Understanding the natural ancient origin of oil versus a biblical Genesis Flood origin of oil

Lorence G. Collins **lorencecollins@gmail.com**

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Introduction

A few people who are young-Earth creationists (YEC) have suggested that oil (petroleum; hereafter mostly referred to as oil) can be formed quickly within 6,000 to 10,000 years and even during or soon after the Flood and that there are biological clues that oil is produced from dead plants and animals. Such YEC include Snelling (1990) who reported (1) that sewage could be processed under heat and pressure to produce long-chain hydrocarbons of crude oil and that it only took a day or two, (2) that an oil shale (torbanite) and brown coal (lignite) in Australia were tested over a 4 year period and that the torbanite produced paraffinic crude oil at 350ºC and that the brown coal produce 1% short-chain hydrocarbons and 0.2% oil, and (3) that globules of oil were formed underwater near volcanic hydrothermal vents in Guaymas Basin in the Gulf of California. On the basis of this rapid formation of oil in three places, he suggested that such agrees with Genesis in that oil can be formed quickly, and he suggested that hot water from "fountains of the deep" would have been associated with volcanic activity that could have generated the heat that caused oil to form rapidly during the Flood. The problem with this hypothesis is the great distances that oil fields are from mid-ocean spreading centers which is presumably where the fountains of the deep originated.

Snelling (2006) suggested that it is possible that some oil and natural gas may have been produced inorganically (abiotic), but he believes that most oil and natural gas has an organic origin. He argued that porphyrins (such as chlorophyll in plants) that are found in oil are clues to the origin of the oil being from an organic source. He thought that most plant sources of the oil were diatoms and beds of coal formed from trees that were uprooted by the Flood on the basis that oils and natural gas are found near coal beds in Victoria, Australia. He also pointed out that slaughter houses in a processing plant in Missouri have been putting animal waste (turkey guts and pig fat) into a biorefinery to produce complex molecular short-chains of hydrogen and carbon molecules of oil. This oil creation was done at 260ºC and at pressures of 600 pounds per square inch.

Matthews (2008) reviews the two different models for the origin of oil. These are the biogenic model favored by geologists in the oil industry and the inorganic source promoted by Thomas Gold. At a conference in which these two models were discussed, he realized that no agreement could be reached as to which model was right, so he created his own model in which he said oil was pristine, created miraculously by God before the Flood, on the basis that Noah covered his ark with pitch and that the Flood carried the oil into the reservoirs where the oil is now found.

Clarey (2013) states that the oil shale deposits are not as old as secular scientist believe and that the chemical signatures of both oil and gas match like fingerprints. (However, chemical signatures do not apply to gas consisting of methane, ethane, propane, and butane.) He believes that there are two types of oil sources, one being algal and the other being marine plankton. He thinks that their deposits just needed to be buried deep enough to "cook" so that the oil and gas can be generated and released. He believes that this can occur when the deposits are buried between 8,000 and 15,000 feet deep where temperatures are between 180-250 ºF, the so-called "oil window." He thinks microorganisms in today's world consume oil so that none is preserved on the Earth's surface and the only way that oil survived in ancient time was for the oil to be trapped in debris that was buried quickly during the Flood before the scavengers could reach it. He says that the depth of burial was as much as 30,000 to 40,000 feet in Wyoming. He thinks the source rocks have to be near a rock that traps the oil when it is released. Moreover, he believes that the Earth cannot be millions of years old because he asserts that the oils would have been destroyed by bacterial action − literally eaten − so that it is reasonable to assume that oil would be totally degraded or consumed by bacteria now because bacteria is found even in rocks at great depth.

Clarey (2014) thinks that oil is even forming today and moving into traps so that the time frame of 4,500 years since the Flood still fits and that explains why we still have oil that is not degraded or eaten by bacteria. (Yes, oil is likely moving into traps today but in insignificant amounts in 4,500 years.) Clarey (2019) says that some secular geologists claim that oil "can survive millions of years underground because it becomes pasteurized at 80ºC (176ºF) preventing further biodegradation." In that way the oil become sterilized and lasts for eons because the heat destroys the microorganisms. He points out that a recent study shows that "about 70% of the earth's microbiota (bacteria and archaea) lives in the subsurface at temperatures of up to 250ºF − well above the boiling point of water at sea level." Therefore, his model is correct.

The author of the article (Anonymous, 1990) claims that oil can be formed quickly because leather scraps from a factory were dumped in a trench and covered with dirt and when the bottom of the trench was exposed 80 years later, the scraps were in a pool of black oil. No chemical analysis was ever made of this supposed oil, however.

Discussion

The above shows that there is a complete range of views by YEC in regard to how oil and gas can form and how they can be generated during the Flood, be preserved in the Flood deposits, and survive until today. Most of these YEC seem to believe that because oil can be formed quickly, that the quickness is evidence that it was possible for oil and gas to be formed during the Flood and within a 6,000 to 10,000 year time frame. None of these YEC seems to take into account the laws of thermodynamics that control how oil can be formed. They give many examples of how oil can be produced industrially, but generally they do not know what exactly the composition of created oil is except that they seem to recognize that short-chain hydrocarbon oil compounds are created and not long-chain hydrocarbon compounds.

So, what is the origin of oil from a modern conventional-geology point of view?

Modern model for the origin of oil (black shales containing fresh water algae or marine phytoplankton and zooplankton)

In a modern model for the origin of oil, oil is thought to be generated from protein, carbohydrate, and fat compounds in fresh water algae or from marine phytoplankton (diatoms, coccoliths) and zooplankton (foraminferans and dinoflagellates) at depths and temperatures in which sedimentary rocks in the Earth's crust occur. When the algae, phytoplankton, or zooplankton die and settle to the bottom of a body of water, a substance called kerogen is created, See: https://www.ems.psu.edu/~pisupati/ACSOutreach/Petroleum_1.html Both the algae and marine plankton are comprised mainly of long-chain biogenic compounds such as protein, lipids, and carbohydrates. Proteins are amino acids and they account for nitrogen compounds in the organisms. Lipids are substances that, due to their structure, are insoluble in water, such as animal fats, vegetable oils, and waxes. Carbohydrates are sugar compounds.

As sediment containing algae or marine creatures is deposited, the sediment is saturated with water. But as deeper burial occurs, diagenesis begins and water is forced out. Then, the proteins, lipids, and carbohydrates break down to form new structures that comprise a waxy material known as “kerogen," in oil shale that also contains silicate minerals and clay. The kerogen does not have a fixed composition and is sapropelic (meaning “putrid mud”) and is rich in proteins, waxes and fatty acids (Nordeng 2013). After burial, its former components of proteins, carbohydrates, and fats in its cells recrystallize by a process called diagenesis to make the kerogen. The compositions of oil shales differ from place to place on the basis of the minerals and trace elements that are associated with the kerogen layers that occur in different places. Oil shale contains 10 to 27 percent kerogen. If the sedimentary rock contains more than 27 percent kerogen, it grades into cannel (candle) coal. Some oil shales can be ignited easily with a match and burns with a very sooty, smoky flame. See **Figure 1**.

Figure 1. Oil shale burning. Composition: ***Primary***: kerogen, quartz, feldspar, clay, carbonate, pyrite. ***Secondary***: uranium, iron, vanadium, nickel, molybdenum. Source of image: https://en.wikipedia.org/wiki/Oil_shale

The oil shale deposits containing kerogen occur in sedimentary layers that have ages of Middle Cambrian (Australia and Sweden), Early and Middle Ordovician (in Sweden and in the kukersite oil shale in Estonia/Russia), Late Devonian to Mississippian (reefs with algae in U.S.), Late Jurassic (British Columbia), Late Cretaceous (Jordan), Paleogene times (U. S.), and Tertiary (Australia) (Dyni, 2006). Large oil shale deposits also occur in Brazil of Permian age (the Irati Formation), and many deposits of oil shales are found in Italy and China. The largest deposits are found where large shallow lakes were once present, such as the oil shales in the Green River Formation of Wyoming and Utah of Eocene age.

At any rate, after kerogen is formed it is supposed to undergo further change to make oil hydrocarbons. That is, as temperatures and pressures increase (deeper burial) the process of catagenesis begins, which is supposedly the thermal degradation of kerogen to form hydrocarbon chains in oil. The conditions of catagenesis determine the product, such that higher temperature leads to more complete “cracking” of the kerogen and progressively lighter and smaller hydrocarbons. Petroleum formation is observed within an "oil window" of temperatures between 150ºF and 300ºF (69-149ºC); higher temperatures above 300ºF (149ºC) yield natural gas (small hydrocarbons).

A great deal of confusion seems to exist as to what depth the supposed oil window starts with the first conversion to oil hydrocarbon molecules and where it ends at a deeper depth in which the oil molecules cannot form. Some geologists say that the oil window begins within a few meters below the Earth's surface. Other models have the range starting at depths below the Earth's surface in the range of 8,000 feet to 10,000 feet where temperatures are in the range of 100 to 300ºC. https://science.howstuffworks.com/environmental/energy/underground-oil-deposits.htm Still other models suggest that the oil window is between 7,000 to 16,000 feet at temperatures 150-300ºF (65-149°C) as in **Figure 3.** https://www.britannica.com/science/petroleum/From-kerogen-to-petroleum-the-mature-stage#ref502600 Nevertheless, temperature is more likely the controlling factor rather than pressure.

An example of the supposed oil window is shown in **Figure 2**.

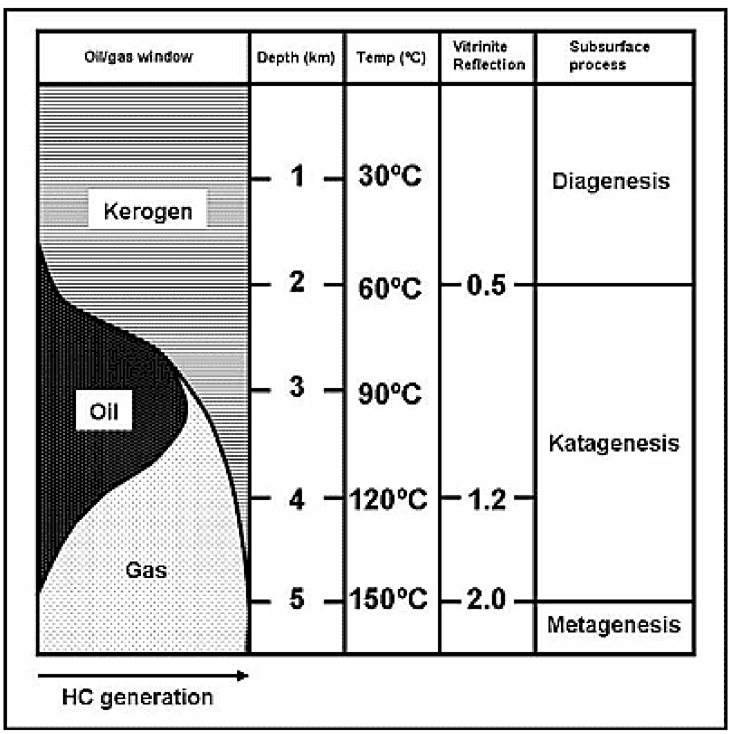

Figure 2. Oil window showing first appearance of oil at about 50ºC and transitioning to gas at temperatures >150ºC, Source of image: Wikipedia.

Another example is shown in **Figure 3**.

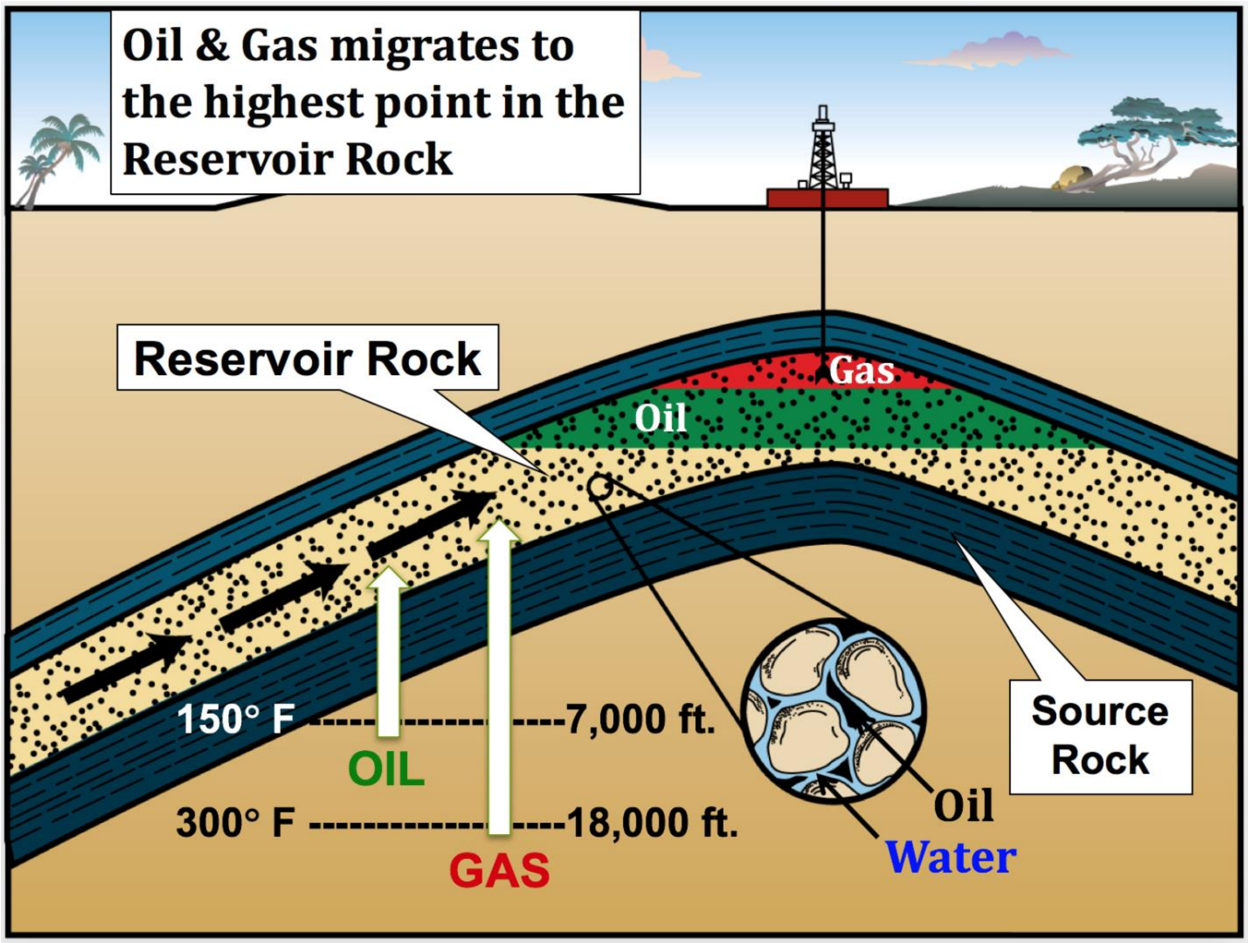

Figure 3. Oil window between 7,000 feet and 18,000 feet and temperatures ranging from 150-300ºF (65-149ºC) and showing the lighter methane gas overlying oil in the reservoir rock. Source of image: Ken Wolgemuth.

But modern evidence strongly suggests that the oil generating window is not thought of as being fixed with a specific depth or range of thickness because oil can be found near the Earth's surface as well as at depths down to 20,000-25,000 feet where the British Petroleum (BP) blowout of the Deepwater Horizon well was between 17,000 and 18,000 feet offshore from the mouth of the Mississippi River, and oil occurs at depths of 35,000 feet in the British Petroleum Tiber Oil field in the Gulf of Mexico. See: https://www.ogj.com/articles/2009/09/bp-s-tiber-one-of.html Moreover, the Eagle Ford unconventional reservoir trend in south Texas shows that the oil is shallower with lower temperature formation and the gas window deeper with higher temperatujres (described later in **Figures 5** and **6**).

Pertinent observations made by chemists

When chemists study how reactions occur between different substances, an equation, such as: **X = Y + energy,** is commonly written, so that when a reaction goes from left to right, energy is released during the reaction. If the reaction is reversed from right to left, then energy has to be put into the system to make it go.

Therefore, in analyzing the origin of oil from the modification of kerogen (derived from algae, phytoplankton, or zooplankton), the following is such a reversed equation.

kerogen + energy = oil

low chemical potential high chemical potential

Chemists know that in order to have a balanced equation that obeys the laws of thermodynamics, compounds that are long-chain hydrocarbons in biogenic proteins, fats and carbohydrates have low chemical potential in comparison to that in alkane oil and cannot be changed into long-chain hydrocarbons in alkane oil unless lots of energy is put into the system. Moreover, extra pressure is also needed. Such energy is not available in temperature ranges of 50-149ºC to make oil as shown on **Figures 2** and **3**. Therefore, much higher temperatures are required to make oil. This relationship is confirmed by the fact that when the oil industry extracts oil from oil shales in Wyoming by "fracking" (hydraulic fracturing), and steam at high temperatures (500-600 ºC) is used and is injected under high pressure before the kerogen in the oil shale can be converted into oil. It is only at these higher temperatures that oil is formed, and then what is extracted has carbon atom lengths from C-5 up to C-14. (Sand is also injected with the steam to keep the fractures open.) See: https://www.google.com/search?sa=X&rlz=1C1EJFA_enUS695US695&q=oil+carbon+chain+length+in+%22wyoming%22+wells&tbm=isch&source=univ&ved=2ahUKEwjtr-jMiobgAhWqxlQKHY4eCLsQ7Al6BAgCEA8&biw=1920&bih=969

Such needed added energy and pressure to make oil is also confirmed by the fact when the Germans during World War II needed gasoline for their tanks, military vehicles, and airplanes, they had to use coal, which they had, and the Fischer-Tropsch method to change the coal into oil with carbon lengths up to C-20 and at temperatures near 700ºC and high pressures.

It is also known that oil is metastable at the temperatures and pressures that exist at the Earth's surface and its near surface and constantly breaks down (although very slowly) to form methane which is stable. Also, bacteria are constantly consuming oil to make methane as a waste product in order to get the energy they need for metabolism and reproduction. Bacteria are known to occur at depths as much as more than 200 feet below the Earth's surface and at temperatures above the boiling point of water. Bacteria do degrade oils, such as crude, gasoline, kerosene, etc., and pitch and tar occur right at the Earth's surface at Pitch Lake in Trinidad (https://www.google.com/search?q=pitch+lake+trinidad&rlz=1C1EJFA_enUS695US695&oq=Pitch+Lake+&aqs=chrome.1.69i57j0l5.9616j0j8&sourceid=chrome&ie=UTF-8), and asphalt is on thousands of miles of roads. Therefore, the degradation by bacteria is quite slow.

On the basis of these observations, oil can form at multiple depths from near the Earth's surface to up to 35,000 feet and the kinds of oil with different carbon atom chain lengths that are produced with higher and higher carbon atom lengths depend upon increasing temperatures and pressures that are reached in a given depth. However, with deeper burial and higher temperatures, the carbon chain length gets shorter until methane gas with one carbon atom is produced. On that basis, these observations and because oil and gas are found at many different depths, the geothermal gradient in some places must increase at a faster rate with depth than the supposed average increase of 25ºC per kilometer. That is, the geothermal gradient in Paleozoic and Mesozoic times must have been much higher in many places when most of the oil and gas was emplaced than today. Moreover, the depth in which each oil concentration is now found during drilling would not have been the same when the oil was originally formed because likely many thousands of feet of overlying sediment have been eroded away, and, therefore, the pressures also were much higher during the time in which the oil of different hydrocarbon oil molecules with various long carbon atom lengths were formed.

Abiogenic model for the origin of oil

Another view for the origin of long-chain heavy hydrocarbon oil was originated by a Russian (Kudryavtsev 1951) and was further developed by other Russian and Ukrainian geologists; see Krayushkin et al, 1994, 2001, Chebanenko et al, 1995, Kenney et al., 2002. These geologists thought that all long-chain heavy hydrocarbon oil had an abiogenic origin. The following is a quote from Professor Emmanuil B. Chekaliuk, at ***All-Union Conference on Petroleum and Petroleum Geology***, Moscow, **1968**, that illustrates this view.

"Statistical thermodynamic analysis has established clearly that hydrocarbon molecules which comprise petroleum require very high pressures for their spontaneous formation, comparable to the pressures required for the same of diamond. In that sense, hydrocarbon molecules are the high-pressure polymorphs of the reduced carbon system as is diamond of elemental carbon. Any notion which might suggest that hydrocarbon molecules spontaneously evolve in the regimes of temperature and pressure characterized by the near-surface of the Earth, which are the regimes of methane creation and hydrocarbon destruction, does not even deserve consideration."

The Ukrainian geologists used the abiotic model during exploration for oil in the Ukraine (Krayushkin et al, 1994, 2001, Chebanenko et al, 1995). Production occurred from 4 different sandstone levels for oil and 23 different levels for gas in upper sedimentary levels of reservoir rocks of Middle and Lower Carboniferous sandstones. Production was also found from 22 different levels in the Precambrian crystalline basement underlying the sandstones at depths ranging from several meters to 200 meters below the top of the crystalline basement. It is not logical that the oil in the Precambrian basement could have a biogenic origin because low-density oil should not migrate down into the crust. Therefore, the oil in both the basement and the sedimentary layers must have had an abiotic origin and came up from the mantle. Likewise, the Athabasca tar sands in Alberta, Canada, likely have a deep mantle origin because no source rocks containing biogenic material occur within 300 miles of these hydrocarbon deposits. This observation is based on a personal observation given to me by Warren Hunt (2002) who obtained seismic studies of the area below the Cretaceous Mannville Formation that contains the tar sands. The seismic image showed a vertical fault extending below the tar sand and a deep shear zone that extended west horizontally from the fault and the tar sand area. Locally, this shear zone became an anticlinal structure to which Hunt drilled and found abundant oil in sheared gabbro. See: http://www.csun.edu/~vcgeo005/Nr47Hunt.pdf Unfortunately, economic production of oil was not possible because hot fluids in this place reacted with oxygen in the water carrying the drilling muds and caused silica to precipitate and plugged all the fractures so that no oil could flow to the well. In other places where this has happened, oil companies have used nitrogen to prevent such sealing of fractures to occur.

This abiotic model was applied to searching for oil in Sweden in the Siljan Ring, which is where a meteorite struck and fractured basement granite. The first drill hole was mismanaged by drillers, not believing in the abiotic model, and they used drilling muds containing diesel oil to convince the Swedish government to continue drilling on the basis that hydrocarbons were being brought up from the drill hole. They also did not maintain perfect vertical drilling, and eventually the drill stem and bit broke off and could not be retrieved so that a second hole was required. J. F. Kenney was brought in to manage this second drilling and used only water with the drilling muds and maintained perfect vertical drilling by his staying at the drill rig every day, 24 hours. No commercial oil, however, was produced after drilling as much as 22,781 feet into the basement granite. At its deepest drilling depth, however, abundant hydrocarbons were found in the interstices of fractured granite, and these hydrocarbons consisted only of viscous tar such that all former volatile hydrocarbons had escaped (personal communication, Kenney, 2001). Examination of the iridium content of escaping volatile hydrocarbon fluids (C-8 to C-16) and of granite fragments increased from the surface to the deepest level with 295 parts per trillion at 18,900 feet and 570 parts per trillion at 22,781 feet, which logically suggest that the oil was abiotic in origin and that the iridium did not result from contamination by the meteorite (Kenney, 1999ab). Although oil seeps occurred along the contact between the Siljan Ring and adjacent limestone layers, no biogenic oil likely migrated into the granite because the limestone likely had no more than 2-5 parts per trillion iridium. See: https://web.archive.org/web/20110718094858/http://www.gasresources.net/SwedenProjectResults.htm).

At any rate, the abiotic model for the origin of oil says oil is formed at depths greater than 100 km below the Earth's surface and at temperatures above

1000 ºC and that five different kinds of hydrocarbon chains in natural oil (alkylbenzene, n-alkene, cyclopentane, cyclohexane, and n-alkane) are produced and whose numbers of carbon atoms in their lengths are as much C-56 but only shown up to C-20 in **Figure 4**.

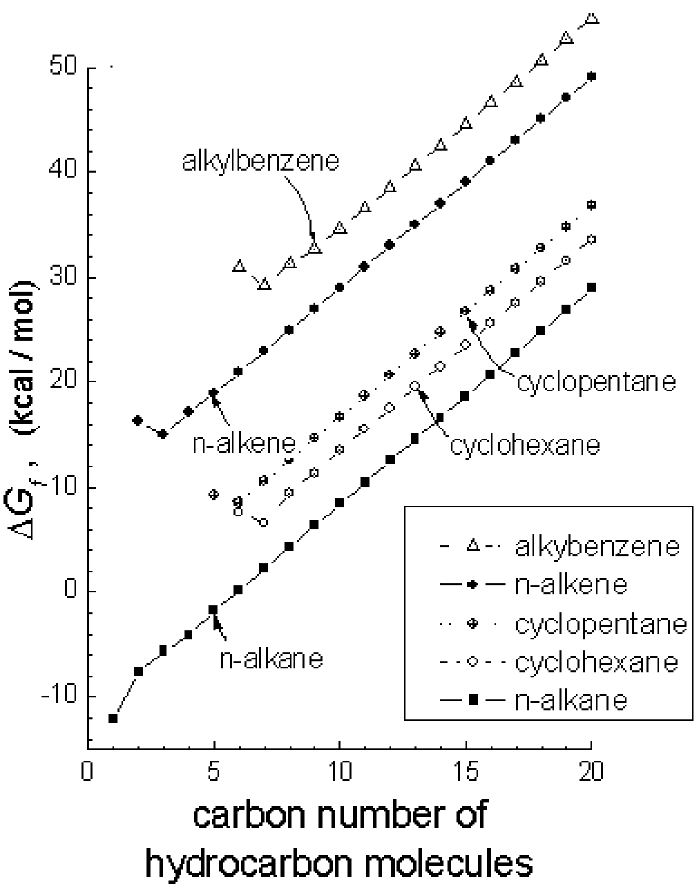

Figure 4. Five kinds of long-chain hydrocarbons in oil. Source of figure image: Kenney et al. 2002.

On the basis of the discovery of oil in the Ukraine having long-chain hydrocarbons (perhaps with carbon numbers as much as C-56) in it and in the Siljan Ring with similar carbon numbers in tar, it is logical that the Russians and Ukrainians suggested that all oil has an abiotic origin. However, this "all" hypothesis is definitely not true because U.S. geologists find oil in several places that do not have the long-hydrocarbon chains, and, therefore, U.S. geologists have a different model for the origin of oil (as described in an earlier section).

Therefore, it depends upon the experience that a geologist has (in the Ukraine or the U.S.) as to how exploration is done for oil and gas and the kind of model that is attributed to the origin of the oil and gas.

Conventional and unconventional reservoirs of gas

Conventional reservoirs of gas are generally found capping anticlinal traps (or other kinds of traps) on top of oil concentrations in sandstones because low density methane natural gas rises to the top of the anticline (**Figure 3**) .

However, in the Eagle Ford formation in South Texas which has an oil belt (shown in green on **Figure 5**) is to the northwest and shallower depth than the dry methane gas trend toward the Gulf of Mexico. The position of the methane gas is opposite to its placement shown on **Figure 3.** The lighter matter is under the heavier matter. The formation dips to the southeast, and the structure map shows depths of productive wells between 4,000 feet to 11,000 feet. Condensate is wet gas that is deeper, and the "gas window" is deeper yet to the southeast.

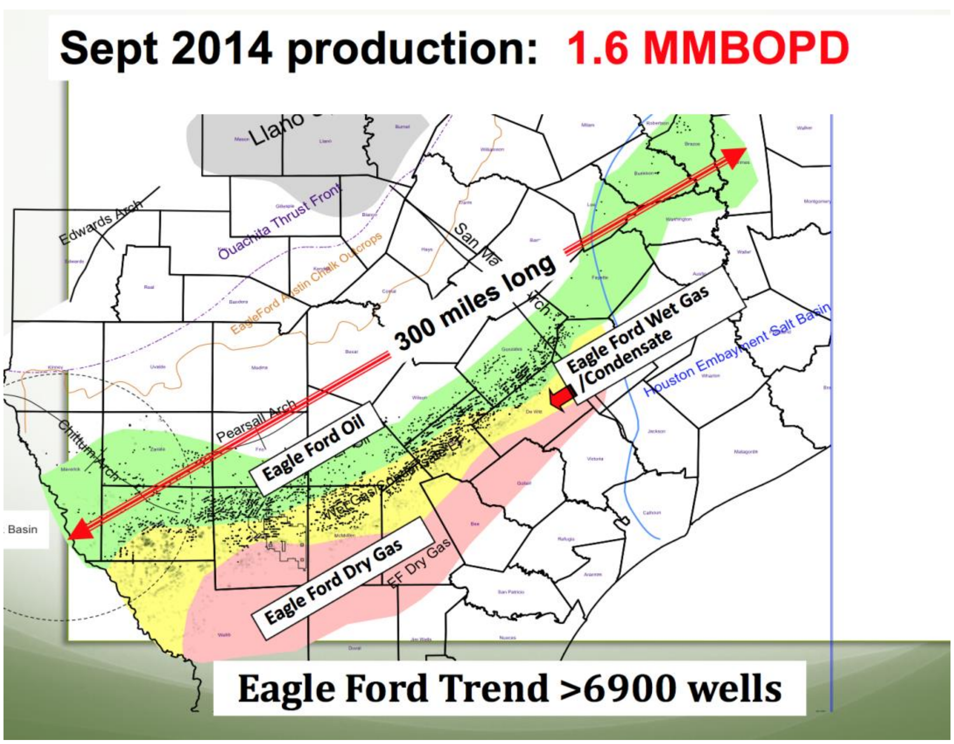

Figure 5. Trend of oil and gas field the Eagle Ford formation in south Texas. https://www.eia.gov/maps/pdf/eagleford122914.pdf Accessed January 28, 2019. Image provided by Ken Wolgemuth**.**

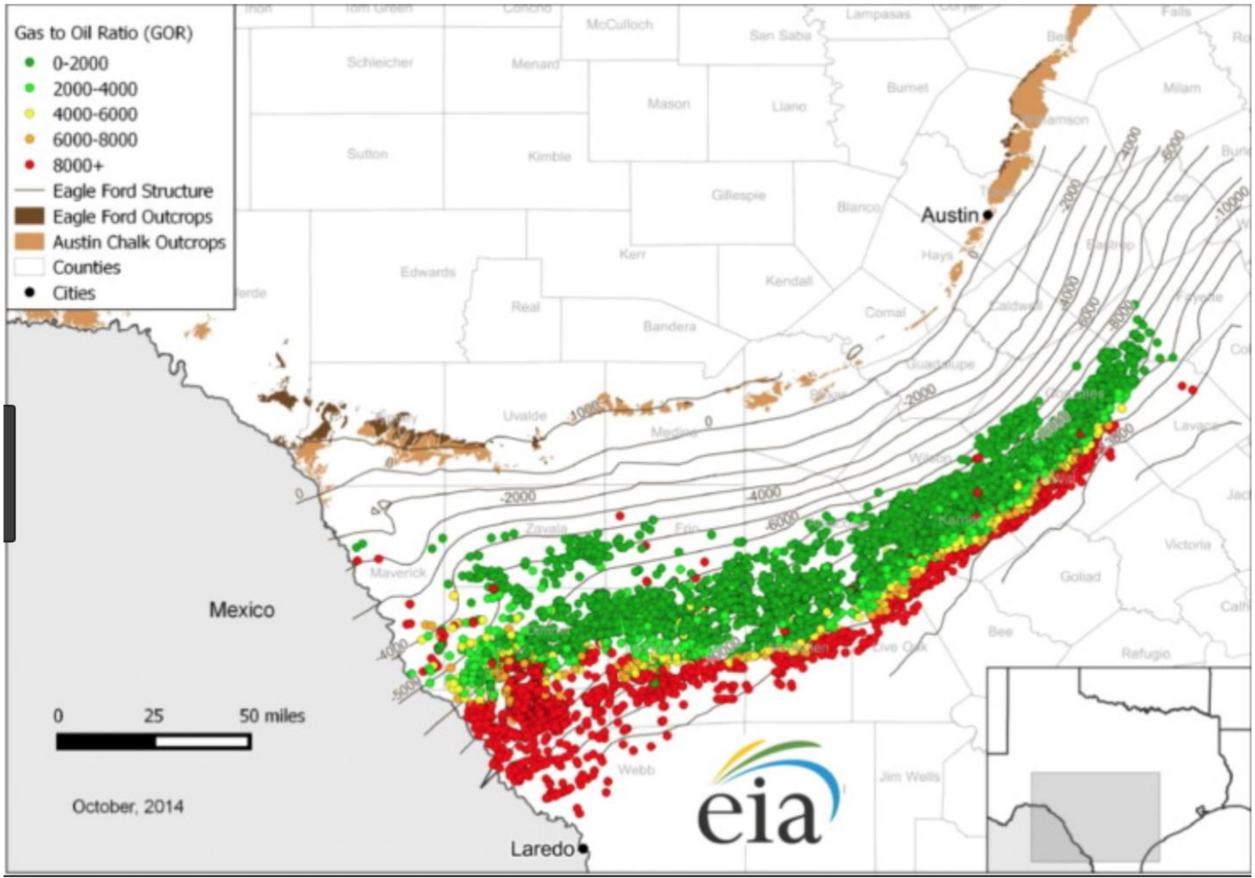

Figure 6. This is a structural map of the top of the Eagle Ford Formation, an unconventional reservoir, with depths of ~2,000 to ~13,000 feet below sea level. The green dots are oil wells with the shallowest group ~4,000 feet. The red dots are gas wells, down-dip and deeper, down to ~12,000 feet. The yellow dots are intermediate, with gas and some light oils. Image from "Updates to EIA Eagle Ford Play Maps: December, 2014. https://www.eia.gov/maps/pdf/eagleford122914.pdf Accessed January 28, 2019. Image provided by Ken Wolgemuth.

This gas field provides an example of a shallow "oil window," and the gas window is deeper and at higher temperature for the slow cooking of the kerogen. Lower temperature breaks the molecules into oil size of C-5 to C-20. Higher temperatures break the molecules into C-1 or methane, that is dry gas.

Another place that shows the difference between conventional and unconventional exploration methods is the Woodford-1 area in Oklahoma. For the first 150 years of the oil industry, oil was produced from rocks that have pore space between the sand grains as shown in the blue color (**Figure 7**).

Figure 7. Difference in sizes of pore spaces in sandstones and shales. Image provided by Ken Wolgemuth.

About 10 years ago, unconventional reservoirs began to be produced, such as this Woodford Shale in Oklahoma (**Figures 8and 9**). These are seal (impermeable) rocks with no visible porosity. The permeability (capacity of oil or gas to flow to the well) is so poor that it is at nanodarcy scale – somewhat like concrete sidewalks.

Figure 8. Woodford Shale core. Image provided by Ken Wolgemuth.

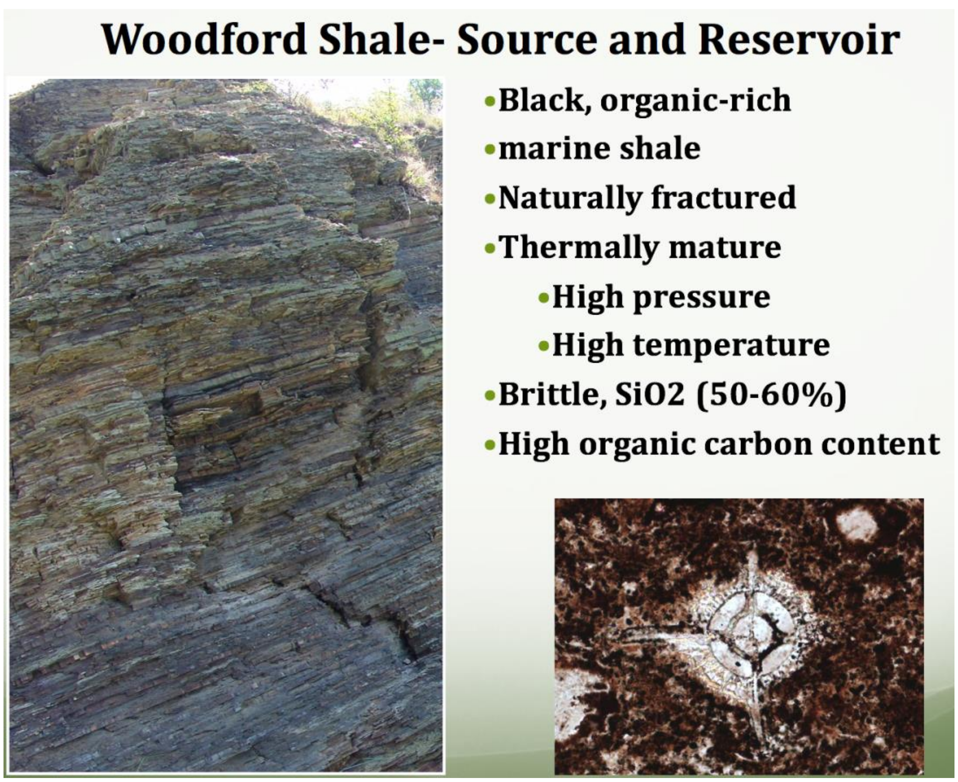

Figure 9. Woodford Shale in Oklahoma that is a reservoir for methane gas. Image provided by Ken Wolgemuth.

The Woodford Shale becomes economic for obtaining gas because vertical well holes are curved to horizontal at depths where the shale is present, and the wells are extended horizontally for 2 miles through the shale. Then, hydraulic fracturing in 25 to 35 stages over that 2 miles of borehole is done to create flow pathways for the released methane gas.

Surface mining of black oil shales and other deep oil shale

A black oil shale portion (60 feet [18 meters] thick) of the Mahogany Zone in the Parachute Creek Member of the Green River Formation that is exposed at the Earth's surface was once mined in Colorado to produce oil. See: https://en.wikipedia.org/wiki/Colony_Shale_Oil_Project However, this oil shale is actually a marlstone rock that contains kerogen that was never buried deep enough for nature to convert the kerogen into oil. The kerogen had to be heated to more than 750ºC to convert it into oil. Oil molecules that were produced ranged up to C-20 in length. See: http://coloradogeologicalsurvey.org/energy-resources/oil-shale-2/ This black shale is not now economic under today's oil prices, and, therefore, is not in production. It is a huge resource for the future.

However, oil is being economically extracted from oil shale in Wyoming by the oil industry and retorting at temperatures of 500 to 750 ºC which produces hydrocarbons that have carbon atoms up to C-20 but not in the heavy hydrocarbons that range from say C-30 to C-56. The composition of the extracted oil is sufficiently different from that of natural oil that liquids derived from oil shale cannot be used as direct substitutes for oil. Oil derived from oil shale has less carbon and hydrogen and more nitrogen, oxygen and (in some places) sulfur than natural oil. Oil refinery operations have to be modified to accommodate oil shale liquids as a feedstock. Hydrogen must be added to the oil during processing. Furthermore, special care must be taken to remove the nitrogen and sulfur during processing, to avoid the formation of sulfur dioxide and nitrogen oxide when the oil is eventually burned when oxygen is added.
https://en.wikipedia.org/wiki/Oil_shale

Supposed biological indicators that all oil has a biogenic origin instead of abiotic origin

Many oil geologists have claimed that all oil has a biogenic origin on the basis of supposed indicators that the oil had to have formed from organic matter in dead plants and animals. Kenney et al. (2002), however, show that such reasoning is false. The arguments in the Kenney article are complex and for this article I have greatly simplified the explanations as to why they are false. The reader needs to go to the Kenney article for expanded explanations. Nevertheless, here is a list of some of the supposed reasons.

1. The ratio of carbon-13/carbon-12 isotopes is thought to be unique for plants and animals, and this ratio is expressed in a value called $\delta^{13}C$ (delta 13 carbon) that is compared to a standard value. Carbon-13 has greater mass (an extra neutron) than carbon-12 has, and plants and animals that eat the plants are thought to take up the lighter carbon-12 faster than the heavier carbon-13 and, therefore, a low value for $\delta^{13}C$ is thought to indicate a biogenic origin. Therefore, when such a low $\delta^{13}C$ value is found in methane that is associated with oil, it is said to indicate that the oil had a biogenic origin. However, studies show that as carbon moves up from the mantle the rate of diffusion of the lighter carbon-12 through the rock layers is faster than for the heavier carbon-13 and, consequently, the $\delta^{13}C$ ratio in oil/methane can have the same range of values that is found in plants and animals. Also, methane-consuming microbes can alter the $\delta^{13}C$ value because the longer that methane remains in a reservoir, the heavier becomes its carbon isotope ratio.

2. Pollen is commonly found in some oil-bearing reservoir rocks, which is supposed to indicate that the oil originated from plants in source rocks adjacent to the oil concentrations of the same age. However, what is found is that the pollen is an indicator of abiotic origin for the oil because where pollen is found, pollen grains of older ages below the oil reservoir rock are also found that indicate that the oil came up from a deep source and brought up the older pollen as the oil passed through the older rock layers.

3. Carbonaceous meteorites contain trace amounts of carbon to as much as six percent, and such carbon clearly is abiotic in origin. Therefore, the carbon in the

mantle can be explained because the Earth likely had an origin from aggregation of meteorite masses.

4, Several kinds of porphyrins occur in oil. Porphyrins of different kinds all also found in plants, such as vitamin B_{12}, chlorophyll, and hemo (hemoglobin in red blood cells, but none of these biogenic porphyrins has ever been observed as a component of natural oil. However, other kinds of porphyrins occur in meteorites, and iron occurs in hemoglobin of red blood cells, but magnesium occurs in hemo in meteorites.

5. Optic activity is found in natural oil and because optical activity is also found in fermented wine, such activity was said to be an indication of a biogenic origin. But again, the phenomenon of optical activity was observed in material extracted from the interiors of meteorites that are 3 to 4.5 billion years old, which can only have an abiotic origin.

Kenney et al. (2002) offer other reasons why they believe that a biogenic origin of oil can be dismissed, but such are probably too complex for the average reader of this article, Those people who have better scientific capabilities can go to this document for those reasons.
https://web.archive.org/web/20110807032303/http://www.gasresources.net/AlkaneGenesis.htm.

Other factors that young-Earth creationists have not considered

If the Earth were 6,000 years old and the Flood occurred about 4,500 years ago, and if the marine phytoplankton (diatoms, coccoliths) and zooplankton (foraminferans and dinoflagellates) require carbon dioxide to make their protein and fat cells or incorporate carbon dioxide during photosynthesis to make organic molecules and if these biogenic organisms in black oil shales are the source of oil in the oil-bearing reservoirs, then there would not be enough time in just 1,500 years (the time between Adam and Noah) to produce enough hydrocarbons to account for all the carbon in these organisms as well as the huge quantities of hydrocarbon molecules in oil in the conventional and unconventional reservoir rocks, including all produced to date, and to be produced into the future. Several examples are huge resources that will probably become economic in the future, oil shales and gas hydrates.

The lack of enough time is because the early atmosphere, when the Earth was first formed, was primarily composed of methane and nitrogen. Therefore, little to no carbon dioxide was present that could supply carbon to later evolving tissues of plants and animals. The early bacteria that existed in ancient Precambrian time were methanogens that gained their energy for metabolism and reproduction by consuming methane. See: http://www.csun.edu/~vcgeo005/Nr40tillites.pdf. When photosynthesizing bacteria finally evolved from the methanogens (taking billions of years to first occur), oxygen was released that eventually reacted with the methane in the atmosphere to make the carbon dioxide that the phytoplankton and zooplankton needed for their growth and reproduction. The time to produce all these huge amounts of carbon in carbon dioxide that could be incorporated by biogenic organisms into hydrocarbon chains in oil would be far in excess of 1,500 years or even 4,500 years, if the Earth is 10,000 years old. Moreover, even more time would have been needed because much of the carbon dioxide that was created in the early atmosphere was taken up by carbonate limestone layers in the Earth's sedimentary crust, and, therefore, much carbon was not available for growth of plants and animals. That is, it would take many, many more years than 4,500 years to dissolve the huge quantities of carbon dioxide gas into the ocean waters so that calcium carbonate could be precipitated either chemically, such as the chemically precipitated carbonates of Silurian age in the Michigan Basin. This is a basin that once contained an isolated shallow sea in which evaporation occurred to also produce more than 14,000 feet of evaporation-formed chemical compounds at the center of the basin that is more than 16,000 feet deep in the center of the basin and in which, besides limestone, also included thick layers of anhydrite (calcium sulfate) and salt (sodium chloride). The bottom of the basin slowly subsided, making the basin deeper and deeper, as the weight of deposited sediment was added to depress the Earth's crust. See **Figure 10.** Such thicknesses of such compounds cannot be accomplished in Silurian time lasting only a few weeks in the YEC one-year Flood-model unless miraculous super-speed hot climates existed.

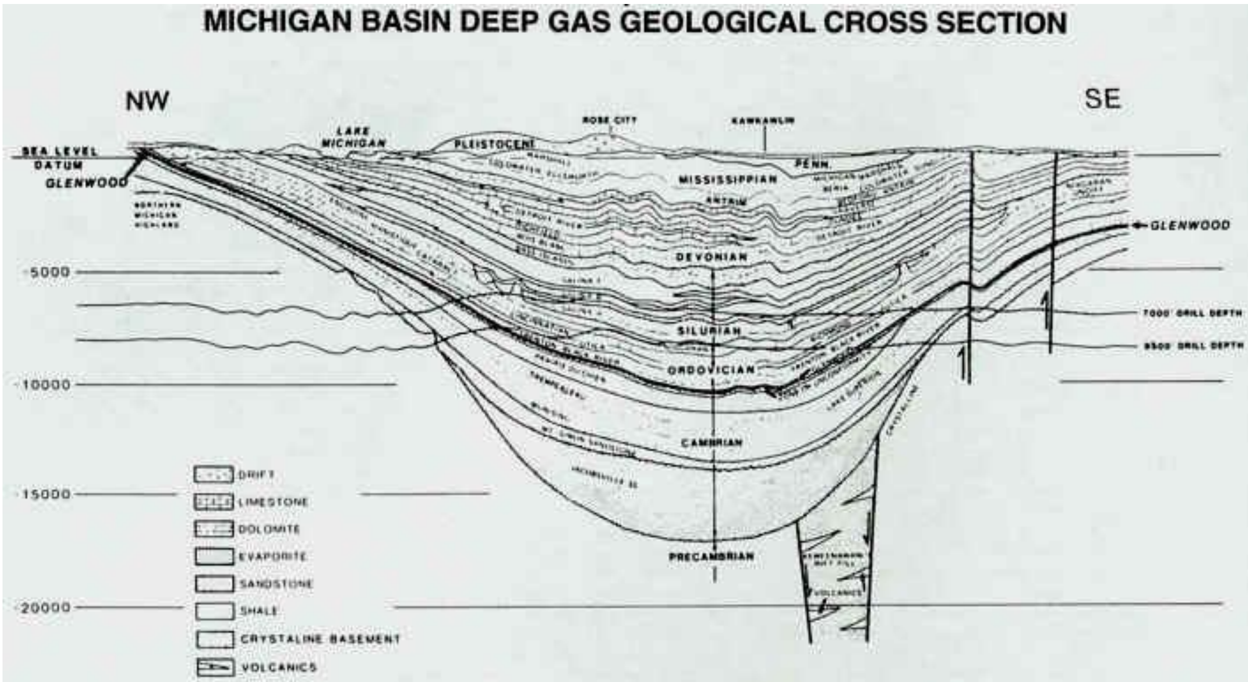

Figure 10. Michigan Basin showing thicknesses of sedimentary rocks. Image taken from http://geo.msu.edu/extra/geogmich/mibasin.html

A second reason that much more than 4,500 years are needed for the age of the Earth are the many shells of such marine creatures as, for example, foraminferans, clams, brachiopods, corals, crinoids, and snails, that occur in the very large volumes of Paleozoic carbonate layers occur in the Grand Canyon area, such as the Mississippian Redwall Limestone and Permian Kaibab Limestone and the Capitan reef in the Permian Basin of Texas as well as the calcite crystals in the limestone.

Therefore, the YEC Flood model is total unscientific nonsense.

More factors to consider

A question could be asked: "If abiogenic oil comes up from the mantle, then why isn't oil found to be associated with oceanic spreading centers?" Perhaps there was abundant carbon at depths in the mantle in those places where basaltic magma/lava first emerged in such spreading centers, but the emerging magma/lava coming up from deep in the mantle would have flushed out most of this carbon over millions of years in which spreading centers were in operation. Moreover, any carbon present there would have been consumed by oxygen to produce carbon dioxide, or the oil molecules would have formed methane and not oil because both carbon dioxide and methane are the stable compounds at the pressures and temperatures found at the Earth's surface.

In continental regions where volcanic terranes are present, a common gas emerging from some places is carbon dioxide. Examples are on the east side of the Sierra Nevada Mountain Range near Mammoth Mountain in the Long Valley Caldera, California, https://pubs.usgs.gov/dds/dds-81/Intro/MonitoringData/CO2/CO2.html and in Cameroon, Africa http://volcano.oregonstate.edu/silent-deadly. But this carbon dioxide has likely come from the decomposition of carbonate rocks through which the magma/lava has penetrated.

Another observation is that where diamond-bearing kimberlites occur in vertical pipes, these places are not sites where oil accumulations are found. Oil geologists do not search for oil near kimberlite pipes. Likely in those places deep in the mantle where kimberlite magmas arose, not enough primary oxygen and hydrogen atoms were also present to make the long-chain hydrocarbons in oil - having as much as 20-56 carbon atoms in the chains, and instead only pure carbon in diamonds could be formed.

Conclusion

On the basis of the observations made in this article, hydrocarbon molecules in oil and gas in the Earth's sedimentary crust were created in four different ways: (1) by burial of biotic organisms (either fresh water or marine in origin) deep enough so that heat in the geothermal gradient was locally high enough to cause the breakdown of biogenic organisms to form methane or volatile short-chain hydrocarbon oil molecules. (2) from oil with long-chain hydrocarbon structures which came up from the mantle, and this oil requires "cracking" by industrial processes to convert the long-chain oil into short-chain structures in gasoline and diesel fuels, (3) from dead algae deposited in fresh water swamps or lakes, and this oil has short-chain structures and is produced from kerogen derived from the algae in industrial "fracking methods," using steam to supply heat at temperatures of 500-600ºC, and (4) from dead phytoplankton and zooplankton in marine black oil shale which have converted to kerogen. In some places, the created man-made oil has short-chain structures and is generated by using retorts that heat the mined kerogens at temperatures of 750ºC. In any of these four possible ways of producing hydrocarbon alkane molecules, their formation never happened in the short time of the last 6,000 to 10,000 years, as YEC want to believe. The reasons that this is true are given in the following two situations.

(1) Huge amounts of time would have been needed to produce the primary carbon that became emplaced in the upper part of the Earth's mantle. This primary carbon would have been produced during a very ancient supernova explosion that scattered carbon "dust" and other elements that later aggregated billions of years ago to form our sun (as a second generation star) and our solar system. The Bible does not give any information that would give the YEC a clue that this is what happened in the ancient past.

(2) Huge amounts of time would have been needed to produce large quantities of carbon dioxide in the atmosphere to supply carbon to the biogenic organisms that later could be altered to oil or gas. On that basis, none of the arguments and models presented by YEC that oil is produced from the alteration of dead plants and animals that were killed by a worldwide Flood and which were buried in sedimentary rocks transported by this Flood make any logical scientific sense. Where in the Bible is this information given about how carbon dioxide gas was created in our atmosphere? Because the Bible is not a science text, the YEC just claim that geologic features were done by miraculous intervention by God and because YEC lack sufficient training in the laws of thermodynamics, they cannot develop a logical scientific model for the origin of oil or how to find it.

Now that an understanding about how oil is formed has been presented in this article, a comparison can be made as to what could happen in the progressive changes for the transformation of organic biogenic matter with increasing depths of burial and increasing temperatures. For kerogen that is produced from deposited residues of higher plants (trees), this kerogen contains mostly cellulose that consists of chains of carbon ring structures bonded to oxygen as well as to hydrogen. The relatively high concentration of oxygen is a distinguishing feature of this kerogen. Methane is the only significant hydrocarbon that can be produced during the alteration of the kerogen (Nordeng 2013). However, with increasing temperatures and pressures the following sequence could occur if the cellulose debris is quite abundant.

wood → kerogen → bituminous coal → anthr. coal → graphite → diamond

<u>0 km</u>　<u>5 km</u>　<u>10 km</u>　<u>20 km</u>　<u>30 km</u>　<u>100 km</u>

In a sequential progression (left to right), wood fragments from trees is first formed at the Earth's surface in a swamp. Then, the wood fragmrnts became buried at depths of 5 km and are changed into kerogen. At depths of 10 km, the kerogen changes into bituminous coal. At 20 km, the bituminous coal converts to anthracite coal, and at 30 km all volatiles are squeezed out to leave pure carbon in graphite. But at this 30-km-depth, the temperatures and pressures are not high enough to make diamond. Depths of ~100 km are required as well as temperatures above 1000ºC.

In contrast the following sequential reactions can occur beginning with algae (or phytoplankton and zooplankton). Probably the length of the number of carbon atoms (C-?) with depth is dependent upon increasing temperature, and the values of carbon atom length (C-?) shown at each depth are not likely correct, but the concept makes sense and obeys the laws of thermodynamics.

algae → kerogen → oil C-2-15 → oil C-15-30 → oil C-30-35 → oil C-35-56

<u>0 km</u>　<u>5 km</u>　<u>10 km</u>　<u>20 km</u>　<u>30 km</u>　<u>100 km</u>

Nevertheless, both kerogen in a "fracking process" and bituminous coal in the Fischer-Tropsch method can be converted into alkane oil with 8 to 20 carbon atoms and with medium chemical potential that is useful for driving our cars. See the following equation.

kerogen + energy at 500-600ºC = alkane oil C-20

<u>medium energy</u>　<u>medium chemical potential</u>

Finally, combining carbon + hydrogen + oxygen at temperatures of 1000ºC and at depths of 100 km, long-chain alkane oil molecules can be formed with >35 carbon atoms in their chains and as much as 56 carbons that have extreme chemical potential.

C + H + O + energy at 1000ºC = long-chain alkane oil >35 carbons

<u>extreme energy</u> **<u>extreme chemical potential</u>**

But to obtain this extreme potential stored energy, extreme energy must be put into the system, and such oil with this extreme stored energy, like diamond, cannot be produced in the shallow sedimentary crust of the Earth. For this reason, the supposed formation of oil from biogenic algae that many oil geologists have espoused as the way long-chain hydrocarbon oil is formed in the Earth's sedimentary crust is not possible. **What is put in is what is stored and has the potential of being gotten out if this oil is burned when oxygen is added!**

Although heavy long-chain hydrocarbon oil molecules have tremendous amount of stored energy, unfortunately they are not useful for moving cars because they are viscous tar. Only, liquid octane gasoline and diesel fuel are what is used. Long-chain biogenic fats, such as olive oil, are not used for moving cars because the energy stored in this plant product by sunlight is not near enough energy to move a car.

To sum up the gist of this article, it is well known that olive trees were living in biblical times prior to the Flood, and, therefore, an olive fruit with olive oil in it can be used as a representative part of biogenic plants living when a supposed worldwide Flood swept over the Earth to bury the plants in the Earth's sedimentary crust. In the YEC model for the origin of oil, a fat molecule in an olive fruit would have been similar to a fat molecule that was part of an algal cell, phytoplankton, or zooplankton that also supposedly became buried and eventually was changed into kerogen found in oil shale in a fresh water or marine environment. Both fat cells in the olive fruit and in the algae, phytoplankton, or zooplankton received their energy from the sun, and their amounts of energy were extremely small per molecule in comparison to the huge amounts of energy that are stored in hydrocarbon alkane molecules, and this energy must be provided at temperatures much above 300ºC. Supposed worldwide Flood water could never locally be raised to temperatures many times the boiling point of water to make the alkane hydrocarbon molecules. Therefore, the YEC model for the origin of oil is totally false. Moreover, the needed added energy is particularly true to produce the five different long-chain hydrocarbon oil molecules with up to 20 carbons (and greater carbon chain lengths) in them as shown on **Figure 4**. The only model for producing such oil that makes sense is the Russian/Ukrainian model because the deep mantle is the only source of the high temperatures and pressures that can produce oil molecules with great amounts of stored potential chemical energy. Nevertheless, the exploration methods by oil industry oil geologists for finding oil and gas which have been produced from dead plants and animals buried in the sedimentary crust make logical sense as is illustrated by their success in finding oil and gas by using such methods. The YEC would not be able to explore for oil by using miracles as a guide.

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