Sunset Astronomical Society

The Sunset *Gazette*

Serving the Tri-Cities since 1975

Volume 7, Issue 6 February, 2010

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

Membership includes voting privileges, the newsletter and free admission into Delta College Planetarium shows.

Treasurer's address for renewals and subscriptions:

Tom Smith

3423 Hidden Rd.

Bay City, MI 48706-1243

Subscription Information

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

"Sky and Telescope" Magazine:
1 year - $33.00 + Membership

"Astronomy" Magazine:

1 year - $34.00 + Membership

2 year - $60.00 + Membership

Dear SAS Members!

We would like to stay with you in contact on a short notice but we are getting too many e-mails returned undelivered! If you have given us your e-mail address when you joined the SAS, but if it has since then changed could you please forward us your new address?

Thank you!

ARE WE ALONE? or

"The discovery of one-cell organisms on a distant planet in our solar system or beyond would have an impact as big as the Copernicus revolution"

By Martin Grasmann. This is the 15th part of an (very) extended summary of a lecture about Astrobiology that Dana Bachmann, SETI Institute/SOFIA-Ames gave on Wednesday, March 26th at the CMU. In the last parts we started to look at some of the theories developed to explain why we have not found them yet (or "they" us). We divided this theoretical approach into four topics and are currently looking at topic no 2:

(2) Alien civilizations do exist, but we see no evidence

The money problem: It is too expensive to spread physically throughout the galaxy: This theory requires an alien civilization with an economic layout similar to our self. From our current physical knowledge there is no reason to assume that interstellar travel is not technological feasible albeit it has not to be at the speed of light but at much slower speeds where travel times could take hundreds, thousands or hundred of thousands of years. This may lead to colonization patterns which are uneven: Colonization efforts may not occur as an unstoppable wave but may slow down or stop at all if the technological effort and cost are to great. The Colonies may also develop a culture and civilization of their own and even loose their drive to further colonize. This kind of colonization may therefore occur in "clusters," in which large areas remain un-colonized at any one time.

We are not listening properly: It has been suggested that programs like SETI could potentially completely miss signals which are present because they are compressed data streams (nearly indistinguishable from white noise to anyone who did not understand the compression algorithm). SETI may also look at the wrong frequencies, that the data rate is too high for our current computers to handle or too slow to be recognized as communication. The sheer size to search for a signal is another problem. The signal could be highly focused either by frequency or by space with the Earth only by sheer chance being in the line of the signal. This means that detectors have to be getting ever more sensitive and listening at an ever increased number and wider range of frequencies to increase the chances of success.

Alien civilizations only broadcast detectable radio signals for a brief period of time: A civilization may advance to a state where radio technology is replaced by other technology (glass fiber etc) or depletion of resources reduced the time in which it will be able to broadcast. Humans are currently moving to directional or guided transmission channels such as electrical cables, optical fibers, narrow-beam microwaves and lasers and reducing the amount of omni-directional broadcast which would be something like high powered radio stations or UHF TV carriers which "waste" a lot of energy in terms of efficiency but are very well suited for long-distance transmissions over interstellar distances.

The directional or guided transmission channels are far less detectable from space. But nearly every SETI project is looking for those strong radio sources because these would be the most conspicuous and artificial signals from an Earth-like civilization that could be detected at interstellar distances. But recent advances are replacing analog TV with digital television which uses the spectrum more efficiently by eliminating or reducing components such as carriers that make them so conspicuous. If we take Earth as an example our own radio visibility happened on December 12, 1901, when Marconi sent radio signals from Cornwall, England, to Newfoundland, Canada. Our own visibility is now ending, or at least becoming orders of magnitude more difficult, as analog TV rapidly becomes a thing of the past. Taken our own example a civilization may only be (un-purposely) radio visible for about one hundred years, so if a neighboring civilization had been very visible during the time of enlightenment we would have missed it because we were just not listening at that time! In other words "Everyone is listening, but no one is sending." This implies that advanced alien civilizations do not evolve beyond broadcasting in the electromagnetic spectrum and may develop means of communication we are not yet able to detect (neutrino signals etc).

Alien civilizations tend to experience a technological singularity: A technological singularity is a term used when technology is going to reach an extremely high or even infinite value in the future. This hypothesis of ever increasing capability could lead to the emergence of self-improving artificial intelligence or a super-intelligence which would so far be beyond current human's capabilities that it would be impossible for us to understand it. The technological singularity would create a wholly new regime of mind, society and technology. It is worth noticing that many prominent academics dispute the plausibility of a technological singularity. In our search for intelligent civilizations this would mean that a civilization in the post-technological singularity state may have altered drastically enough to render communication impossible (like us trying to communicate with amoebae)

(3) The alien civilizations choose not to interact with us

The Zoo hypothesis or Earth is purposely kept isolated: This is probably a well known concept of fiction (see 'Prime Directive' in Star Trek) that the aliens purposefully do not communicate as to not to interfere with our development. Other reasons have been proposed that contact would only be allowed when the human race passes certain standards be it ethical, political (very anthropocentric) or technological.

It is too dangerous to communicate: As we know from history when two civilization met the results were often disastrous for one side and this may also apply to interstellar contact: An alien civilization may abstain from contact and even purposely hide itself because they think it is too dangerous to communicate, for they fear it is the nature of intelligent life to destroy itself.

The civilizations are too alien: An argument often mentioned is that an alien civilization may simply be too alien to us and that we underestimate how different life may evolve on another planet. The use of mathematics, language and tools may be too human and not shared by other life-forms.

The civilizations are non-technological: A civilization must not necessarily develop technology at all. It would therefore be very difficult if not impossible to distinguish between intelligent but non-technical life from non-intelligent life once we acquire the technology to scan for life-signs on potential life bearing Earth-like planets. If non-technological civilizations are the rule and we are the exemption it would indeed be very hard for us to detect any alien civilization in our galaxy.

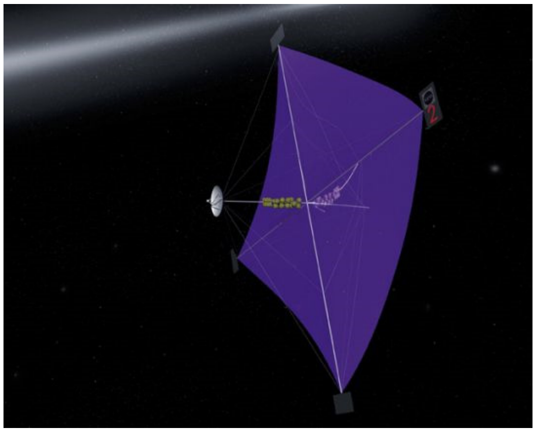
(4) Alien civilization are already here on Earth or in our Solar System

I do not want to go to deep into this hypothesis but it states that an alien civilization or civilizations are here right now on Earth or in our solar system and observing us undetected. A civilization advanced enough to travel interstellar distances should very well be capable of concealing themselves from us. Another theory is the so called paleo-contact with extraterrestrials visiting Earth in the early historical era, with myths and religious lore as evidence of such contact(s).

This concludes some ideas and hypothesis around the Fermi paradox. The next part will deal with a favorite theme of the author: interstellar drives! The drive systems I want to discuss will be technological advanced, some very advanced but still in the realm of the physical possible even if it is clear that mankind will not be able to build any of these in the next hundred years.

Interstellar Drives

In reality we already have two space probes venturing into interstellar space: the Pioneer and Voyager probes. These space crafts have reached the sun's escape velocity and are now forever outward bound. They have now entered the region of space where the solar wind generated by our sun is encountering the interstellar wind which originates from all stars in our galaxy. By definition these probes are now in interstellar space. Compared to interstellar distances these probes are very slow: Voyager 1, the fastest of them travels with 62000 km/h and would therefore take over 73,000 years to get Proxima Centaury, our nearest neighbor at 4.22 light years distance. This brings us the first problem: distances! It implies that either very high speeds or very long travel times are involved. But even with high speeds (a good fraction of the speed of light) we are looking at travel times of many decades in best case scenario and many hundred to thousand years in a worse case scenario. During all the times the spaceship and potentially its crew would have to endure the hard vacuum radiation, micrometeorites and weightlessness. Traveling at extremely high speeds poses great risks because it would be impossible to avoid small objects in space. At a tenth of the speed of light, even hitting a tiny micrometeorite would unleash massive kinetic energy upon a ship and probably destroy it. At higher speed even atomic particles like protons, H and He atoms in the interstellar wind could potentially be damaging and massively corrode the hull of the spacecraft. Because the travel times would span many generations it will be quite difficult to make an economic case for such a venture, because any potential benefits will be far in the future. Another problem are the energies needed to propel a spacecraft to any useful velocity to make the journey in reasonable time. A lower limit for the energy is given by the kinetic energy $e = 0.5\ mv^2$ where m is the spaceship mass and v the end velocity. If the spacecraft is not just making a quick fly by at the destination but is going to slow down an additional amount of energy is necessary in the order of magnitude of the amount to accelerate the ship in the first place. To get an idea of the energies involved think about the following numbers: for a journey to Alpha Centauri at least 100 times the total energy output of the entire world would be required.



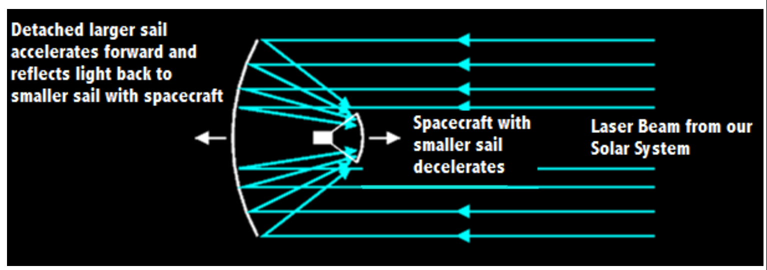
NASA concept of a solar sail with attached space

One theory states that if the interstellar mission cannot be completed within 50 years it should not be undertaken at all because in the meantime a better propulsion system may have been invented and the later spacecraft would pass the one started earlier. Predicting this future, however, is not easy. We simply lack even the basic physical theories to travel faster than light-speed making the engineering of an interstellar drive even further away. There are however, some interesting ideas on the drawing board that are within current theoretical limits. What I want to discuss next are the most promising concepts to enable exploration beyond our solar system and interstellar travel.

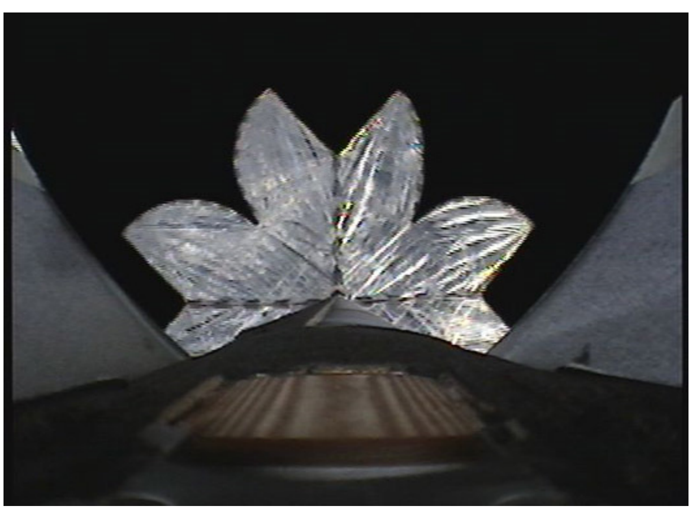
1.**Light sails**

Of all concepts discussed this is currently the most technologically viable. The scientist and science fiction writer R. L. Forward first proposed solar sails in 1984. The basic idea is to take a very large and very light area and use huge lasers to push this object out of the solar system. Light, made up of photons can indeed exert a very small force over objects they hit and transfer some of its momentum. It is of course vital that the object is as large and lightweight as possible - like a sail. It also needs to be reflective as only photons bouncing off an object impart velocity – absorbed photons generate heat and to prevent this the backside of the sail needs to be an effective radiator. A potential material for the sail could be some form of Mylar which would be thin and strong. The lasers would have to be very, very powerful. For example you would need a 10 gigawatt laser to send a 1 km diameter sail to the closest stars with just 16 g of payload! The sail would have to be hit with great precision as long as possible to allow the highest possible velocities. To do that and to allow the sail being propelled continuously the laser would have to be placed in space, possible in one of the Lagrange points. The energy of the laser could come from solar panels. According to R. L. Forward a laser powered solar sail probe could reach the next star in about only 10 years! The table above lists some example concepts using beamed laser propulsion as proposed.

Mission	Laser Power	Vehicle Mass	Acceleration	Sail Diameter	Maximum Velocity (% of the speed of light) reached @ light year (ly) distance
1. Flyby	65 GW	1 t	0.036 g	3.6 km	0.11 @ 0.17 ly
2. Rendezvous					
outbound stage	7,200 GW	785 t	0.3 g	100 km	0.21 @ 2.1 ly
deceleration stage	26,000 GW	71 t	0.2 g	30 km	0.21 @ 4.3 ly
3. Manned					
outbound stage	75,000,000 GW	78,500 t	0.3 g	1000 km	0.50 @ 0.4 ly
deceleration stage	17,000,000 GW	7,850 t	0.3 g	320 km	0.50 @ 10.4 ly
return stage	17,000,000 GW	785 t	0.3 g	100 km	0.50 @ 10.4 ly
deceleration stage	430,000 GW	785 t	0.3 g	100 km	0.50 @ 0.4 ly



As you can see from the table the technology would scale up to higher payloads and even manned missions would be possible, but the energy requirements and sail diameters would soon become mind-boggling! One questions to be answered would be how to decelerate the sail in the vicinity of the target star (there is after all not a second laser in that star system to decelerate it again!). One concept could be that the large main sail is detached form the spacecraft and at the same time a smaller sail is deployed to the rear of the spacecraft. Light is now reflected form the large sail to the smaller one which reflects it forward just like in a Cassegrain system (see right drawing!) .



The first time a big, thin film solar sail in space was deployed for the first time in the world was in August 9, 2004 . The Japanese ISAS launched a small rocket from Uchinoura Space Center in Kagoshima, Japan. The rocket was posed to carry out two kinds of solar sail deploying schemes: A clover type deployment was started at 100 seconds after liftoff at 122 km altitude, and a fan type deployment was started at 169 km altitude at 230 seconds after liftoff, following the jettison of clover type system. Both experiments of the two types deployment were successful, and the rocket splashed into the sea at about 400 seconds after liftoff.

Left: The deployment of clover type film taken by camera onboard the S-310 rocket.

The next parts will talk more about the possibility of interstellar travel. Interested? Then watch this space! The next parts of this gripping story of 'Are We Alone?' will follow in the next issues of the Sunset *Gazette*!

SUNSET ASTRONOMICAL SOCIETY
THE SUNSET GAZETTE
SERVING THE TRI- CITIES SINCE 1975

Martin Grasmann
Secretary - SAS
6108 Summerset Drive
Midland, MI 48640

President, Steve VanTol stevenv106@aol.com

1. Vice President, Dale Sisson dalesisson@hotmail.com

2. Vice President, Tim Ross tjrastronomy@hotmail.com

Treasurer, Thomas Smith tom55net@att.net

Secretary, Newsletter Editor, Martin Grasmann

martin.grasmann@sbcglobal.net

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

http://sunsetastronomicalsociety.com

SAS Meeting

February 12, 2010

Delta College Planetarium Theater

7:00 Welcome, new members

Dale Sissons's

Constellation of the Month:

"Canis Major"

Followed by

"Beyond the Big Bang"

If the weather is clear please bring your telescope!

UPCOMING EVENTS

Feb 1-15: This is good time to see the Zodiacal light: You need a dark location with a good western horizon. What you will see is a vague, huge pyramid of pearly light visible when twilight fades. Start looking ca 80 min after sunset.

Feb 3: *Midnight:* Spica can be found 4 deg upper left of Moon in the ESE with Saturn above them.

Feb 5: Last quarter Moon.

Feb 7: *Dawn:* Antares ca 3 to 5 deg lower left of Moon.

Feb 11: *Dawn:* For binocular viewers Mercury can be seen 7 deg lower left of Moon and 4 deg to the right on **Feb 12**.

Feb 13: New Moon

Feb 14: *Dusk:* Very thin New Moon just after sunset ca 5 to the right deg Venus and Jupiter can be seen.

Feb 15-18: *Dusk:* Venus and Jupiter only 2 deg apart in WSW horizon 15 min after sunset. On **Feb 16** they are only 0.5 deg apart!

Feb 21: First quarter Moon .

Feb 25: *Night:* Mars ca 5 to 6 deg from Moon.

Feb 28: Full Moon.

Feb 30: Full Moon.

March 2-17: Zodiacal light visible, see Feb announcement.

March 7: *Dawn:* Antares ca 4 to 6 deg lower left of Moon.

March 7: Last quarter Moon.

UPCOMING MEETINGS