Sunset Astronomical Society

The Sunset *Gazette*

Serving the Tri-Cities since 1975

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Meeting information

Meetings are generally in the theater in the Delta College Planetarium in Bay City. The meetings will usually be on the 2nd Friday of each month at 7:00 PM. Watch the newsletter for changes in dates and times. Membership is not required to participate in meetings and activities. See Page 6 for this month's meeting site.

Membership Information

Student / Senior: (17 years & younger, 65+ years)

1 year - $15

2 year - $20

Regular: (18+ years)

1 year - $20

2 year - $30

Family: 1 year - $25

2 year - $40

New Members receive a New Member Observing Kit at their first meeting, courtesy of SAS. Membership includes voting privileges, the newsletter and free admission into Delta College Planetarium shows.

Subscription Information

Subscription prices available at club rate with the purchase of individual or family membership.

"Sky and Telescope" Magazine:
1 year - $32.95 + Membership

2 year - $65.90

"Astronomy" Magazine:

1 year - $34.00 + Membership

2 year - $60.00 + Membership

President's Message

"Astronomy in the mid-Michigan area is looking up" to paraphrase a popular poster. We have two active clubs with excellent membership and a Planetarium with a staff dedicated to public education and the support of amateur activities. The Sunset Astronomical Society offers interesting monthly meetings and an informative monthly newsletter with Astronomical articles and schedules of local events. The Astronomical Unit focuses on observational Astronomy but also offers presentations at bi-monthly meetings. Both clubs invite the public to the free meetings to meet and share our common interest in Astronomy in a friendly atmosphere. I'd estimate that we have about 70 active members between the two clubs.

Make the time to follow your interest by braving a cold but clear winter night if only to wonder at the beauty of the Pleiades or the Orion Nebula through binoculars. You'll feel better because you did.

Hopefully you were one of the audience members at the recent Astronomical Unit meeting when Axel Mellinger described how he creates the photos for the beautiful "all sky" posters that are available commercially.

I'm looking forward to talking with you at the February 13 SAS meeting. Bring your telescope and share your expertise with others in our annual "Telescope Workshop". My friend and professional Astronomer, Mark Vincent, has already shown me the finer points of tuning my recently acquired Meade "go-to" telescope. I'll also show an excellent presentation on the "Keck Accomplishments" sent to me by the Night Manager of the Keck Observatory. Dale Sisson will more than satisfy our thirst for his knowledge of the next 'Constellation of the Month'.

Clear Skies!

Bill Albe

ARE WE ALONE? or

"The discovery of one-cell organisms on a distant planet in our solar system

By Martin Grasmann. This is the 10th part of an extended summary of a lecture about Astrobiology that Dana Bachmann, SETI Institute/SOFIA-Ames gave on Wednesday, March 26th at the CMU. This part in our ongoing series about the existence of life other than Earth will have the somewhat speculative theme: **"Panspermia"**.

Panspermia is a hypothesis that life, or better the seeds of life, already exist in the Universe and that life on Earth may have originated through interaction with this "seeds". This hypothesis is actually not a child of the 20th century but has been developed much earlier, albeit the meaning "panspermia" has somewhat changed over the centuries and millennia.

The first mentioning was by the Greek philosopher Anaxagoras in the middle of the 5th century BC although his concept was different. In his theory "all things have existed from the beginning, but existed in infinitesimally small fragments of themselves, endless in number and inextricably combined. The mind then arranged the segregation of like from unlike and possessed of all knowledge and power, is especially seen ruling in all the forms of life."

The panspermia hypothesis lay then dormant for over 2000 years until it was discovered 1743 in the writings of Benoit de Maillet who suggested that germs from space had fallen into the oceans and grown into fish and later amphibians, reptiles and then mammals. The hypothesis was again revived my some very famous 19th century scientists like Bercelius, Helmholtz and Arhenius: Panspermia was definde to be either interstellar (exchange of seeds between star systems) or interplanetary (exchnge of seeds between planets in the same star system).

The mechanism by which panspermia can occur is radiation pressure (solar wind or solar photons may drive microscopic seeds through space (Arrhenius) and so called lithopanspermia (microorganisms trapped in rocks where there can survive) (Kelvin). Further concepts are directed panspermia from space to seed Earth (Orgel and Crick) or sent from Earth to seed other solar systems (Mautner) have also been proposed. The late astrophysicist and cosmologist Sir Fred Hoyle (some of you better known as a science fiction writer "The Black Cloud") and Chandra Wickramasinghe proposed the hypothesis that life-forms continuously entering the Earth's atmosphere, and may be responsible for epidemic outbreaks, new diseases, and the genetic novelty necessary for macroevolution.

The Panspermia hypothesis does not actually abandon the idea that life has to originate somewhere but it extends the possibilities = environments and the time frame. Also life does not have to originate in one place and spread through the Universe but it may have started in multiple places over the time and then be able to spread to environments suitable for replication. So what about the hypothesis of interplanetary transfer of life from one planet to another? The transfer of material from one planetary body to another is actually very well documented as the evidence of meteorites from the Moon or Mars shows.

An impact of a large body like an asteroid or a comet is able to produce enough energy to accelerate smaller bodies to speeds were they are able to leave the gravitational pull of their planet or moon of origin. You may think that such an impact is a very violent end energetic event and any ejected material may be heated far beyond temperatures which organic matter can withstand but recent research showed that the ejected material form the fringes of impact may have a good chance to survive with being fried. How big are chances that some "passengers"-microbes would survive the journey? It has known for some time that live is much tougher and can withstand much harsher conditions that previous thought and there is a increasing number of extremophiles more resistant to extreme conditions than previously recognized, and may be able to survive for very long periods of time even in deep space. These extremophiles could possibly travel in a dormant state between environments suitable for ongoing life such as planetary surfaces. As mentioned in one of the earlier parts of this series bacteriea have been found in the surroundings of black smokers or oceanic volcanic vents, thriving in temperatures above 100 °C, a fraction of bacteria even survived short periods of up to 250 °C in vacuum! Other bacteria can thrive in strongly basic envirnments and others at extreme pressures 11 km under the ocean. Semi-dormant bacteria were found in ice cores over a mile deep beneath the Antarctic ice shields given rise to the thought that bacteria my survive in the surface of ice comets.

An example for a higher life form than bacterias are **Tardigrades** (commonly known as water bears, see the nice picture to the right) who are polyextremophiles and are reported to be found in hot springs, on top of the Himalayas, under layers of solid ice and in ocean sediments. It has recently been demonstrated that they can survive the vacuum of open space and solar radiation combined for at least 10 days.

Spores are even better suited for transporting life through inhospitable and deadly environments, such as the depths of interstellar space. They are produced as part of the normal life cycle of many plants, algae, fungi and some bacteria produce endospores or cysts during times of stress. These structures are often highly resilient while metabolically inactive, and start to function again when favorable conditions are restored. Therefore if bacteria or spores were sheltered from the radiation of space (the most dangerous threat to life), perhaps inside a thick meteoroid, they could survive dormant for millions of years.

This is approximately the time it would take for ejected material to reach the gravitational influence of another planetary body. But would they survive the entrance into an atmosphere and the impact? If the body is large enough so that the life form is shielded against the heat by an insulating rock layer it may survive the trip through Earth atmosphere. If it is not too large the meteorite is decelerated by the air's resistance and the impact would be relatively soft.

With **Mars** being one of the most likely places to have formed life in the solar system one of the key questions we would want to answer is that of whether Martian life formed independently or shared a common origin with life on Earth. Because of the much lower Mars gravity any ejected objects from an impact would only need 1/3 of the speed to leave the Martian gravitational influence than that of Earth. It is therefore more probable that life would transferred form Mars to Earth and not vice versa.

Because we only now life here on Earth we do not know for sure if life is a common event and always happens if the conditions are right for a long enough time. If life on Mars would be found this would be a strong indication that life form easily it can be assumed that the universe is teeming with life. But we would to prove that life on Mars has and independent origin. A common origin would prove that life can travel between planets - at least inside a solar system but would leave open the question the likelihood of life outside our solar system. On Earth all live has a common origin and we must believe that all life inherit properties from a universal ancestor. By comparing the sequences of genes involved in fundamental chemical processes common to all life one can construct a "tree of life" showing the relatedness of all groups of life. If we can do this for potential life found on Mars and it is found to share the same chemical processes as life on Earth this would indicate a common origin. These common chemical processes life uses are DNA as its basic genetic material.

The DNA message is read by copying it onto RNA (a process called transcription) and this RNA message is used to synthesize proteins (a process called translation) by means of an RNA/protein complex called the ribosome. The resulting proteins are most frequently used as catalysts (enzymes) to drive the many chemical processes in the cell. The genetic code — which translates three "letter" sequences of the four DNA bases to the corresponding amino acid to be added into a protein — is almost universal. Unfortunately if we find some fundamental differences in the chemistry this would not indicate an independent origin. The reason is that the last universal ancestor may not be all the life ever lived on Earth. The evolution before the last universal ancestor is only poorly understood as we have no direct fossil record of what occurred. However, it is generally thought that the current DNA/RNA/protein basis for life was preceded by an era known as the "RNA World" in which RNA provided the information storage and catalytic roles, which were later taken over by DNA and proteins. This RNA world was probably itself preceded by a pre-RNA world based on some other genetic material.

Answering the question of a common origin and if life originated on Mars independently is quite actually difficult! If life was transferred from mars to Earth it must have happened in primordial times in which the chemical basis for life could be very different from that we know today. In one scenario we could look at the genetic code of potential Martian life. On Earth nearly all life uses a "Universal Genetic Code". Would a difference in the two codes mean that life evolved independently on Mars? Not necessarily! The "Universal Genetic Code" on Earth did must have been inherited from the last common universal ancestor and it has changed little or not at all in subsequent evolution. Why? Because any substantial changes would make all genes produce the wrong protein sequence and be lethal to the organism. On the other hand there is strong evidence that this "Universal Genetic Code" has not always be the same. Simulations have shown that our current "Universal Genetic Code" is among the best possible, which suggests that the code has evolved by natural selection. So if life on Mars and Earth diverged before the last common universal ancestor it may have happened when the genetic code was still in process of evolving into its current form. If that is the case a different genetic code is perfectly compatible with a common origin for life on Earth and Mars. So if we ever find life on Mars and we need to find living organisms not fossils (but even that would be a sensation) it will be very difficult to determine id life had an independent origin.

So what about life from interstellar origin? Space is very damaging to any life over a long period of time even shielded life is getting damaged by radiation, cosmic rays and stellar winds. When bacteria frozen in ice are subjected to these conditions their half life is about 1.1 million years— enough for life to be moved around in the solar system but by far not enough time to travel interstellar distances. For example not a single extra-solar meteorite has been found so far - all of them have originated during the birth of our solar system.

Want to know more about the outer Solar System and chances of life on planets circling distant suns ? Then watch this space! The next parts of this gripping story of 'Are We Alone?' will follow in the next issues of the Sun-

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This issue can now be accessed in color on the website of the SAS!!!

SAS Meeting

February 13, 2009

Delta College Planetarium Theater

7:00 Welcome, new members

Dale Sisson's

Constellation of the Month:

"Auriga"

Bill Albe:

"The Keck Telescope"

Break: Refreshments served

Telescope Workshop:

"How to Use the Telescope You Got for Christmas" including "Collimate and Use Your Telescope"

Don' t forget to bring your telescopes for some Sidewalk Astronomy after the meeting (weather permitting).

Observable Planets:

Venus shines very bright in the southwest after sunset. Saturn visible in the evening high in southeast.

UPCOMING EVENTS

Feb 1: First quarter Moon.

Feb 3: Moon passes through the northern edge of the Pleiades, e.g., 4.4 mag Taygeta is eclipsed 9.19 pm EST.

Feb 9: Full Moon. For NW America to be seen as deep penumbral eclipse.

Feb 10,11: Moon ca 8° upper-right of Saturn late in the evening, and 10° below Saturn on 11th.

Feb 11 - 25: Watch out for the zodiacal light in the evening sky.

Feb 17: Mars ca 0.6° south of Jupiter very low in bright dawn.

Feb 22: For early birds: Crescent Moon ca 6° upper right of Jupiter, with Mercury in the middle of both, very low in the east before sunrise. Binoculars!.

Feb 24: Mercury and Jupiter less than 1° apart in the very low east at dawm

Feb 24: New Moon.

Feb 27: Thin crest Moon is 1.5° lower left of Venus.

UPCOMING MEETINGS

Supporting the International Year of Astronomy 2009:

First Friday of each month: Public Observing at the Planetarium

March 13: Messier Marathon preparation.

April 10: "Astronomical Tutorial" / NASA Lunar Sample training

SAS Elections

April 17: Star Party at Tawas: weekend of 17-19 (Fri - Sunday)

April 24: Messier Marathon with the AU

May 8: "The Lunar Landings" Dick Van Effen

May 1 - 31: Possible Star Party at the 30" Observatory of Garry Beckstrom. Weather permitting on short notice.

If you are interested in presenting to our club, please contact

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