

## Wall Street Journal Article About The Origins Of Crude Oil

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# Odd Reservoir Off Louisiana Prods Oil Experts to Seek a Deeper Meaning

#### By CHRISTOPHER COOPER

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HOUSTON -- Something mysterious is going on at Eugene Island 330.

Production at the oil field, deep in the Gulf of Mexico off the coast of Louisiana, was supposed to have declined years ago. And for a while, it behaved like any normal field: Following its 1973 discovery, Eugene Island 330's output peaked at about 15,000 barrels a day. By 1989, production had slowed to about 4,000 barrels a day.

Then suddenly -- some say almost inexplicably -- Eugene Island's fortunes reversed. The field, operated by **PennzEnergy** Co., is now producing 13,000 barrels a day, and probable reserves have rocketed to more than 400 million barrels from 60 million. Stranger still, scientists studying the

field say the crude coming out of the pipe is of a geological age quite different from the oil that gushed 10 years ago.

### Fill 'er Up

All of which has led some scientists to a radical theory: Eugene Island is rapidly refilling itself, perhaps from some continuous source miles below the Earth's surface. That, they say, raises the tantalizing possibility that oil may not be the limited resource it is assumed to be.

"It kind of blew me away," says Jean Whelan, a geochemist and senior researcher from the Woods Hole Oceanographic Institution in Massachusetts. Connected to Woods Hole since 1973, Dr. Whelan says she considered herself a traditional thinker until she encountered the phenomenon in the Gulf of Mexico. Now, she says, "I believe there is a huge system of oil just migrating" deep underground.

Conventional wisdom says the world's supply of oil is finite, and that it was deposited in horizontal reservoirs near the surface in a process that took millions of years. Since the economies of entire countries ride on the fundamental notion that oil reserves are exhaustible, any contrary evidence "would change the way people see the game, turn the world view upside down," says Daniel Yergin, a petroleum futurist and industry consultant in Cambridge, Mass. "Oil and renewable resource are not words that often appear in the same sentence."

#### **Mideast Mystery**

Doomsayers to the contrary, the world contains far more recoverable oil than was believed even 20 years ago. Between 1976 and 1996, estimated global oil reserves grew 72%, to 1.04 trillion barrels. Much of that growth came in the past 10 years, with the introduction of computers to the oil patch, which made drilling for oil more predictable.

Still, most geologists are hard-pressed to explain why the world's greatest oil pool, the Middle East, has more than doubled its reserves in the past 20 years, despite half a century of intense exploitation and relatively few new discoveries. It would take a pretty big pile of dead dinosaurs and prehistoric plants to account for the estimated 660 billion barrels of oil in the region, notes Norman Hyne, a professor at the University of Tulsa in Oklahoma. "Off-the-wall theories often turn out to be right," he says.

Even some of the most staid U.S. oil companies find the Eugene Island discoveries intriguing. "These reservoirs are refilling with oil," acknowledges David Sibley, a **Chevron** Corp. geologist who has monitored the work at Eugene Island.

Mr. Sibley cautions, however, that much research remains to be done on the source of that oil. "At this point, it's not black and white. It's gray," he says.

Although the world has been drilling for oil for generations, little is known about the nature of the resource or the underground activities that led to its creation. And because even conservative estimates say known oil reserves will last 40 years or more, most big oil companies haven't concerned themselves much with hunting for deep sources like the reservoirs scientists believe may exist under Eugene Island.

Economics never hindered the theorists, however. One, Thomas Gold, a respected astronomer and professor emeritus at Cornell University in Ithaca, N.Y., has held for years that oil is actually a renewable, primordial syrup continually manufactured by the Earth under ultrahot conditions and tremendous pressures. As this substance migrates toward the surface, it is attacked by bacteria, making it appear to have an organic origin dating back to the dinosaurs, he says.

While many scientists discount Prof. Gold's theory as unproved, "it made a believer out of me," says Robert Hefner, chairman of **Seven Seas Petroleum** Inc., a Houston firm that specializes in ultradeep drilling and has worked with the professor on his experiments. Seven Seas continues to use "conventional" methods in seeking reserves, though the halls of the company often ring with dissent. "My boss and I yell at each other all the time about these theories," says Russ Cunningham, a geologist and exploration manager for Seven Seas who isn't sold on Prof. Gold's ideas.

#### **Energy Vacuum**

Knowing that clever theories don't fill the gas tank, Roger Anderson, an oceanographer and executive director of Columbia University's Energy Research Center in New York, proposed studying the behavior of oil in a reservoir in hopes of finding a new way to help companies vacuum up what their drilling was leaving behind.

He focused on Eugene Island, a kidney-shaped subsurface mountain that slopes steeply into the Gulf depths. About 80 miles off the Louisiana coast, the underwater landscape surrounding Eugene Island is otherworldly, cut with deep fissures and faults that spontaneously belch gas and oil. In 1985, as he stood on the deck of a shrimp boat towing an oil-sniffing contraption through the area, Dr. Anderson pondered Eugene Island's strange history. "Migrating oil and anomalous production. I sort of linked the two ideas together," he says.

Five years later, the U.S. Department of Energy ponied up \$10 million to investigate the Eugene Island geologic formation, and especially the oddly behaving field at its crest. A consortium of companies leasing chunks of the formation, including such giants as Chevron, **Exxon** Corp. and **Texaco** Corp., matched the federal grant.

## **Time and Space**

The Eugene Island researchers began their investigation about the same time that 3-D seismic

technology was introduced to the oil business, allowing geologists to see promising reservoirs as a cavern in the ground rather than as a line on a piece of paper.

Taking the technology one step further, Dr. Anderson used a powerful computer to stack 3-D images of Eugene Island on top of one another. That resulted in a 4-D image, showing not only the reservoir in three spatial dimensions, but showing also the movement of its contents over time as PennzEnergy siphoned out oil.

What Dr. Anderson noticed as he played his time-lapse model was how much oil PennzEnergy had missed over the years. The remaining crude, surrounded by water and wobbling like giant globs of Jell-O in the computer model, gave PennzEnergy new targets as it reworked Eugene Island.

What captivated scientists, though, was a deep fault in the bottom corner of the computer scan that was gushing oil like a garden hose. "We could see the stream," Dr. Anderson says. "It wasn't even debated that it was happening."

Woods Hole's Dr. Whelan, invited by Dr. Anderson to join the Eugene Island investigation, postulated that superheated methane gas -- a compound that is able to absorb vast amounts of oil -- was carrying crude from a deep source below. The age of the crude pushed through the stream, and its hotter temperature helped support that theory. The scientists decided to drill into the fault.

#### **Unlucky Strike**

As prospectors, the scientists were fairly lucky. As researchers they weren't. The first well they drilled hit natural gas, a pocket so pressurized "that it scared us," Dr. Anderson says; that well is still producing. The second stab, however, collapsed the fault. "Some oil flowed. I have 15 gallons of it in my closet," Dr. Anderson says. But it wasn't successful enough to advance Dr. Whelan's theory.

A third well was drilled at a spot on an adjacent lease, where the fault disappeared from seismic view. The researchers missed the stream but hit a fair-size reservoir, one that is still producing.

It was here, in 1995, that the scientists ran out of grant money and PennzEnergy lost interest in continuing. "I'm not discounting the possibility that there is oil moving into these reservoirs," says William Van Wie, a PennzEnergy senior vice president. "I question only the rate."

Dr. Whelan hasn't lost interest, however, and is seeking to investigate further the mysterious vents and seeps. While industry geologists have generally assumed such eruptions are merely cracks in a shallow oil reservoir, they aren't sure. Noting that many of the seeps are occurring in deep water, rather than in the relative shallows of the continental shelf, Dr. Whelan wonders if they may link a deeper source.

This summer, a tiny submarine chartered by a Louisiana State University researcher will attempt to install a series of measuring devices on vents near the Eugene Island property. Dr. Whelan hopes this will give her some idea of how quickly Eugene Island is refilling. "We need to know if we're talking years or if we're talking hundreds of thousands of years," she says.

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