Sunset Astronomical Society

The Sunset *Gazette*

Serving the Tri-Cities since 1975

Volume 7, Issue 10 June, 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

RESPONSE NEEDED FROM YOU, PLEASE!

Dear SAS member,

For those of you who have attended the monthly meetings in the last year we have seen steady decrease of dollars in our treasury report. The point is we have more expenditures than income. The major expenditure is the monthly newsletter. The cost of one issue including printing, envelope and postage is $1 give or take a few cents.

At the last meeting of May 14,2010 a vote was cast and accepted by overwhelming majority that from now on (June 2010 issue) we will send out hardcopies of the newsletter until the current dues paid by the members expire.

For those of you who have been receiving e-mail from the club please request to receive the e-mail notification only. Please send your request to Tom Smith (tom258 @att.net) as he holds the master list. We will send out an e-mail notification with either a pdf attached or a reminder to go to the SAS website, www.sunsetastronomicalsociety.com . This is where the latest but also previous newsletters can be accessed.

The members who do not opt to receive e-mail notification now will have three options when they renew their dues next time:

1.For those who have e-mail addresses but still want to be mailed a hardcopy to hold in their hands we have decided to charge an additional amount of $10 per year. At this time $10 should roughly cover the cost of the yearly issues.

2.Those who have e-mail addresses but do not longer need a hardcopy will just pay the usual fees for the one or two year membership and will receive a e-mail notification with either a pdf attached or a reminder to go to the SAS website, www.sunsetastronomicalsociety.com . This is where the latest but also previous newsletters can be accessed.

3.We understand that some of more senior members are not familiar with e-mail or do not have e-mail addresses. For those we will still send out hardcopies with no additional costs.

Some of our other expenses are to cover the cost like the monthly break supplies at each meeting, the Christmas pot luck costs, maintenance to keep up Dobzilla and the trailer in safe and good working order.

We hope you understand the reasons for this step but we think it's for the best of the SAS and should secure a healthy (financial) future of the club!

Thank you,

Steve VanTol (President), Dale Sisson (1.Vice President), Tim Ross (2.Vice President), Thomas Smith (Treasurer), Martin Grasmann (Secretary)

RESPONSE NEEDED FROM YOU, PLEASE!

ARE WE ALONE? or

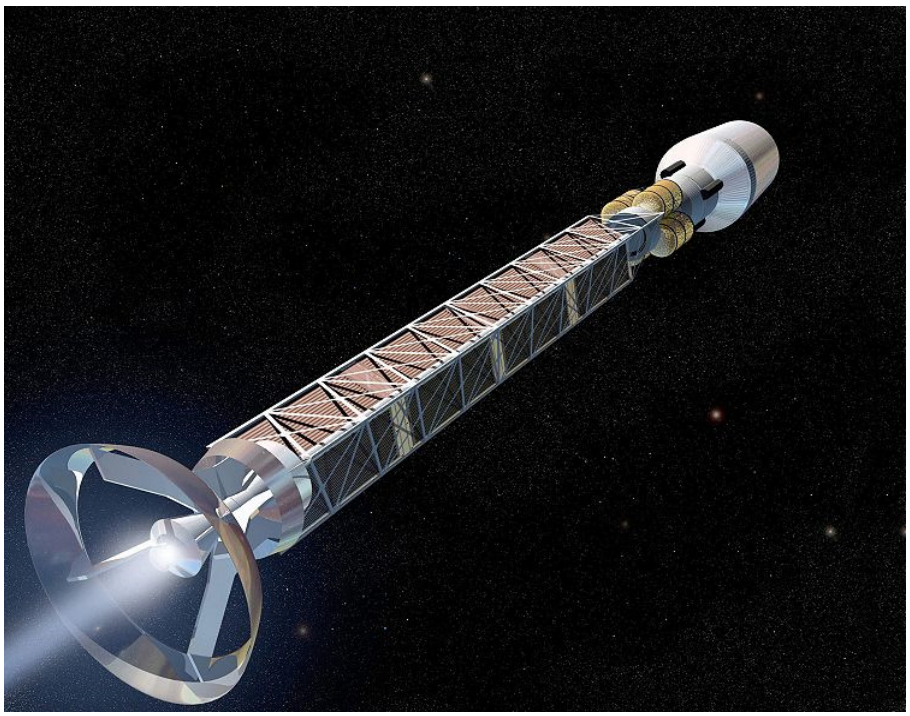
"The discovery of one-cell organisms on a distant planet in our solar system or beyond would have an impact as big as the Copernicus revolution"

By Martin Grasmann. This is the 20th of an (very) extended summary of a lecture about Astrobiology that Dana Bachmann, SETI Institute/ SOFIA-Ames gave on Wednesday, March 26th 2008 at the CMU.

Antimatter rockets

The antimatter rocket is probably the most far flung design of the various rockets we have discussed so far but it is still based on somewhat conceivable science. An antimatter rocket does not consist of antimatter (it would not get very far!) but uses antimatter as the source of power in its drive system. The potential advantage of this class of rockets is that by using the reaction between mater and antimatter most of the rest mass would convert to energy which allows this drive system to have a far higher energy density and specific impulse than any of the other class of rockets proposed in the previous newsletter editions.

What is antimatter? **Antimatter** is composed of antiparticles very much in the same way that normal matter is composed of particles. For example ordinary matter is composed of atoms consisting of electrons (negatively charged particles) surrounding a positively charged core made up of protons (source of the positive charge) and neutrons, which as the name suggests do not have a charge. An antimatter atom would be the exact opposite. In place of the electrons we would have positively charged positrons surrounding a negatively charged core consisting of antiprotons and again neutrons. Both the positron and the antiproton would have the same mass as the electron respectively the proton. Therefore an antihydrogen atom or any other element could be formed consisting completely of antimatter. As long as it does not come in contact with ordinary matter it would be stable. Of course if one would brings matter and antimatter into direct contact the picture would change dramatically: both opposite charged particles would annihilate each other to create an enormous amount of energy. How much will show you the following example: An antimatter-matter collision will result in photon emission and the entire rest mass is converted to kinetic energy ($E = m*c^2$!). The energy per unit mass is ca 10^{10} times greater than the chemical energy extracted from the same mass (e.g. explosion of TNT or burning hydrogen and oxygen) and still 1000 times greater than nuclear fission and ca 140 times greater than nuclear fusion!

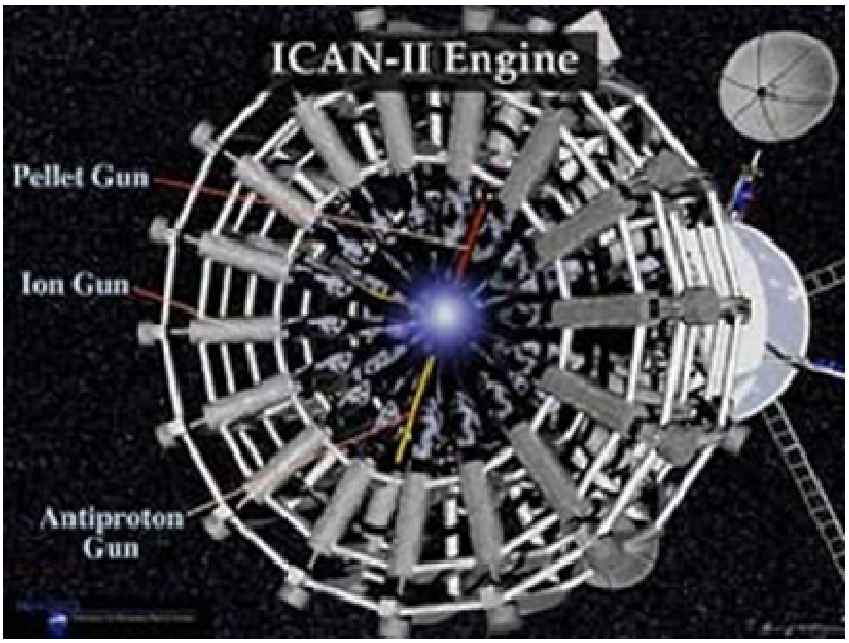


So the reaction of 1 kg of antimatter with 1 kg of matter would form the energy equivalent of 43 megatons of TNT. For example the largest nuclear explosion ever performed by man was the "Tsar bomba" which approximately released 50 megatons of TNT but used hundreds of kgs of fission and fusion material to achieve this.

Antimatter is not as rare as you think it is. Despite the fact that we and everything arround us is mostly composed of ordinary matter, there are processes in the universe that do produce antimatter: Antiparticles are created everywhere where high-energy particle collisions take place: High-energy cosmic rays impacting into Earth's atmosphere produce very small quantities of antiparticles in the resulting particle jets which are immediately annihilated by contact with nearby matter. Relativistic jets produced by the accretion disks formed when matter collects around high gravity objects like black holes or neutron stars also produce antimatter when they interact with the interstellar medium.

For example when a positron annihilates with an electron the results are gamma rays which have the characteristic energy of 511 keV, which tells the astronomer that a electron-positron annihilation took place. If a antiproton annihilates with a proton it produces charged and uncharged mesons in addition to gamma rays.

So how would an antimatter rocket work? In a nutshell: take some antimatter and react it with matter in controlled manner and use the energy to drive the ship forward. Sounds easy, but nothing is easy when antimatter is involved!



"The ICAN-II (ion compressed antimatter nuclear II) spacecraft designed at Penn State would use the ACMF engine and only 140 nanograms of antimatter for a manned 30-day crossing to Mars".

Antimatter used as direct reaction products also called *Beamed Core Engine*: Both antiproton and positron annihilation has been proposed for rocketry: In the case of the antiprotons the annihilation products would be charged and uncharged mesons and gamma rays. Only the charged mesons could be channeled by a magnetic nozzle therefore the design would not be perfectly efficient because energy is lost as gamma rays and non-charged mesons cannot be directed and used as thrust. A recent much more efficient space propulsion system has been proposed by the antimatter work group at Penn State University. It would need only a tiny fraction of the antimatter consumed by a *beamed core engine*. The process is called antiproton-catalyzed microfission (ACMF) and would work like this: In a conventional nuclear fission reactor only heat can be transferred from the uranium core to the surrounding propellant. But the ACMF design permits all energy from fission reactions to be used for propulsion. This results in a more efficient engine that could be used for interplanetary manned missions.

Positron annihilation: At the time of its proposal it was assumed that a material to deflect gamma rays would be found sometime in the future, but so far no solid material has been found which has these properties and a plasma is not sufficiently reflective to gamma rays under practically attainable conditions. However, the momentum of gamma rays can indeed be partially transferred to matter by Compton scattering: This is a type of scattering that X-rays and gamma rays undergo in matter. When photons in-elastically scatter in matter their energy is reduced because part of this energy is transferred to a scattering electron, which then recoils and is ejected from its atom. The rest of the energy is taken by the scattered X-rays or gamma rays.

Antimatter used as heating a secondary exhaust fluid: This kind of technology very much resembles proposed designs for thermal nuclear rockets. One design is to use positron annihilation gamma rays to heat a solid engine core through which then a gas (e.g. helium, hydrogen etc) is ducted, heated, accelerated and finally expelled through the exhaust nozzle. Another proposal sees the use of an ablative sail onto which the annihilation gamma rays are directed. The ablative material is heated in the process, evaporated and provides the thrust.

Antimatter used to generate electricity: Previously we talked about electric drives like ion or plasma drives. Here a material (argon, xenon) is accelerated by electric or magnetic fields. These drives provide a high specific impulse but very little thrust. The energy is normally generated from solar panels or via a thermoelectric nuclear battery. The idea is to use antimatter annihilations to directly or indirectly heat a working fluid, and use it to generate electricity, which is then used to power a plasma or ion drive.

Apart from the mentioned problems to transfer the enormous energies released during the annihilation reaction into actual momentum to drive the ship forward there are other problems: The creation of such large amounts of antimatter and the storage of the material in a save manner. To create antimatter one needs at least the same amount of energy as will be created in the particle/antiparticle pairs. Our current methods of creating antimatter are so inefficient that we would use orders of magnitude more energy! The most efficient method to date is the use of high energy lasers: In 2008 the Lawrence Livermore National Laboratory reported a process where a laser drives ionized electrons through gold nuclei which caused the incoming electrons to emit energy quanta, that decayed into both matter and antimatter. Positrons were detected at a higher rate and in greater density than ever previously detected in a laboratory. To put a price tag on this: The estimated cost $62.5 trillion per gram for anti-hydrogen! Once produced the antimatter has to be stored. Most schemes propose the use of a Penning Trap – a supercold, evacuated electromagnetic bottle in which charged particles of antimatter can be suspended. This trap works best for antiprotons. Current traps can hold ca 10 million antiprotons for a week. But traps with a capacity 100 times greater are in work. At the same time, FermiLab is installing new equipment that will boost its production of antimatter by a factor of 10-100. Of course this is still afar cry from having enough material to even send even the tiniest probe to the moon….

The next parts will see the continuation of concepts for interstellar travel. You will hear more about some outrageous interstellar rockets and possible the start of a new series. 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
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New (Old) Elected Officers for the SAS:

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 be accessed in color on the website of the SAS!!!
http://sunsetastronomicalsociety.com

SAS Meeting

7 PM, June 4th, 2010

Delta Planetarium

1. Welcome, new members

4. "Another Earth "

3. Break

4. Club Stuff

What's up in the Sky

June 1: Pre-Dawn: If you watch the Lagoon Nebula = Messier 8 you have the chance of seeing Ceres (recently promoted to dwarf planet) passing through its southern part. High powered binoculars or better telescopes recommended!

June 2: *Evening:* Mars less than 2 deg right of Regulus.

June 4: Last quarter Moon

June 6: *Dawn:* Jupiter and Uranus ca 6 to 7 deg lower right of the Moon.

June 8: *Dawn:* Opportunity to see Uranus and Jupiter in your eyepiece: Uranus at 5.9 mag is only 26' above and slightly left of Jupiter. For 1st half of June the plants are within 1 deg of each other.

June 10: *Dawn:* Mercury visible in binoculars in the east 1/2 hour before sunrise.

June 11: *Dawn:* Thin crescent Maybe visible 1/2 hour before sunrise ca 6 deg to Mercury's left.

June 11: *Evening:* Venus, Castor and Pollux form straight line ca 10 deg long.

June 12: New Moon

June 6: *Evening:* Mars + Regulus form tilted triangle with the Moon.

June 19, 20: *Evening:* Venus less than 1 deg from Beehive cluster.

UPCOMING EVENTS

Friday & Saturday June 11-12: Dobzilla (25" Dob) at River Valley RV Park for public observing - weather permitting. Everybody is invited! Contact Pat Ray or Kevin Dehne for information. ktde-hne@delta.edu

Friday, July 16: On the Hill at Sue's

Saturday July?: Bay County Fairgrounds / Relay for Life

October 7 - 10: Great Lake Star Gaze 8 at River Valley RV Park