in foraminifera over 6.5 million years, from the early Paleocene (64.5 million years ago), at the bottom, to the late Paleocene (58 million years ago), at the top. Upper right: The foraminiferan microfossil *Globorotalia.*

Pa-le-on-tol-o-gy
n. *from the Greek word* paleo, *or ancient, and the Latin* ontologia, *the study of.*

is correlated with adjacent wells, determining the timing of events. Looking at groups or the assemblage of fossils in the well, a paleontologist can determine what the approximate water depth, or paleobathymetry, was at the time of deposition. This critical information reveals much about the depositional environment, its organic productivity, and the potential for forming hydrocarbons.

Using certain fossil species that indicate the age of sedimentary strata, and other species that reveal the water depth, the geoscientist reconstructs time slices and cross-sections to tell the geologic history of the area being studied. The paleontologist can generate various paleo maps that often coincide with sedimentation and structural trends. Integration of microfossil data with seismic and well log data leads to a more complete assessment of hydrocarbon development and reservoir delineation.



The paleontologist plays detective with beautiful microfossils, searching for critical clues left untouched or unseen for millions of years. With geologists and geophysicists applying the fossil evidence as age controls onto seismic sections, well logs, and structure maps, those tiny microfossils provide an essential framework for regional geologic history...and petroleum fields in particular.

For more information:

Paleontology at MMS

http://www.gomr.mms.gov/homepg/whatsnew/speeches/PPDM-2002.html

Biostratigraphic Chart for the Gulf of Mexico

http://www.gomr.mms.gov/homepg/pubinfo/freeasci/paleo/freepaleo.html

Where does oil come from?

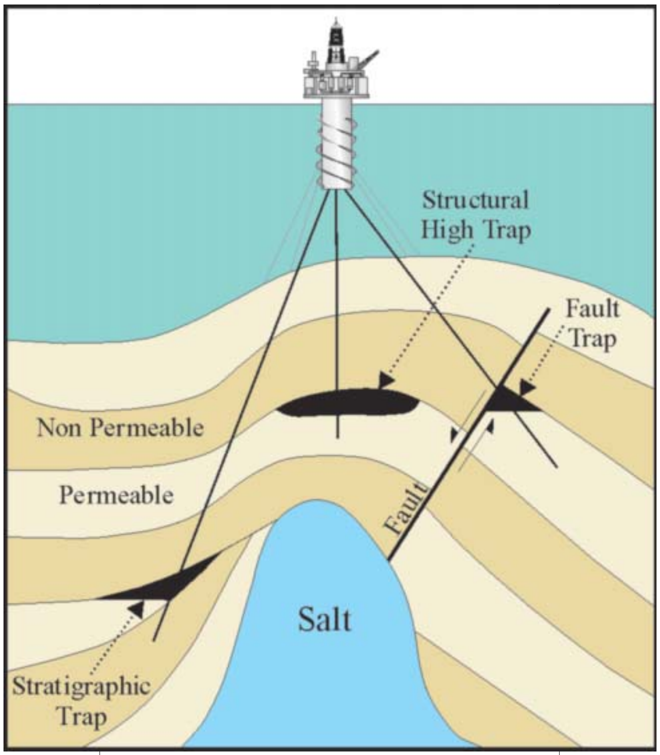
Crude oil is a smelly, yellow-to-black liquid usually found in underground layers called reservoirs. Scientists and engineers explore a chosen area by studying rock samples from the earth. Measurements are taken and, if the site seems promising, drilling begins. Above the hole, a structure called a "rig" is built to house the tools and pipes going into the well. When finished, the drilled well will bring a steady flow of oil to the surface.

The world's top five crude oil-producing countries are Saudi Arabia, Russia, United States, Iran, and China. In the United States, the top five crude oil-producing states are Texas, Alaska, California, Louisiana, and Oklahoma.

Much of the crude oil from Texas, California, and Louisiana is produced offshore. The amount of crude oil produced (domestically) in the United States has been getting smaller each year, but the amount produced from the OCS (primarily from the Gulf of Mexico) has been rising each year.

PROSPECTING WITH NEW TOOLS

The search for oil and gas is a challenge that carries a high financial risk. Wells may cost more than $50-70 million each and be drilled to nearly six miles below the ocean's surface. In the early days of energy exploration, discoveries were often a matter of luck. Even today, the U.S. Energy Information Administration estimates 13% of all holes drilled in the U.S. do not find commercial quantities of oil and gas (down from 37% in 1973). Advanced geophysical and geological tools such as three-dimensional seismic imaging, sophisticated well-logging tools and techniques, computer-based petrophysical analysis, and paleontology reduce the risk associated with locating oil and gas reserves.

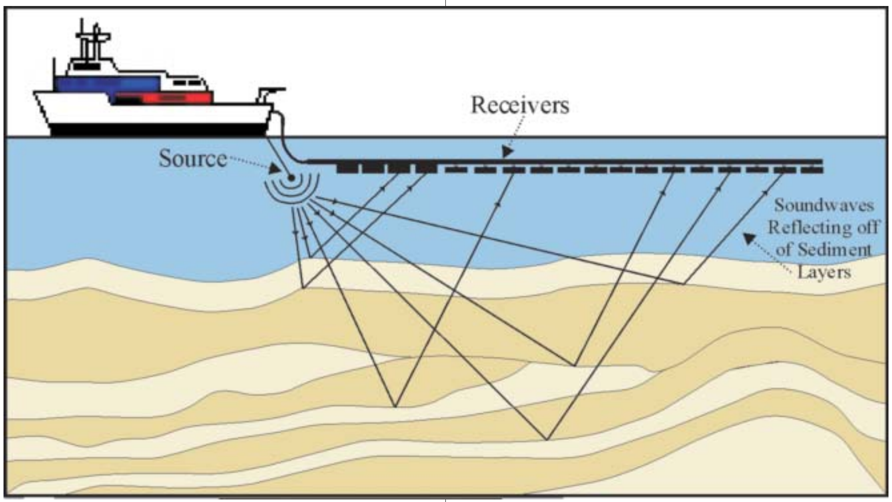


Above: A spar production platform with three wells drilled to different depths where oil or gas has collected or been trapped. In this example, a salt dome has formed, pushing the sediment layers upward and causing faults and deformation. Oil and gas are trapped where permeable layers come in contact with impermeable layers.

In the past, geoscientists had to rely on two-dimensional seismic data interpretation to define potential hydrocarbon prospects. The images scientists assembled were useful, but less than complete. Today, however, advanced three-dimensional seismic data are providing a more detailed understanding of a prospect. Seismic data are obtained by using hydrophone or geophone receivers. These receivers record the time it takes for a signal or sound wave (caused by an air pulse) to travel from the source to the receiver. As the signal or wave travels, it reflects off the layered sediments it encounters and returns to the receiver. The source and receiver are then moved in a grid pattern across an area as the process is repeated.

The data generated through this method are then processed to yield a three-dimensional image or "picture" that represents the subsurface strata and geologic features (faults, salt domes, etc.) in the area of investigation. By estimating the velocity of sound through the various subsurface strata and the travel time of the signal from the source to the receiver, the depth to a particular reflector can be estimated. Geoscientists then translate the seismic data into maps, cross-sections, and three-dimensional models of potential hydrocarbon accumulations or prospects.

In the evaluation of a new lease block, exploratory wells may be drilled to test subsurface strata and structures for potential hydrocarbon accumulations. Logs obtained from these exploration wells (see figure on page 3) provide information that can enhance the three-dimensional seismic picture of the area. Well logs are continuous recordings of specific physical properties of the subsurface strata encountered during drilling of an exploratory well. Such logs may be obtained by wireline logging,



Left: A seismic boat collecting information about the different sediment layers below the seafloor. Sound is emitted from a source and is reflected by the different layers. Receivers listen to the sounds and record the time it takes to travel from the source. This information is translated into 2-dimensional or 3-dimensional images of the sediment layers.

which consists of lowering a logging tool into a well and recording data as the tool is raised from the bottom of the well. Logs can also be generated by recording data as the well is drilled. The MMS has about 300,000 logs from 44,000 wells in the Gulf of Mexico.

Logging tools can measure the temperature, electric potential, density, radioactivity, velocity, resistivity, and conductivity of the rock formations they encounter. These measurements are used to determine the petrophysical characteristics – porosity, permeability, and water and hydrocarbon saturation – directly related to the oil and gas producing potential of the rock. These evaluations are necessary not only to identify the rock type and hydrocarbon-bearing reservoirs but also to identify the type of hydrocarbon (i.e., gas, oil, condensate), and to determine the volume of hydrocarbons in place and the volume of hydrocarbons that can be successfully extracted from a reservoir. Detailed petrophysical analysis is a vital and necessary step in the exploration for the development of oil and gas prospects.

Paleontology also provides the geoscientist with tools to use in the hunt for hydrocarbons. The study of microfossils by paleontologists provides additional clues to the geologic history of a hydrocarbon prospect. The type of fossils found in a potential field can help scientists determine the age and depositional environment of the strata or structure being explored.

Today's geoscientists use many tools in the exploration for hydrocarbons beneath the seafloor. Each tool provides its own unique insights into the subsurface. As technology advances, refinements are made and more advanced tools are developed. The result is a more accurate and cost-effective means of oil and gas exploration.

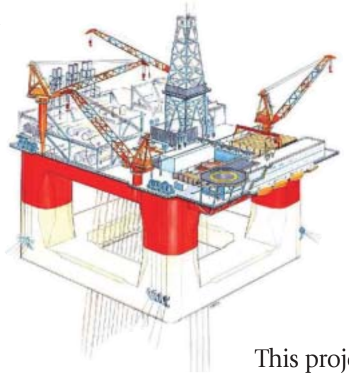
GULF OF MEXICO'S NEW ARRIVAL

THUNDER HORSE SEMI-SUBMERSIBLE PRODUCTION UNIT

The world's largest semi-submersible production unit, the 59,500-ton Thunder Horse production, drilling, and quarters (PDQ) unit, recently arrived at the Kiewit yard in Ingleside, Texas, following an eight-week journey to the Gulf of Mexico from Korea aboard the *Dockwise Blue Marlin.* British Petroleum Company (BP) will operate this unit.

The topside modules, fabricated in Morgan City, Louisiana, are being installed onto the PDQ (hull). Sail out for installation at the BP Thunder Horse field is slated for the end of the first quarter of 2005.

Above: *Dockwise Blue Marlin* carries Thunder Horse PDQ. Photo courtesy J. Ray McDermott, Inc.



Left: Artist's rendering of Thunder Horse PDQ. Photo courtesy BP Exploration, Inc.

Below: *Dockwise Blue Marlin* carries Thunder Horse PDQ. Photo courtesy Dockwise.

This project has garnered worldwide interest because of its sheer massiveness. The distance from the base of the hull to top of the drill rig is just over 450 feet, roughly the height of a 40-story building. The immense deck area is approximately 3 acres.

Nearly four years in the making, the Thunder Horse unit will soon make its home in 6,000 feet of water in the Gulf of Mexico, 150 miles southeast of New Orleans. The Thunder Horse field is the largest discovery ever made in the Gulf of Mexico. When fully operational, the unit will be capable of producing an astounding 250,000 barrels of oil and 200 million cubic feet of natural gas per day.

TAKING "PICTURES"
BELOW THE EARTH'S SURFACE

Finding oil and gas resources located miles beneath the ocean's floor may seem like trying to find a "needle in a haystack." However, advancing technology makes finding that needle a little easier. To determine whether the rock strata beneath the ocean floor may contain oil and gas resources that can be developed economically, geoscientists must interpret and integrate large volumes of geophysical, geological, petrophysical, and paleontological data. The interpretation of these data allows the geoscientist to create an image or "picture" of the subsurface, which is then used to determine whether an area has any potential for oil and gas resources.

The introduction of three-dimensional (3-D) seismic data has greatly improved the ability of geo-scientists to obtain detailed information about the rich resources available beneath the ocean floor. The 3-D seismic data provide accurate images of the subsurface and cover large areas. Other geological data, such as that provided by electrical logs and paleontology, enhance the interpretation of the 3-D subsurface seismic image of an area of interest. When used together, each of the data types allows a clearer image of deep-sea subsurface structures and hydrocarbon potential to emerge.

To compile and interpret the massive quantity of data available from various sources, geoscientists use high-tech workstations comprising stand-alone or networked computers. These work-stations use integrated geoscientific interpretation and reservoir simulation software to interpret and analyze 2- and 3-D seismic data. In addition, the workstations help to create geological and geophysical maps, construct cross-sections of buried rock formations, and manage the immense amount of data used. The Minerals Management Service (MMS) currently has 8 terabytes of seismic data stored on its computers.

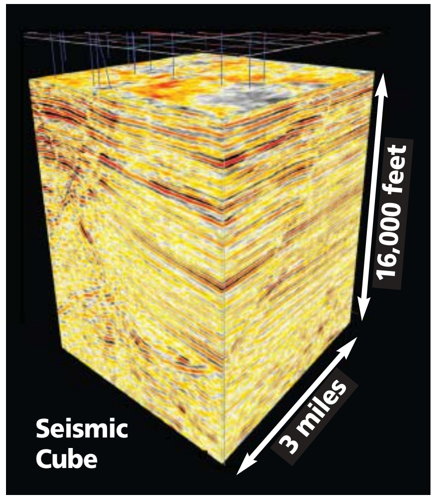
The Agency is pursuing the acquisition of an immersive visualization center that will display geological and geophysical data three-dimensionally on projection walls in theater-like rooms. Geoscientists wearing 3-D glasses will be "immersed" in the display. Geoscience teams may then simultaneously view the data, making it easier for them to collaborate. Such collaboration provides quicker and more accurate inter-pretations and evaluations of potential subsurface hydrocarbon resources.

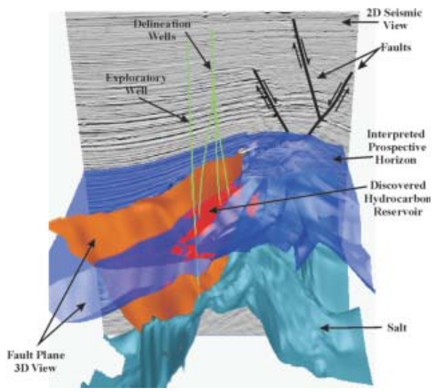
Using the numerous data types available and high-tech workstations in a collaborative environment, geoscientists from MMS and the oil and gas industry can more readily identify and evaluate what lies beneath the ocean floor and determine which areas may be economically profitable to develop. With these data and high-tech data analysis tools, the "haystack" becomes much smaller, the needle a bit larger, and the search much less costly.

FOR MORE INFORMATION:

MMS Publication 2001-050

Improved Geohazards and Benthic Habitat Evaluations: Digital Acoustic Data with Ground Truth Calibrations





Top: A 3-dimensional cube generated by using computer modeling from seismic data showing the sediment layers below the seafloor.

Above: A 3-dimensional view created from 2-dimensional seismic data of subsurface features.

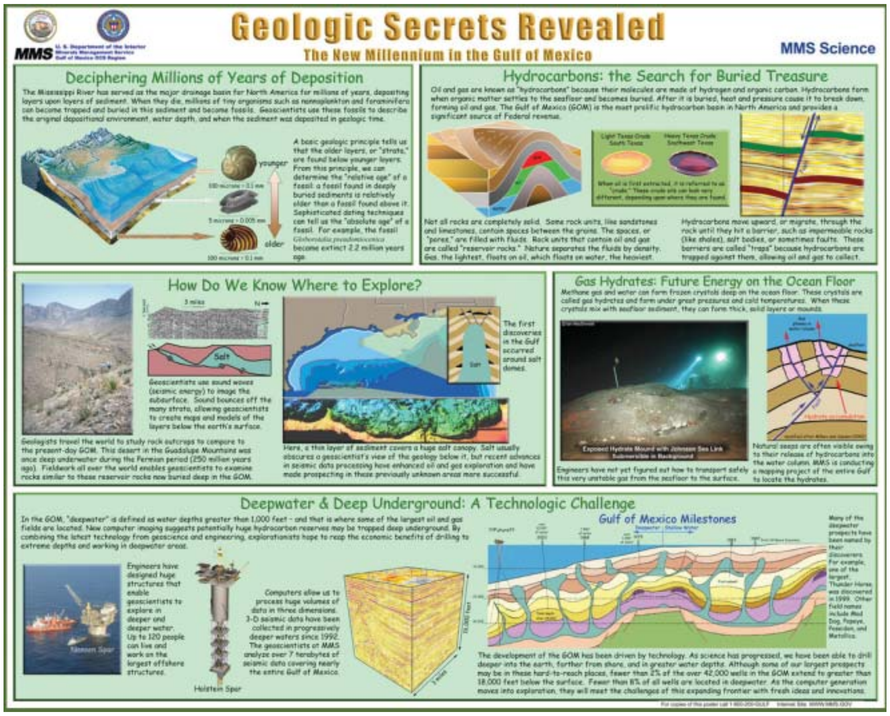
Left: An MMS scientist reviewing geophysical data at a work station.

GEOLOGIC MYSTERIES

The Outer Continental Shelf (OCS) abounds with rich and varied biological, chemical, and geological natural resources. The oil and gas resources located on the OCS are particularly important to the Nation's energy future. The unique geology of the surface and subsurface has made the OCS a prolific area for hydrocarbon resources in North America, producing almost 29% of the oil and 25% of the natural gas in the U.S.

The area known as the OCS runs from approximately 3 miles from a State's coastline to about 200 nautical miles from shore. Generally, the continental shelf runs in a gentle slope from the beach to approximately 600 feet of water depth. The continental slope is a relatively steep feature that begins where the shelf leaves off (600 ft up to 10,000 ft). The continental rise begins at the end of the slope and is an apron of sediment between the slope and the abyssal plain, a relatively flat seafloor.

Hydrocarbons (oil and gas) are formed when organic matter such as plant material and animal remains settles to the bottom of a body of water and becomes buried by sediment. Through millions of years, heat and pressure from natural processes are applied. Over time, oil and gas are formed as the organic material is broken down.



"Geological Secrets Revealed: The New Millennium in the Gulf of Mexico" focuses on the geoscientists' search for energy resources, including oil, natural gas, and gas hydrates, on and deep below the seafloor of the Gulf of Mexico.

However, hydrocarbons do not remain where they were deposited. They begin to migrate upwards through porous rocks that serve as pathways. The hydrocarbons continue to rise until they are trapped in pockets between two strata or layers, one porous or permeable and the other impermeable. Gas, being lighter, is usually at the top of the trap, heavier oil is next, and at the bottom is water.

Traps form when rocks fold into structural highs by tectonic plate activity, or when faults move layers of rock where porous rock, such as sandstone or limestone, presses against impermeable rock such as shale. The trap must be sealed by impermeable layers to prevent oil and gas from escaping and it must also have enough space for oil and gas to accumulate.

The Nation's energy potential may not rest entirely on conventional hydrocarbon resources. Scientists are now studying the possibility that a unique and puzzling frozen "ice" crystal may hold the key to future energy resources. Gas hydrates form when methane gas and water are subjected to pressurization and extremely cold temperatures. When mixed with sediments on the sea bottom, gas hydrates form thick layers or mounds. Discovering a method to transport the gas from these formations to the surface is key to their potential use.

As new reservoirs are discovered and new forms of energy explored, the responsible stewardship of the OCS remains a vital part of our National interest. The Minerals Management Service continues to study and evaluate the rich geologic mysteries existing there.

Teachers and educators are encouraged to order the free "Geologic Secrets Revealed" poster shown above. To order, please contact: Minerals Management Service, Gulf of Mexico OCS Region, Public Information Office (MS 5034), 1201 Elmwood Park Boulevard, New Orleans, Louisiana 70123-2394, or call 1-800-200-GULF.

For more information:

MMS Kids' Pages

Website: http://www.mms.gov/mmskids/

MMS Kids – Alaska Region

Website: http://www.mms.gov/alaska/kids/index.htm

Educational Resources

Website: http://www.gomr.mms.gov/homepg/lagniapp/lagniapp.html

MMS Pacific Region

Website: http://www.mms.gov/omm/pacific/kids/educate.htm

MMS – A Leader in Securing the Nation's Domestic Energy Supply

Fugro Explorer drilling vessel
Photo courtesy of Fugro

NEW WAVES
Late-breaking News & Information

Major Hydrate Expedition to be Launched in Spring

A drilling vessel will embark this spring on a mission in support of the project *Characterizing Natural Gas Hydrates in the Deep Water Gulf of Mexico: Applications for Safe Exploration and Production Activities.* This project is funded by a Joint Industry Program (JIP) by ChevronTexaco to investigate and obtain information necessary to bring methane hydrates into the natural gas resource base and ensure safe drilling operations near formations.

The project is a 5-year collaborative effort to develop technology and collect data to characterize naturally occurring gas hydrates in the deep water Gulf of Mexico.

A series of cored and logged holes will be drilled in the Gulf of Mexico at Atwater Canyon Blocks 13 and 14 (AC-13,14) in 2005 and at Keathley Canyon Block 151 (KC-151) in 2006. These sites were selected on the basis of observed seafloor hydrate mounds, maps of gas hydrate indicators, and interpretations of seismic data. These blocks have all the characteristics of hydrate deposits, including bottom-simulating reflectors, wipe-out zones, mud volcanoes, chaotic-appearing geological structures, and faults that extend up to the seafloor.

Site AC-13,14 lies in 4,000-4,300 feet of water while KC-151 is in 4,300-4,800 feet of water. A series of 4-5 holes will be drilled through the hydrate stability zone at each site. After the drilling, the seismic lines across each hole will be calibrated with the data from the cores and electric logs. It is hoped that with the combined use of drill hole and geophysical data, reasonably accurate estimates of the volume of gas hydrate can be made.

Methane hydrates represent a potentially enormous natural gas resource. Estimates range as high as 700,000 trillion cubic feet (Tcf) worldwide, many times the estimated total of conventional resources of natural gas. The United States hydrates resource is estimated at 100,000 to 300,000 Tcf.

"The Gulf of Mexico JIP is the most significant offshore hydrate research that will be done in the next few years, and it will provide the first real data on safe drilling and operations, resource assessment, and environmental characterization and protection of hydrate-bearing sediment in our deepwater areas," says Dr. Mike Smith, geochemist at the Minerals Management Service.

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