

## **ABIOTIC OIL THEORY: BACKGROUND**

### **Background**

There has been much written and spoken about ‘peak oil’ and the economic, social and environmental consequences of that phenomenon. The premise behind all the discussion is that oil and natural gas were formed from dead plant and animal material under tremendous geological pressures, and over the course of millions of years. In other words, oil and natural gas can be said to be formed from biotic materials. Most petroleum geologists and engineers agree with and support this premise. In today’s dialogue on our pending energy crisis, there is more and more discussion about an alternative theory about the formation of oil and natural gas. That is the theory that oil and natural gas are formed through geological processes, not biological, and is continually being formed in the depths of the magma enveloping our planet.

The implications of this alternative concept are that we have much more oil and natural gas in reserves at greater depths, and that wells which might appear to be depleted will, over time, be re-filled. This term used for this theory is ‘abiotic’ oil. This concept is being grasped by those who have not and do not believe that we are running out of oil and natural gas, the ‘nay-sayers’ in industry and government who are pushing for further exploration and development, despite what we have seen happen in the Gulf of Mexico with one of these wells chasing the deep “abiotic” oil.

The discussion of the origin of our sources of oil and natural gas has been over-shadowed to this point by discussion on the rate of escalation of our usage of these resources as fuels and the resultant impacts on our air quality and global climate. There is overwhelming recognition that our rate of consumption of oil and natural gas, particularly as fuels to be burned, must abate. We must deal with our addiction. But we must be prepared to deal with those who will attempt to use the disagreement on the genesis of our oil and natural gas supplies to slow or even to derail our attempts to address the necessary changes and challenges facing us.

This essay provides some background information on this issue as an introduction to other perspectives presented in the four following essays.

### **Abiotic Oil**

There is an alternative theory about the formation of oil and gas deposits that could change estimates of potential future oil reserves. According to this theory, oil is not a fossil fuel at all, but was formed deep in the Earth's crust from inorganic materials. The theory was first proposed in the 1950s by Russian and Ukranian scientists. Based on the theory, successful exploratory drilling has been undertaken in the Caspian Sea region, Western Siberia, and the Dneiper-Donets Basin.

The prevailing explanation for the formation of oil and gas deposits is that they are the remains of plant and animal life that died millions of years ago and were compressed by heat and pressure over the years. Russian and Ukranian geologists argue that formation of oil deposits requires the high pressures found only in the deep mantle and that the hydrocarbon contents in

sediments do not exhibit sufficient organic material to supply the enormous amounts of petroleum found in supergiant oil fields.

The abyssal, abiotic theory of oil formation continues to receive attention due to the work of retired Cornell astronomy professor **Thomas Gold**, known for several theories that were initially dismissed but eventually proven true, including the existence of neutron stars. He has also been wrong, however; he was a proponent of the "steady state" theory of the universe, which has since been discarded for the "Big Bang" theory. Gold's theory of oil formation, which he expounded in a book entitled *The Deep Hot Biosphere*, is that hydrogen and carbon, under high temperatures and pressures found in the mantle during the formation of the Earth, form hydrocarbon molecules which have gradually leaked up to the surface through cracks in rocks. The organic materials which are found in petroleum deposits are easily explained by the metabolism of bacteria which have been found in extreme environments similar to Earth's mantle. These hyperthermophiles, or bacteria which thrive in extreme environments, have been found in hydrothermal vents, at the bottom of volcanoes, and in places where scientists formerly believed life was not possible. Gold argues that the mantle contains vast numbers of these bacteria.

The abiogenic origin of petroleum deposits would explain some phenomena that are not currently understood, such as why petroleum deposits almost always contain biologically inert helium. Based on his theory, Gold persuaded the Swedish State Power Board to drill for oil in a rock that had been fractured by an ancient meteorite. It was a good test of his theory because the rock was not sedimentary and would not contain remains of plant or marine life. The drilling was successful, although not enough oil was found to make the field commercially viable. The abiotic theory, if true, could affect estimates of **how much oil remains** in the Earth's crust.

The abiogenic origin theory of oil formation is rejected by most geologists, who argue that the composition of hydrocarbons found in commercial oil fields have a low content of  $^{13}\text{C}$  isotopes, similar to that found in marine and terrestrial plants; whereas hydrocarbons from abiotic origins such as methane have a higher content of  $^{13}\text{C}$  isotopes.

### References

Lollar, S.B., *et al.* 2002. Abiogenic formation of alkanes in the earth's crust as a minor source for global hydrocarbon reserves. *Nature* 416: 522-524.

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