The Prospect of Oil and Gas on the Planet Mars

By Wanny Abdel Fattah Mohamed

The British University in Egypt

Abstract

The discovery of hydrocarbons on the Planet Mars via interpretation of the theory of the formation of petroleum, the solar system (Big Bang theory), and the life on the Planet Mars in the light of background and previous relevant results where by the composition of the planet Mars is similar to that of the Earth because of its close proximity from the Planet Earth unlike The planet Jupiter that is impossible to find a life over there. As a result, there are sedimentary rocks and Igneous rock (Reservoir Rocks) on Mars which are necessary for the formation of petroleum due to the planet Mars and the Planet Earth were formed from the same huge planet. If the formation of petroleum theory is integrated with the solar system big bang theory, and life on Mars, there is a probability of the presence of oil and gas on Mars.

Introduction

Peak oil, an event based on M. King Hubbert's theory, is the point in time when the maximum rate of extraction of petroleum is reached, after which the rate of production is expected to enter terminal decline. Peak oil theory is based on the observed rise, peak, (sometimes rapid) fall, and depletion of aggregate production rate in oil fields over time. Mostly due to the development of new production techniques and the exploitation of unconventional supplies, Hubbert's original predictions for world production proved premature. Peak oil is often confused with oil depletion; however, it is the point of maximum production, while depletion refers to a period of falling reserves and supply.

Some observers, such as petroleum industry experts Kenneth S. Deffeyes and Matthew Simmons, predict negative global economy implications following a post-peak production decline and oil price increase because of the high dependence of most modern industrial transport, agricultural, and industrial systems on the low cost and high availability of oil. Predictions vary greatly as to what exactly these negative effects would be.

Optimistic estimations of peak production forecast that the global decline will begin after 2020, and assume major investments in alternatives will occur before a crisis, without requiring major changes in the lifestyle of heavily oil-consuming nations. These models show the price of oil at first escalating and then retreating as other types of fuel and energy sources are used. Pessimistic predictions of future oil production made after 2007 stated that either that the peak had already occurred, that oil production was on the cusp of the peak, or that it would occur shortly.

In the future during the next hundred years we want other sources for hydro cans

International Journal of Scientific & Engineering Research, Volume 6, Issue 3, March-2015
ISSN 2229-5518

History of the discovery of oil the Plant Earth

It is true that necessity is the mother of invention and that most inventions came by chance, as well as discoveries. In the United States in the search for salt (where it was used in the cooling operations at the time) under the surface of the ground workers found a liquid viscous, black in color, out of the wells, salt, and cause a lot of harassment at work, did not know the importance of the oil, but when the pharmacist Samuel Kerr refining him up process in the laboratory, where he was able to get picked pure, found it can be used in lighting thus discovered importance of oil in 1845 or 5 years of drilling before the first oil well in the town of Tetwzfel (Pennsylvania) America in 1859 at the hands of Colonel (Derek).

There is a story drilling the first oil well after the discovery of importance of oil as a fuel, and the increasing demand for energy source next to coal, it has been the establishment of a company of Pennsylvania for oil shale in December 1854, and entrusted the company into one of its employees and named Dwayne Derek ((which title later Colonel Derek)) drilled well for the detection and extraction of oil near the town of Tetwzfel.

In the late 19th century, after digging a large number of wells, oil men first noted that the closest to the ocean fields have better productivity. However, do not know exactly the first offshore drilling rigs and the implementing agency has a history, remember some sources T F Rowland, as the inventor of offshore drilling, because he was the owner of a patent for the design of offshore drilling rig in 1869. Other sources speak for Williams as the first naval port well in 1887, in Summerland, California. Spanned the first well dug by Williams about 300 feet in the Pacific Ocean. Newspaper 'USA Today' and specifies that the first date for the production of free oil in the United States was in 1896. The completion of the first offshore well away from the beach in 1947 off the coast of the Gulf of Mexico, and was carried out by Kerr-McGee Corporation, and that was the beginning of modern marine industry as they are known today. By 1949, 11 people were found offshore field in the Gulf of Mexico, their 44 exploratory wells.

The Formation of Petroleum.

Petroleum formation occurs by various hydrocarbons combining with certain minerals such as sulphur under extreme pressure, temperature, and geo-time. Modern day scientists have proven that most if not all petroleum fields were created by the remains of small animal and plant life being compressed on the sea floor by billions of tons of silt and sand several million years ago.

When small sea organisms die they will be buried and will then lie on the sea floor where they will decompose and mix with sand and silt. During the decomposition process tiny bacteria will clean the remains of certain chemicals such as phosphorus, nitrogen and oxygen.

Figure 1, [Oil Formation]

The partially decomposed remains will form a large, gelatinous mass, which will then slowly become covered by multiple layers of sand, silt and mud. This burying process takes millions of years, with layers piling up one on top of the other. As the depth of the sediment builds up it increases the weight of the sand and silt pressing down on the mass and will compress it into a layer which is much thinner than the original. Furthermore, when the depth of the buried decomposing layer reaches somewhere around 10,000 feet the natural heat of the earth and the intense pressure will combine to act upon the mass. The end result, over time, is the formation of petroleum.

With petroleum formation, the actual temperature applied to the original organic mass is critical in determining the overall properties of the resulting petroleum. Typically, lower temperatures during petroleum formation will result in thicker, darker, raw petroleum deposits, the most solid of which being a bitumen substance. If the heat applied during the formation of the petroleum process fluctuates too much then gas will be produced, often separating from the petroleum, sometimes remaining mixed with the raw oil. If the temperature is too high, that is, over 450 degrees Fahrenheit then the original biomass will be destroyed and no gas or petroleum is formed.

As the mud and silt above the deposit become heavier and the forces placed upon the silt and mud begin to change the bottom layers of the compressing layer above the petroleum, then it will turn into shale. As the shale forms, the oil will be forced out of its original area of formation. The raw petroleum then moves to a new rock formation, usually termed as a reservoir rock, and remains trapped until it is accessed in some way. The formation of naturally occurring raw petroleum takes millions of years, certainly far longer than can be deemed renewable, yet mankind has managed to almost deplete the world's supply in little more than a century.

It is important that people are educated and come to realize that burning such a precious fuel, which takes so long to form, at such a rate is nothing short of disastrous for the environment and the natural reserves.

Figure 2, [Algae]

The formation of the Solar System (Big Bang Theory)

The formation of the solar system is estimated to have begun 4.6 billion years ago with the gravitational collapse of a small part of a giant molecular cloud. Most of the collapsing mass collected in the centre, forming the Sun, while the rest flattened into a protoplanetary disk out of which the planets, moons, asteroids, and other small Solar System bodies formed.

This widely accepted model, known as the nebular hypothesis, was first developed in the 18th century by Emanuel Swedenborg, Immanuel Kant, and Pierre-Simon Laplace. Its subsequent development has interwoven a variety of scientific disciplines including astronomy, physics, geology, and planetary science. Since the dawn of the space age in the 1950s and the discovery of extra solar planets in the 1990s, the model has been both challenged and refined to account for new observations.

The Solar System has evolved considerably since its initial formation. Many moons have formed from circling discs of gas and dust around their parent planets, while other moons are thought to have formed independently and later been captured by their planets. Still others, such as the Earth's Moon, may be the result of giant collisions. Collisions between bodies have occurred continually up to the present day and have been central to the evolution of the Solar System. The positions of the planets often shifted due to gravitational interactions. This planetary migration is now thought to have been responsible for much of the Solar System's early evolution.

In roughly 5 billion years, the Sun will cool and expand outward many times its current diameter (becoming a red giant), before casting off its outer layers as a planetary nebula and leaving behind a stellar remnant known as a white dwarf. In the far distant future, the gravity of passing stars will gradually reduce the Sun's retinue of planets. Some planets will be destroyed, others ejected into interstellar space. Ultimately, over the course of tens of billions of years, it is likely that the Sun will be left with none of the original bodies in orbit around it.

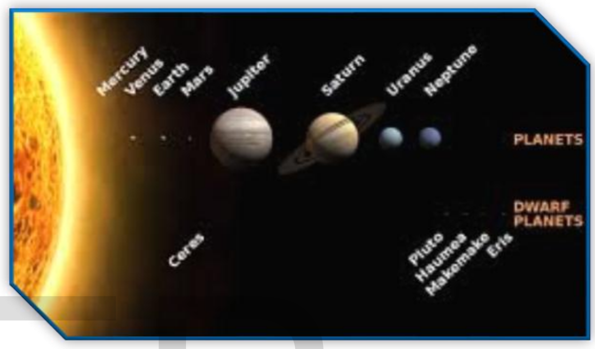

Figure 3, [Solar System]

So the geological age of the planet Mars quite similar to the planet Earth.

The composition of the planet Mars quite similar to the planet Earth.

Life on Mars

For centuries people have speculated about the possibility of life on Mars due to the planet's proximity and similarity to Earth. Serious searches for evidence of life began in the 19th century, and they continue today via telescopic investigations and landed missions. While early work focused on phenomenology and bordered on fantasy, modern scientific inquiry has emphasized the search for water, chemical biosignatures in the soil and rocks at the planet's surface, and biomarker gases in the atmosphere.

Mars is of particular interest for the study of the origins of life because of its similarity to the early Earth. This is especially so since Mars has a cold climate and lacks plate tectonics or continental drift, so it has remained almost unchanged since the end of the Hesperian period. At least two thirds of Mars's surface is more than 3.5 billion years old, and Mars may thus hold the best record of the prebiotic conditions leading to abiogenesis, even if life does not or has never existed there. It remains an open question whether life currently exists on Mars or has existed there in the past, and fictional Martians have been a recurring feature of popular entertainment of the 20th and 21st centuries.

On January 24, 2014, NASA reported that current studies on the planet Mars by the Curiosity and Opportunity rovers will be searching for evidence of ancient life, including a biosphere based on autotrophic, chemotrophic, and/or chemolithoautotrophic microorganisms, as well as ancient water, including fluvio-lacustrine environments (plains related to ancient rivers or lakes) that may have been habitable. The search for evidence of habitability, taphonomy (related to fossils), and organic carbon on the planet Mars is now a primary NASA objective.

In a step toward analyzing Mars for signs of life, researchers from MIT, Harvard and Massachusetts General Hospital are working on a DNA-sequencing microchip that can survive radiation doses similar to those found on Mars. If there is life on Mars, it’s not too farfetched to believe that such Martian species may share genetic roots with life on Earth. More than 3.5 billion years ago, a blitz of meteors ricocheted around the solar system, passing material between the two fledgling planets.

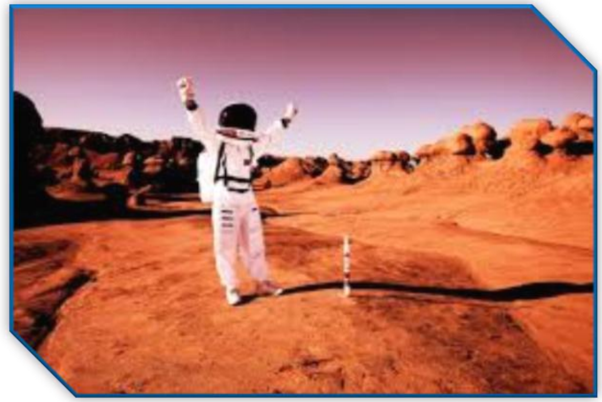

Figure 4, [the Mars Surface]

What we have found is that Gale Crater was able to sustain a lake on its surface at least once in its ancient past that may have been favorable for microbial life, billions of years ago. This is a huge positive step for the exploration of Mars.

“It is exciting to think that billions of years ago, ancient microbial life may have existed in the lake’s calm waters, converting a rich array of elements into energy. The next phase of the mission, where we will be exploring more rocky outcrops on the crater’s surface, could hold the key whether life did exist on the red planet.”

Figure 5, [Core Sample of the Mars Surface]

Liquid water

Liquid water, necessary for life as we know it, cannot exist on the surface of Mars except at the lowest elevations for minutes or hours. Liquid water does not appear at the surface itself, but it could form in minuscule amounts around dust particles in snow heated by the Sun. Also, the ancient equatorial ice sheets beneath the ground may slowly sublimate or melt, accessible from the surface via caves.

Water on Mars exists almost exclusively as water ice, located in the Martian polar ice caps and under the shallow Martian surface even at more temperate latitudes. A small amount of water vapor is present in the atmosphere. However, there are no bodies of liquid water on the Martian surface because of its atmospheric pressure at the surface which averages about 600 pascals (0.087 psi)—approximately 0.6% of the Earth's mean sea level pressure—and because the temperature is far too low, (210 K (−63 °C) leading to immediate freezing. Despite this, about 3.8 billion years ago, there was a denser atmosphere, higher temperature, and vast amounts of liquid water which flowed on the surface, including large oceans.

It has been estimated that the primordial oceans on Mars would have covered between 36% and 75% of the planet. Warm-season flows on slope in Newton Crater Analysis of Martian sandstones, using data obtained from orbital spectrometry which suggests that the water that previously existed on the surface of Mars would have had too high a salinity to support most Earth-like life. Tosca et al. found that the Martian water in the locations they studied all had water activity, aw $\leq$ 0.78 to 0.86—a level fatal to most Terrestrial life. Haloarchaea, however, are able to live in hypersaline solutions, up to the saturation point. In June 2000, possible evidence for current liquid water flowing at the surface of Mars was discovered in the form of flood-like gullies. In addition, similar images were published in 2006, taken by the Mars Global Surveyor, suggested that water occasionally flows on the surface of Mars.

The images did not actually show flowing water, rather, they illustrated changes in steep crater walls and sediment deposits, providing the strongest evidence yet that water coursed through them as recently as several years ago. There is disagreement in the scientific community as to whether or not the recent gully streaks were formed by liquid water. Some suggest the flows were merely dry sand flows. Others suggest it may be liquid brine near the surface, but the exact source of the water and the mechanism behind its motion are not understood.

Silica

The silica-rich patch was discovered by Spirit Rover in May 2007. The Spirit Rover disturfloor is a patch of ground with an inoperative wheel, uncovering an area extremely rich in silica (90%).The feature is reminiscent of the effect of hot spring water or steam coming into contact with volcanic rocks.

Scientists consider this as evidence of a past environment that may have been favorable for microbial life, and theorize that one possible origin for the silica may have been produced by the interaction of soil with acid vapors produced by volcanic activity in the presence of water. Based on Earth analogs, hydrothermal systems on Mars would be highly attractive for their potential for preserving organic and inorganic biosignatures. For this reason, hydrothermal deposits are regarded as important targets in the exploration for fossil evidence of ancient Martian life.

Information about the evolution of the Martian crust and deeper regions within the planet comes from Curiosity's mineralogical analysis of a football-size igneous rock called "Jake M." Igneous rocks form by cooling molten material that originated well beneath the crust. The chemical compositions of the rocks can be used to infer the thermal, pressure and chemical conditions under which they crystallized.

"No other Martian rock is so similar to terrestrial igneous rocks," said Edward Stolper of the California Institute of Technology, lead author of a report about this analysis. "This is surprising because previously studied igneous rocks from Mars differ substantially from terrestrial rocks and from Jake M."

Figure 6, [life on the Mars Planet]

The other four reports include analysis of the composition and formation process of a windblown drift of sand and dust, by David Blake of NASA's Ames Research Center at Moffett Field, California, and co-authors.

Curiosity examined this drift, called Rocknest, with five instruments, preforming an onboard laboratory analysis of samples scooped up from the Martian surface. The drift has a complex history and includes sand particles with local origins, as well as finer particles that sample windblown Martian dust distributed regionally or even globally.

The rover is equipped with a laser instrument to determine material compositions from some distance away. This instrument found that the fine-particle component in the Rocknest drift matches the composition of windblown dust and contains water molecules. The rover tested 139 soil targets at Rocknest and elsewhere during the mission's first three months and detected hydrogen — which scientists interpret as water — every time the laser hit fine-particle material.

"The fine-grain component of the soil has a similar composition to the dust distributed all around Mars, and now we know more about its hydration and composition than ever before," said Pierre-Yves Meslin of the Institut de Recherche en Astrophysique et Planétologie in Toulouse, France, lead author of a report about the laser instrument results.

A laboratory inside Curiosity used X-rays to determine the composition of Rocknest samples. This technique, discovered in 1912, is a laboratory standard for mineral identification on Earth. The equipment was miniaturized to fit on the spacecraft that carried Curiosity to Mars, and this has yielded spinoff benefits for similar portable devices used on Earth. David Bish of Indiana University in Bloomington co-authored a report about how this technique was used and its results at Rocknest.

X-ray analysis not only identified 10 distinct minerals, but also found an unexpectedly large portion of the Rocknest composition is amorphous ingredients, rather than crystalline minerals. Amorphous materials, similar to glassy substances, are a component of some volcanic deposits on Earth.

Another laboratory instrument identified chemicals and isotopes in gases released by heating the Rocknest soil in a tiny oven. Isotopes are variants of the same element with different atomic weights. These tests found water makes up about 2 percent of the soil, and the water molecules are bound to the amorphous materials in the soil.

"The ratio of hydrogen isotopes in water released from baked samples of Rocknest soil indicates the water molecules attached to soil particles come from interaction with the modern atmosphere," said Laurie Leshin of Rensselaer Polytechnic Institute in Troy, New York, lead author of a report about analysis with the baking instrument.

Baking and analyzing the Rocknest sample also revealed a compound with chlorine and oxygen, likely chlorate or perchlorate, which previously was known to exist on Mars only at one high-latitude site. This finding at Curiosity's equatorial site suggests more global distribution.

Data obtained from Curiosity since the first four months of the rover's mission on Mars are still being analyzed. NASA's Jet Propulsion Laboratory, a division of Caltech in Pasadena, California, manages the mission for NASA's Science Mission Directorate in Washington. The mission draws upon international collaboration, including key instrument contributions from Canada, Spain, Russia and France.

Conclusion and Recommendations

The composition of the planet Mars is similar to the Earth because of its close proximity. As a result, there are sedimentary rocks on Mars which are necessary for the formation of petroleum. If the formation of the petroleum theory is integrated with the solar system big bang theory, and life on Mars, the presence of oil and gas on Mars is possible.

I hope to continue the R&D about tis issue.

References

1) Aldo Vitagliano "The Mean Plane (Invariable plane) of the Solar System passing through the bary center". April 3, 2009. Retrieved April 10, 2009.
2) D. L. Bish, et al., "X-ray Diffraction Results from Mars Science Laboratory: Mineralogy of Rocknest at Gale Crater," Science 27 September 2013: Vol. 341 no. 6153; DOI: 10.1126/science.1238932.
3) E. M. Stolper, et al., "The Petrochemistry of Jake_M: A Martian Mugearite," Science 27 September 2013: Vol. 341 no. 6153; DOI: 10.1126/science.1239463.
4) Folkner, W. M. et al. (1997). "Interior Structure and Seasonal Mass Redistribution of Mars from Radio Tracking of Mars Pathfinder". Science 278 (5344): 1749–1752. Bibcode:1997Sci...278.1749F. doi:10.1126/science.278.5344.1749. ISSN 0036-8075.
5) John P. Grotzinger, "Analysis of Surface Materials by the Curiosity Mars Rover," Science 27 September 2013: Vol. 341 no. 6153 p. 1475; DOI: 10.1126/science.1244258 .
6) Jump up to: a b "What is the typical temperature on Mars?". Astronomycafe.net. Retrieved August 14, 2012.
7) L. A. Leshin, et al., "Volatile, Isotope, and Organic Analysis of Martian Fines with the Mars Curiosity Rover," Science 27 September 2013: Vol. 341 no. 6153; DOI: 10.1126/science.1238937.
8) Lodders, Katharina; Fegley, Bruce (1998). The planetary scientist's companion. Oxford University Press US. p. 190. ISBN 0-19-511694-1.
9) Mallama, A. (2007). "The magnitude and albedo of Mars". Icarus 192 (2): 404–416. Bibcode:2007Icar..192..404M. doi:10.1016/j.icarus.2007.07.011.
10) Mallama, A. (2011). "Planetary magnitudes". Sky and Telescope. 121(1): 51–56.
11) "Mars Exploration Rover Mission: Spotlight". Marsrover.nasa.gov. June 12, 2007. Retrieved August 14, 2012.
12) P.-Y. Meslin, et al., "Soil Diversity and Hydration as Observed by ChemCam at Gale Crater, Mars," Science 27 September 2013: Vol. 341 no. 6153; DOI: 10.1126/science.1238670.
13) Seidelmann, P. Kenneth; Archinal, Brent A.; A'Hearn, Michael F. et al. (2007). "Report of the IAU/IAG Working Group on cartographic coordinates and rotational elements: 2006". Celestial Mechanics and Dynamical Astronomy 98 (3): 155–180. Bibcode:2007CeMDA..98..155S. doi:10.1007/s10569-007-9072-y.
14) Williams, David R. (September 1, 2004). "Mars Fact Sheet". National Space Science Data Center. NASA. Retrieved June 24, 2006.
15) Yeomans, Donald K. (July 13, 2006). "HORIZONS Web-Interface for Mars (Major Body=499)". JPL Horizons On-Line Ephemeris System. Retrieved August 8, 2007. —Select "Ephemeris Type: Orbital Elements", "Time Span: 2000-01-01 12:00 to 2000-01-02". ("Target Body: Mars" and "Center: Sun" should be defaulted to.) Results are instantaneous osculating values at the precise J2000 epoch.