

# Moon Miners' Manifesto

& The Moon Society Journal

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# 197

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## Guest Editorial: Launch Vehicle

by Larry Jay Friesen <ljfriesen@ev1.net>

When I read "Worrisome Bumps on the Roadway Back to the Moon" article, I thought it might be worth sharing some information I acquired recently, as well as some I picked up somewhat earlier.

This May, the Houston section of the American Institute for Aeronautics and Astronautics (AIAA) held a Technical Symposium. One of the more interesting papers was one given by Chris Taylor, on launch vehicle economics, with some worked examples.

Mr. Taylor has done quite a number of case studies of real launch vehicles. In doing so, he found that one of my cherished theories was not true.

Have you ever heard the quote (I regret I don't know the source): "It ain't all them things you don't know that hurts you as much as all them things you do know that just ain't so."? [emphasis mine] Until I heard Taylor's paper and saw his data, I had believed that the main driver for launch costs was the operational costs of launch vehicles. Not so. What Taylor found, for case after case, was that the development cost of a launch vehicle was very much the largest factor in determining how much it costs per pound (or kilogram) to launch a payload on that vehicle.

## Costs and NASA Choices

per pound (or kilogram) to launch a payload on that vehicle. Not that operational costs are trivial, but development costs are much larger still. Because it turns out that in real life, no vehicle has so far had enough launches to amortize its development costs sufficiently to bring the development cost down below other factors. There hasn't been enough traffic to orbit (and most realistic models don't expect there to be), and in many cases, a "better" launch vehicle has come along in a few years, which then has to amortize its own development costs. Taylor noted that we planned to amortize the development cost of the Shuttle, for example, over scores of launches per year, and things didn't work out that way.

Development cost, by the way, turns out to be roughly proportional to the launch mass of the vehicle. As Taylor put it, "We buy launch vehicles the way we buy sausage: by the pound."

If that's the case, is there any way to minimize development costs? Taylor's findings were (not surprisingly) that lean organizations like "skunk works" and startup companies had the lowest range of development costs, large bureaucratic organizations, like major corporations and government agencies, had the highest. [ fi p. 2, col. 2 ]

### July 13, 2006 - First Inflatable Module in Orbit!

After a flawless launch in the nose faring of a Dnepr rocket, Bigelow Aerospace' Genesis 1, 1/3 scale prototype of the 22ft by 45ft full scale Nautilus inflatable habitat module, successfully entered orbit and inflated. Genesis will be monitored for how well its envelope performs. This technology may lead to more spacious and less expensive space stations, orbital hotels, and lunar outposts! fi p. 3



# Moon Miners' Manifesto

**Moon Miners' MANIFESTO/ Moon Soc. Journal** is published every month except in January and July.

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- **Moon Miners' Manifesto CLASSICS:** Beginning with 'July 2004, we have begun an effort to re-edit, reformat, re-illustrate and republish the timeless articles of MMM's first ten years, with the intention of publishing two issues, each covering one year, in PDF format only, for free downloading, each January and July.

- **MMM's VISION:** "expanding the human economy through off-planet resources"; the early era of heavy reliance on Lunar materials; earliest use of Mars system and asteroidal resources; and the establishment of the permanent settlements necessary to support such an economy.

- **MMM's MISSION:** to encourage "spin-up" entrepreneurial development of the novel technologies needed and promote the economic-environmental rationale of space and lunar settlement.

- **MMM retains its editorial independence.** MMM serves several groups each with its own philosophy, agenda, and programs. Participation in this newsletter, while it suggests overall satisfaction with themes and treatment, requires no other litmus test. Any presumption that participating organizations can be labeled by indirect mutual association is unwarranted.

- For the current space news and near-term developments, read *Ad Astra*, the magazine of the **National Space Society**, in which we recommend and encourage membership.

- **The Lunar Reclamation Society** is an independently incorporated non-profit membership organization engaged in public outreach, freely associated with the National Space Society, insofar as LRS goals include those in NSS vision statement. LRS serves as NSS' Milwaukee chapter

=> [www.lunar-reclamation.org](http://www.lunar-reclamation.org)

- **The National Space Society** is a grassroots pro-space membership organization, with 10,000 members and 40 chapters, dedicated to the creation of a spacefaring civilization.

The National Space Society, 1620 I Street NW, Suite 615,  
Washington, DC 20006; Ph: (202) 429-1600 <= NEW HQ  
FAX: (202) 463-8497; [nss@nss.org](mailto:nss@nss.org) => [www.nss.org](http://www.nss.org)

- **MMM's desktop publication** has received computer hardware and software support from the **Space Frontier Foundation**, 16 First Ave., Nyack NY 10960; 800-78-SPACE - SFF seeks to open the space frontier to human settlement as rapidly as possible. [openfrontier@delphi.com](mailto:openfrontier@delphi.com) => [www.space-frontier.org](http://www.space-frontier.org)

- **The Moon Society** is "dedicated to overcoming the business, financial, and technological challenges necessary to establish a permanent, self-sustaining human presence on the Moon." — See contact information on page 9.

- **NSS chapters and Other Societies** with a compatible focus are welcome to join the MMM family. For special chapter/group rates, write the Editor, or call (414)-342-0705.

- **Publication Deadline:** Final draft is prepared ASAP after the 20th of each month. Articles needing to be keyed in or edited are due on the **15th**. Sooner is better! - No compensation is paid.

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Moon Miners' Manifesto, c/o Peter Kokh,  
1630 N. 32nd Street, Milwaukee WI 53208-2040

=> IN FOCUS Editorial continued from p. 1.

He also found that trying to develop a brand new vehicle cost much more than if teams were modifying an existing launch vehicle.

In this context, he said that NASA Administrator Mike Griffin's choices for the Moon-Mars initiative made a lot of sense. Griffin realized that NASA was not going to transform itself overnight into a lean, mean organization. So he chose to use existing or previous designs wherever possible (borrowing shuttle components and even Apollo-era engines, for example), and only developing new hardware and technology where it is truly necessary.

Let me now shift gears away from Chris Taylor's paper and mention some comments Mike Griffin himself made some months back about the Moon-Mars initiative in a NASA press briefing. He said that while he wants to encourage commercial participation in the initiative wherever possible, there are certain items for the program that he chose develop in-house. The reason he gave is that while commercial operations may be more efficient, when he assigns NASA to do something he can be pretty sure of getting a product; a commercial company might choose to drop the effort altogether, if they perceived insufficient profit from it. And so he said that he would develop in-house, by NASA, certain items that he deemed essential for carrying out the initiative, even though they might cost more that way, to be sure that they were there. <L JF>

**Editor's Comment:** To us, this is a new, and refreshing view-point. It is a relevant and profound "reality check" on the aspirations of space access startup companies and their plans. We don't want to discourage any of these companies, but encourage all of them to keep these points in perspective when making decisions that may have unexpected negative effects on their bottom lines.

We thank Larry Jay Friesen for this piece. In general we welcome well-thought-out opinion pieces from others. We have no monopoly on wisdom, and submissions such as this one will lead to a more balanced MMM! PK

## Tile Protection System – Shuttle's Achilles Heel

by Peter Kokh

I vividly recall when I first read all about the Shuttle Tile Protection System in an illustrated article either in *Mechanics Illustrated* or *Popular Mechanics*, way, way back in the late 70's. "How 'Mickey Mouse!'" was my immediate reaction. At the time, there was a desing effort to produce a commercial shuttle which would not need such a system because it would take a different angle of attack in descending into the upper atmosphere.

MMM would welcome an article as to "why in h-ll NASA insisted on a reentry path that made such a failure-point-laden heat rejection system necessary. Send your comments to [kokhmmm@aol.com](mailto:kokhmmm@aol.com). <MMM>

# INFLATABLE HABITATS

## A Promising Technology at the Threshold

by Peter Kokh

### Background: Late 1990's to present

In the late 1990s, a NASA team under Donna Fender was developing inflatable habitat technology in the TransHab program at JSC. I visited the TransHab work site while at the 1999 ISDC in Houston. It was an exciting project for all of us. But three forces worked together to cancel this program. Congressman James F. Sensenbrenner (R-WI) worried that successful completion of this project might lead NASA to scuttle its hard hull Space Station Habitat in TransHab's favor, and that such a development might give those Europeans opposed to ESA involvement in the Space Station (he specifically mentioned unnamed French and Germans ISS program opponents) the opportunity they needed to opt out of the program. He told me so in person at a meeting I had arranged with him in August 1999 at the request of Mars Society founder Robert Zubrin. Zubrin saw TransHab as an inexpensive Mars Expedition living quarters option in lieu of the hard hull "double tuna can" design modeled by the Mars Arctic and Mars Desert Research Stations in Canada and Utah.

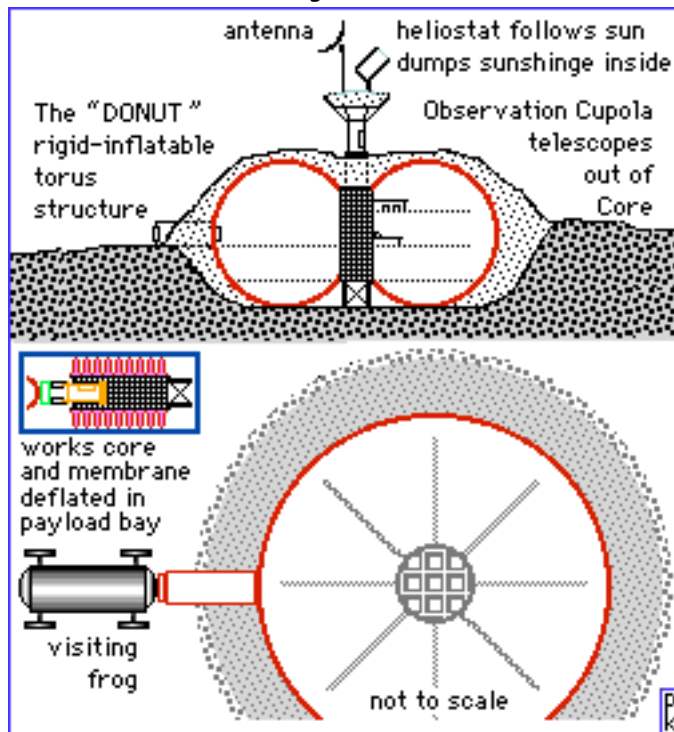
But others in Congress also wanted to kill TransHab as a cost-cutting measure. Finally, the Space Frontier Foundation wanted NASA out of the inflatable technology development business to clear the way for entrepreneurial development of this technology. *It is now quite clear that the Foundation was right on target.* The lesson? The fastest way is not always the best way!

The NASA Authorization Act of 2000 (H.R. 1654), Section 127. It prohibited NASA from developing its own inflatable module but specifically allowed it to procure one commercially. Subsequently, a memorandum of Agreement was signed between Boeing, SpaceHab, DASA, Alenia-Spazio, and Bigelow Aerospace to develop a joint business plan to bid on a commercial version of the TransHab. Bigelow emerged as the sole winner of this "competition" and secured the license to further develop the technology from the point to which NASA had brought it.

### Background: before TransHab

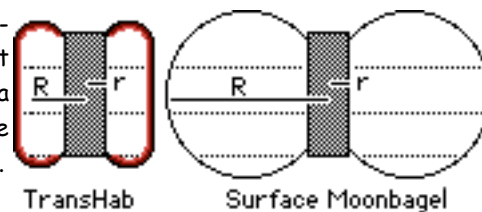
NASA's TransHab project was not the beginning of the story. Others had proposed inflatable structures as the best way to get more habitat volume at less weight and less money given the constraints of payload bay and rocket faring size constraints. Lowell Wood of Lawrence Livermore National Lab had presented NASA with a developed proposal in the late 1980s. It was too revolutionary, ahead of its time. At the 1991 International Space Development Conference in San Antonio, in my stead, Mark Kaehny presented a paper on "Lunar Hostels: An Alternate Concept

for First Beachhead and Secondary Outposts", Peter Kokh, Douglas Armstrong, Mark R. Kaehny, and Joseph Suszynski, © 1991, The Lunar Reclamation Society, in which we described a "big dumb volume" option dubbed "the donut" - an inflatable torus enclosing a "works core."



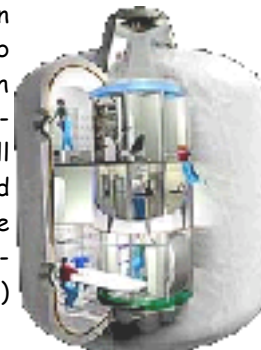
[http://www.lunar-reclamation.org/papers/hostels\\_fig7.gif](http://www.lunar-reclamation.org/papers/hostels_fig7.gif)

The TransHab structure would likewise be centered on a central works core, but its much thicker (12") envelope, designed to protect against the space debris in low Earth orbit, would take up so much space in the transporting shuttle payload bay, that the full inflated size of TransHab would be much more modest than that which we had foreseen as possible: an inflatable designed to be promptly covered with a protective blanket of lunar moondust could have a much thinner envelope that translates into a much habitable area room inside.



### Fast Forward: TransHab Bigelow Aerospace, Las Vegas

Bigelow has developed the TransHab technology well beyond the level achieved in Houston through 1999. TransHab was seen as a vertical cylinder, with as many as three floors perpendicular to its central Axis. The full size Nautilus module being developed in North Las Vegas is a 22 ft wide (tall) by 45 ft long horizontal cylinder presumably with floors (2?, 3?) parallel to its axis.



But all the evidence is that Bigelow is planning horizontal outfittings.



For use in space in a micro-G environment, where there is no effective "up" or "down" the choice between vertical and horizontal outfitting would seem to be a matter of ergonomic plusses and minuses. For lunar or Martian bases, a horizontal configuration does seem to be much easier to shield, a consideration still being downplayed in the Mars Society.



#### Pre- or Post-Outfitting?

The TransHab and the LRS-designed "donut" or "moonbagel" with their works-packed core choose a design path that pre-endows the inflatable torus with much of its outfitting needs. The core can hold all the utility systems, a galley kitchen, a bathroom. Floor and wall framing can be built into the core to "fold-down, pull out, etc." after inflation. Pre-outfitting, to the extent feasible, removes the need for post-outfitting that may involve many manhours in cumbersome spacesuits, with attendant dangers.

This is not a moot question. How to post-outfit was one of the biggest challenges for those who a generation ago sought to design ways to reuse shuttle External Tanks, which could have been brought to orbit, even parked in high stable orbits, at minimal extra expense. The most elegant suggestions included:

- Building "purchase points" into the skeleton of the ET: it could be argued that the existing skeleton already was "purchase" or "attachment-friendly".
- designing a long thin works core which could be slid inside the empty (or residual fuel) and parked tank through the 1 meter wide access port at the bottom. The writer does not know if that 1 meter is the size of the opening clearance or of the hatch cover.

At any rate, even if the inflatable envelope now being tested in space under real low Earth orbit debris conditions passes the test of time - it will be watched for leaks for the next several years - there will be more to supplying habitable inflatables than just the protective inflatable envelope. Later modules will test life support and power systems. Still not enough.

#### Bigelow could help its cause by seeking design input

What Bigelow has designed is akin to an empty airliner. The airlines who place the orders pick from the variety of cabin layouts the manufacturer offers, or can ask for custom layouts, no doubt at a custom price. Bigelow may want no help. But it could publish the interior specifications and note any envelope features that suggest ways to subdivide or structure the interior. And then the company could run design competitions for outfitting layouts and outfitting methodologies. Such a competition would not only guarantee more choices in less time, but greatly enliven the public imagination of the possibilities along with their anticipatory interest in orbital and circum lunar tourism horizons ahead.

#### The Road Ahead: fly & test

The 8 ft wide by 14 ft long 1/3rd scale Genesis I test module is only the first of several Bigelow plans to launch in the near future. As you can see from this photo of the pre-inflated module being placed in the Dnepr rocket faring, there is ample room inside the faring to fly the next stage, a 45% scale module, dubbed "Guardian," two of which are to be launched next year to test life support and power generation, not provided for on the present Genesis module which is only testing how well it stays inflated and functions in real space environments.



#### The first Destination-minded "Start-up"

While SpaceHab began making pressurized modules for use in space 20 years ago, Bigelow Aerospace is the first contractor to design and build habitable spaces: modules to provide living space. The outlook is bright for its Nautilus modules to help expand the Space Station, to serve in clusters as commercial space stations and tourist hotels, and even "elbow room" habitat space on the Moon! <MMM>

# MOON BASE? MARS BASE? *rock on! far(ther) out man!*

by David A. Dunlop <dunlop712@yahoo.com>

The beginning of the Moon Base agenda story is the rationale and description of the work required to develop a lunar base at its several purposes. The next phase is the rationale and description of the work required to develop a Mars Base and to settle and develop Mars. Kim Stanley Robinson has given us his grand trilogy Red Mars, Green Mars, Blue Mars for that.

## Beyond Mars

But, once we have nuclear propulsion to greatly shorten the involved transit times and with it greatly reduce the vulnerability to cosmic rays and solar flares, there are other places that may provide settlement and base opportunities farther out.

Beyond Mars is the asteroid belt. With a mature technologies base including all those needed for the bases on the Moon and Mars we can see the potential to advance another step.

John Lewis' book "Mining the Sky" gives us a rationale for going to the asteroids that for the most part are too small and too poor for consideration of a significant manned base. If there is a case for the Moon, and a case for Mars, *is there a case at all for asteroid settlement?*

Certainly, if a case can be made for a base on an asteroid it is likely to be of a lower priority than "humans to Mars." Such an effort will require a mature nuclear propulsion transportation technology to deliver what is needed at such distances. A higher level of self-sufficiency will be needed, higher, even, than that needed for Mars. It will be a pretty long supply chain if essential in situ resources are not available or cannot be developed.

It seems unlikely in the near term that we can realize significant commercial & financial returns for the effort and expense. Perhaps for purposes of astronomy and other sciences and as a base for obtaining especially strategic asteroid resources, a case can be made.

But for the sake of argument, assuming that these issues are no longer a problem, let's consider the physical scale of the first ten asteroids and a few others.

The great bulk of meteorites fall into either of two categories. The most common (92%) are the S-Class Stony meteorites. These are composed mostly of rock: Metal oxides and various silicates. Next in frequency of occurrence (5.7%) are M-Class Metallic Iron/Nickel meteorites.

Since it is presumed that most meteorites come from asteroids from which they were separated by impacts, many asteroids are of S Class or M Class designation. These classes differ in composition quite clearly in comparison both to each other and to the Earth's crust. See table 2 =>

**TABLE 1: Some Candidate Asteroids**

#	Name	Diameter (equatorial, polar)	
1	Ceres	975 km	909 km

Comments: Spherical, mantle of water ice wrapped around rocky core with thin dusty crust. May have greater volume of water than Earth. Surface area 5 times that of Texas, equal to India. NASA's *Dawn* Probe is scheduled to orbit Ceres from February to July, 2015.

2	Pallas	570 km	525 km x482
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Comments: Not spherical. In an orbit inclined by 35 degrees to the ecliptic, or general solar plane. Thus requiring more energy to reach

3	Juno	246 km	
4	Vesta	525 km	

Comments: Not quite spherical, 5hr 20.5 minute day, geologically diverse a large impact basin as well as lunar like basaltic maria formed from magma probably melted by radioactive isotope of aluminum. NASA's *Dawn* Probe is scheduled to orbit Vesta from October 2011 to April 2012.

5	Astraea	167 km x 123 km	
6	Hebe	205 km x 185km x 170km	
7	Iris	209 km	
8	Flora	140 km	
9	Metis	365 km	
10	Hygiea	430 km	
226	Eugenia	226 km	
216	Kleopatra	217 km	
2060	Chiron	180 km	

Comments: Centaur class (orbit beyond Saturn) and Classified as comet

**TABLE 1I: Composition Differences between**

**Column 1: Metal Meteorites & Asteroids (5.7%)**  
**Column 2. Stony Meteorites & Asteroids (92.8%)**  
**Column 3. Earth's Crust**

Element	1	2	3 Earth Crust
Iron	91.0%	26.0%	5.0%
Nickel	8.5%	1.4%	0.007%
Cobalt	0.6%		(25ppm)
Oxygen	36.0%	49.0%	46.6%
Silicon	18.0%	26.0%	27.7%
Magnesium	14.0%	1.9%	2.1%
Aluminum	1.4%	7.5%	8.1%
Calcium	1.3%	3.4%	3.6%
Sodium		2.6%	2.8%
Potassium		0.4%	2.6%

## Outbound from Mars

Mars will be a big bone to chew on. The investment of exploration and colonization of Mars will be dependent on the profitability and infrastructure development that results from commercial development of the Earth/Moon economy. I suspect the resources for a human colony will be a long way down on everybody's priority list (the everybody on Earth, the Moon, and Mars) especially because of the low G conditions and lack of a significant economic return on that investment. At some point it may be an "affordable" science luxury to go to Ceres like Antarctica is for us in our time. [continued next page below Table 3.]

**TABLE 3: Other Meteorite & Asteroid Classes**

There are quite a number of spectral classes and beyond the M Class and the S class they do not all look alike, if you're a spectrometer. Fourteen spectral classes are listed below with examples given of notable or well-known asteroids. from information listed at:

<http://www.daviddarling.info/encyclopedia> and at  
<http://www.space.com/scienceastronomy/solarsystem/asteroids-ez.html>

- A Class** - Reddish color, olivine . Example, #246 Asporina
- B Class** - Carbonaceous Chondrite subcategory #2 Pallas
- C Class** - Carbon-rich Meteorites /Carbonaceous Chondrites. Examples #10 Hygiea, #253 Mathilde
- D Class** - reddish. Examples Jupiter Trojan, Hektor; Phobos & Deimos Mars moons of suspected Trojan Origin
- E Class** - rare, often Earth crossing, similar to M Class & P Class. Examples Hungaria Family
- F Class** - C Class subcategory - UV absorption features; Examples: Nysa-Polana Family, #45 Eugenia (226 km)
- G Class** - Subcategory of C Class strong ultra violet absorption. Example #1 Ceres, 568 miles in diameter
- M Class** bright, reflective, metallic iron & nickel Spectrally similar to E Class & P class; Examples: # 16 Psyche 248 km, #216 Kleopatra
- P Class** - dark type spectrally similar to E class or M Class but lower albedo. Example #87 Sylvia 282 km wide
- Q Class** - fairly bright, rare. Examples #1862 Apollo and a few others near Earth asteroids similar to ordinary carbonaceous chondrites
- R Class** - extremely red with high albedo. Example: Dumboska, most reddish object in the Solar system
- S Class** - bright, slightly red olivine & pyroxene stony, Iron. Examples #3 Juno, #7 Iris 208, #29 Amphitrite
- T Class** - low albedo, rare. Example #114 Cassandra
- V Class** - high albedo, pyroxene. Example #4 Vesta

[continued from page 5] This could well be a century or more from the present and it might also represent a biological frontier of genetic engineering a subspecies better adapted to low *G* living. Ceres might therefore represent a strategic adaptive opportunity out of all proportion to its small mini world size. It may be the place where Homo Ceres is developed at the very limits of human society and poised for a break out from the warmth of our native star.

At the first blush it seems that the early best candidate for humans is Ceres that might provide essential in situ resources and become the water station for the asteroid belt. If there is an economic rationale for obtaining metals the water on Ceres might provide the critical in situ resources that enables an Astronomy site and "deep space" settlement that could develop a reasonable level of self sufficiency and provide support logistics for exploration and utilization of asteroid resources. It is hard to think there

will be many other near term resources & economic incentives for development for the level of effort and infrastructure needed at this last stop in the inner solar system low *G* station.

Beyond the inner asteroid belt are the small cold moons of the outer gas planets. These places are far too cold for consideration of human presence unless there were a mature fusion technology and boundless ability to utilize Helium 3 from the atmosphere of Neptune. Without the Helium fusion technology the distances and temperature scale of the outer solar system make proceeding beyond the asteroid belt highly problematic.

Nuclear fission reactors are of course developed technology and provide sophisticated long term propulsion and power technology for the nuclear submarine fleet and the super carriers. Why not just put one of these puppies in a large "2001 style" spinning torus structure and use high ISP ion drive rockets to accelerate to speeds which will allow human to visit and traverse the outer planets, the Kuiper Belt or even the Oort Cloud? Fission reactors put out a large neutron flux that gradually degrades the reactor vessel and leaves the remaining material as radioactive waste. For the distances and long operational life needed to visit and settle on these very cold objects fission reactors seem too much of a stretch.

By preference most people wouldn't give serious consideration to settlement in these cold remote places. For those brave few who can face a frolic in the low *G* cold we shall continue this icy-lite conversation where Homo Ceres is poised for breakout! By mixing in some of those carefully preserved Zubrin genes some member of Homo Ceres will write "The Trans Neptunian Cases for Pluto and Zena UB313

**Pluto**, whose status as the 9th and last of the planets, and as the first of the Kuiper Belt Object" with an inclined orbit of 17 degrees, has a diameter of 1,403 miles, a rotation period of 6 days and 9 hours and orbits the sun in 248 Earth years. It has 0.2% of Earth's mass and is 39 AU from the Sun. The International Astronomical Union considers Pluto to be the first member of the class of Trans Neptunian Objects. Pluto's largest Moon is Charon with a mean diameter of 1212 km and two new small additional moons [Nix and Hydra] have been discovered.

*By Golly Clyde Tombaugh! Pluto is a system!*

[www.space.com/scienceastronomy/solarsystem/pluto-ez.html](http://www.space.com/scienceastronomy/solarsystem/pluto-ez.html)

More than 800 Kuiper Belt Objects (KBO) have been found since 1992 when QB1 was found. (Solar System Surprise: A New View of What's Out There-Nov 24,2004

[www.space.com/scienceastronomy/mystery\\_monday\\_041122.html](http://www.space.com/scienceastronomy/mystery_monday_041122.html)

**Xena, 2003 UB 313:** With a diameter of 2,100 miles, half again as large as Pluto and comparable to the Moon's 2160 miles. Its orbit moves from 38 to 97 AU over 560 years inclined 45 degrees to the main plane of the ecliptic. Xena might be seen as a planet: it is larger than Pluto, and also has a moon. Its reflectance is high as it's

atmosphere is frozen out. Its temperature ranges during its orbital period range from 405 below zero (Fahrenheit) to 360 degrees. Caltech's Mike Brown and colleagues Chad Trujillo and David Rabinowitz discovered this. It will take some time to explore and characterize this new real estate. Even with the limited catalog that exists now these big places represent the Manifest Destiny of Homo Ceres.

**Sedna, 2003 VB12** is a KBO about 3/4ths the size of Pluto with an upper size limit of 1,000 miles diameter was found two years ago found by Caltech astronomer Mike Brown' Team, and takes 10,000 Earth years to orbit the Sun **2003 EL61** has a diameter of 1200 km, is smaller than Pluto and has two small satellites. **Quaoar** another KBO was discovered in 2002 has an estimated diameter of 780 miles and orbits the Sun every 288 Earth years. **Orcus, 2004 DW** has an estimated diameter ranging from 840 to 1170 miles with a best estimate of 994 miles and is nearly 47 AU from the Sun. Over 11 KBO with more diameters of 1000 km or more are listed at [www.ifa.hawaii.edu/faculty/jewitt/kb.html](http://www.ifa.hawaii.edu/faculty/jewitt/kb.html)

**Living Nearby, not "on"** - Perhaps even larger objects will be found with a higher gravity and a plentiful mix of resources, and with adequate mass for underground protection of high-energy cosmic radiation, that could be considered for eventual human occupation. For extreme environments such as these, the issue is not really settling other "asteroids." Humans will not directly experience such places. Humans will live in "built environments" constructed from the materials derived in such places. Unlike the O'Neill cylinders envisioned in the 70s these environment will not be built to take advantage of a large solar flux but to provide a secure heated stable environment against the terrible cold of a 3° Kelvin background environment. But these settlers cannot live indefinitely without new sources of fuel. Therefore, we must become a low *G* wanderer species looking for Helium 3 in all the right places.

**Want to Get Away?** The limitations of energy technology aside, why would humans want to settle out there? Ideological reasons that would want to make some people settle away from the cultural challenges they face in the inner solar system. Like the Pilgrims they might choose to define their existence apart from a majority religions population they wish to escape. Perhaps they could not sustain their cultural and religious identity in the face of unrestricted competition from other groups. Perhaps there are groups who would flee the IRS, so to speak and rather build their own world rather than life subject to a larger political context. The decision to "create" Homo Ceres is a critical change in biology and in destiny and functional identity

**Redesigning Ourselves** - Perhaps the lesson of the inner solar system is that terrestrial Homo sapiens is not well suited biologically to live in a low *G* environment. With a solar system economy ranging from 1*G* on down to the mini-*G* levels of large asteroids in the inner belt it may come to

pass that genetically engineered subspecies will be bred to better survive the low *G* settlements. These new humans would not look to the Earth as their home or to the Moon or Mars as their home because of the intensity of the gravity wells. Someone born on Ceres would weigh 6 times normal on the Moon! Homo Ceres, seeking new opportunities, might be the leading edge of humanity beginning on Ceres and then moving far out in the Kuiper Belt and Oort cloud, away from the warmth and abundant solar power of the inner system.

**Transitions:** These new humans might "island hop" from such cold objects to others identified even farther out until they find something orbiting in the province of another star and thus transition out of our solar system to another system. After so many generations apart from a planetary existence they will have no emotional tie to our sun. It will be only another star and at one point no longer the closest star.

Such island hopping might continue from the outer regions of one star to another even if there were no identified Earth like planets around a number of stars. *Even if we find other Earth like planets, the human-derived species that make the journey may not be able to settle on a larger high G environment unless they reverse engineer their genetics.* They would then once again be trapped on a single terrestrial ball in a "wild and extreme" environment with no guarantee of easy settlement. Looking at themselves and the rich and terrible tradition of human development and history on Earth is not necessarily motivating. *Would they as an interstellar adapted species want to "Play It Again Sam" on a new earth even with the attractions of a stable sun for another billion years?* Why would they want to go back if the outer regions can commonly provide resources for continued travel? If new planets had their own life, the biological problems of adaptation and coexistence reappear.

**Impossible.?** The cliché "Where you stand depends on where you sit" would seem to apply to this evolutionary set of choices. If we can supply ourselves a body well adapted to an Earth-like planet that is mostly a marine world would we reengineer our selves to be an intelligent marine mammal or an intelligent terrestrial species? Which environment is more attractive, comfortable, and better able to provide a stable base for an intelligent species? Perhaps several intelligent species would be bred under such circumstances.

Perhaps on the other hand the picture presented in the film "Independence Day" of a migratory interstellar species is instructive. *That species with advanced technology and mega "built environments" moves from planet to planet stripping them of resources needed for its own purposes, then moves on.* This could be the evolutionary tactic used to sustain mobile existence for a large number of individuals maintaining a high technology culture in the galaxy.

The development of Moon and Mars base technologies may lead not only to a variety of distant places but to distant and different identities. *Far Out! Man!* <MMM>

# The Challenges of Migration into the Cold & Darkness of the Outer Solar System

by Peter Kokh

We are not yet back on the Moon, have not yet made our first footfall on Mars. But that does not stop our Ad Astral aspirations from trying to project our presence further out: on the asteroids Ceres & Vesta, on Jupiter's Callisto and Europa, on Saturn's Titan & Iapetus, and ever beyond. It is part of the process of imagining far away places from a frontier-perspective.

It will be quite some time before there is any concerted effort to "talk up" and "think out" human expeditions beyond Mars. But that day will come. When it does, what we imagine as possibilities today, may seem quaint, Jules Verne-ish to those who follow with access to science and technology that we can only dimly glimpse. Going further out, will, however, be challenging to the extreme.

These challenges are threefold. As we go further from the Sun, the amount of light and warmth we receive from it diminishes with the square of the distance: at twice the distance there is only one fourth the light and heat. This makes solar energy collection ever more difficult and less feasible a way to derive power. Surrounding space gets *ever darker, colder and colder*.

The spacing between planets gets larger and larger. Low energy Hohmann transfer orbits take years, decades, even centuries, not just months as on the way to Mars and back. Places to visit become *ever further apart* from one another. Trade in supplies and goods becomes increasingly more difficult, let alone journeys by individuals whether for business or pleasure.

Because of the greater heat in the inner solar system at the time of planet formation, the inner system planets are predominantly rocky: silicates and metal oxides. Further out, the proportion of ice and water, and other volatiles in comparison with rocky elements becomes greater and greater. Indeed, on the icy moons of Jupiter, Saturn, Uranus, and Neptune, and probably the more so on KBOs and TNOs - Kuiper Belt and Trans-Neptunian objects, while water, oxygen, nitrogen, and carbon are abundant for life support, the challenge will be to extract metals for technology. The situation we find on the Moon is stood on its head further out. That could discourage development of human frontier exclaves except in locations where a happy medium can be found.

Perhaps nowhere will trade be more necessary, and at the same time, more difficult to the point of futility, as anywhere in the Outer Solar System except within the planet-moon systems of Jupiter, Saturn, Uranus, and Neptune, a complementary full suite of needed materials may be a very rare occurrence..

## What we stand to learn on Ceres

On Ceres, the next likely frontier beyond Mars, the availability of both volatiles and rocky elements in an appreciably colder (than Mars) environment, makes a frontier settlement there the ideal testing ground for a greater reliance on new cryoplastics, synthetics build of volatile elements but tolerant of temperatures significantly lower even than those we find in the lunar night or in the Martian winter. If it proves possible to develop a versatile suite of such cryoplastics and cryo-synthetics, then we will be prepared for the Moons of Jupiter and beyond, as far as the material side of human existence is concerned.

While solar power becomes ever more impractical a solution the further out we go, we might still find a use for it on Ceres. A collector 1 meter on a side on Earth or the Moon would have to be scaled up to 3.5 meters on a side. Nuclear power in some form seems sure to become the solution of choice.

The danger from solar flares will lessen as we go further out, but not that of cosmic radiation. Ice will become the shielding material of choice.

Transportation will be the biggest challenge. Goods and cargo can always be shipped in a continuous pipeline fashion, unmanned ship after ship. How long it takes to go through the pipeline is irrelevant, so long as the "faucet" is always spitting something out on time, and in the amount needed. Special orders, however, will take years, even decades or centuries to fill. That will but ever greater urgency on achieving the highest degree of self-reliance. And that means settling only where *all* the needed elements are economically available. As we go further out, an ever increasing number of worldlets will not pass that muster.

## The low gravity question

Callisto, Ganymede, Europa, Io around Jupiter, and Titan around Saturn have gravity levels between 19% and 15% normal, comparable to the Moon's 16+%. A population adapted to lunar gravity will have no difficulty adjusting to life on those large satellites. We can hope that the physical deterioration we see in Earth orbit will level off at an acceptable level in lunar sixthweight, meaning that not only will our offspring be healthy, but theirs in turn.

However, physiological zero-gravity occurs when the friction within blood vessels is no longer overcome by the gravity gradient. The only instrument worth reading is the body. Ceres' 3% gravity may flunk the test. If so, we will become increasingly reliant on artificial gravity. Bioreengineering ourselves is unlikely to be an early generation choice. That is not a new idea. Read "The Seedling Stars (Paperback) by [James Blish](#), Publisher: Roc (1959), ISBN: 045101622X, available from Amazon.com."

One danger that may become a growing problem, is that frontier settler groups may depart with too shallow a gene pool, forcing on them a degree of inbreeding that could spell doom. The outward drive will be an epic saga! <MMM>

# The Moon Society



## JOURNAL

<http://www.moonsociety.org>

Please make NEWS submissions to KokhMMM@aol.com

**The Moon Society** was formed in July, 2000 as a broad-based membership organization with local chapters, to spearhead a drive for further exploration and utilization of the Moon in cooperation with other like-focused organizations and groups.

**Artemis Society International** was formed in August 1994 as a forum for supporters and participants in the **Artemis Project™** quest to establish a commercial Moon base as a first step to a permanent, self-supporting lunar community. **ASI** does not engage in any form of commercial business directly, but seeks to build a Project support business team. Registered trademarks of the **Artemis Project™** belong to **The Lunar Resources Company®**

**PROJECTS:** [www.moonsociety.org/projects/](http://www.moonsociety.org/projects/)

**The Artemis Project™ – Project LETO™ – Rent-MDRS**

**Moon Society DUES** include **Moon Miners' Manifesto**

- **Electronic (pdf) MMM \$35 Students/Seniors: \$20**
- **Hardcopy MMM: U.S. & Canada \$35 Elsewhere: \$60**

**Join/Renew Online** - [www.moonsociety.org/register/](http://www.moonsociety.org/register/)

### Mail Box Destinations:

- ☐ **Checks, money orders, membership questions**  
**Moon Society Membership Services:**  
PO Box 940825, Plano, TX 75094-0825, USA :
- ☐ **Projects, chapters, volunteers, information, etc.**  
**Moon Society Program Services**  
PO Box 080395, Milwaukee, WI 53208, USA

**OUR LOGO** above, shows the Moon in its natural beauty, empty and deceptively barren, waiting for human settlers to shelter and to mother as an adopted new human home world. We have work to do!

## Moon Society Elections 2006

**Ballots due back by email or mail by August 15**

from Peter Kokh

If this issue of MMM reaches you via the Post Office, you can ignore this notice, as it will arrive too late. If, however, you are getting MMM electronically, you may still have time to cast your ballot.

Many members do not bother to vote. That is true of all organizations. In the Moon Society, however, we have always beaten the national average for election participation in volunteer organizations. While the ballot choices for President and Secretary are between one candidate and the write-in option, your vote is still appreciated. All our officers and directors are unpaid volunteers. For the Board of Director openings, however, we are happy to have more candidates than there are openings. So if you are not familiar with the candidates, please read their statements and mark your preference, putting a 1, 2, 3, and 4 next to each candidate according to how you would rank them. This form of preferential ballot is designed to best reflect the choice of the members.

We have an election every year, staggering 2 directors one year, 3 the next, President and Secretary even years, Vice-President and Treasurer in odd years. This ensures that there is at least partial continuity in the elected leadership of the Society.

To be an officer or a director, the bylaws require two years of continuous membership as of the date the election is to be decided. This provision, can be, and has been waived by the Board of Directors on an individual basis, when outstanding merit, previous achievement and service to the society merit, or when lack of other candidates make it necessary.

It is probably true that a significant percentage of our members have leadership skills. If you think that you would like to participate in the direction of the Society, and have the time to do so, you can go to the Teams page on the website (Left Hand Destinations Menu, bottom) and select "Leadership Council" and click "join." This should get you on the Leadership Council mailing list.

The Council meets twice a month, on the first and third Wednesday evenings, from 9-11 pm ET, 8-10 CT, 7-9 MT, 6-8 PT on the ASI-MOO (click on the graphic link further down on the front page left hand menu column and follow directions. The MOO is a sort of advanced chat room environment. To get into the Leadership Council chambers on the MOO, you will need to have someone grant access to your Moon Society username and password (those of you who get MMM electronically are already using this combo.) So if you join the Leadership Council, let me know by email to kokhmmm@aol.com or president@moonsociety.org.

In the Leadership Council you will get to know other leaders and help us arrive at consensus decisions. <MSJ>

May 2007						
S	M	T	W	T	F	S
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6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

*Mark your Calendar!*

**Moon Society  
Membership Reception,  
Town Meeting & Workshop  
DALLAS, TX  
May 24-28, 2007  
Memorial Day Weekend**

## ISDC 2007

**The National Space Society's 26th Annual  
International Space Development Conference  
"From Old Frontiers to New"**

*Learn how the new frontier will transform the old one.*

### **Hotel – InterContinental DALLAS**

15201 Dallas Parkway, Addison, TX 75001

<http://www.ichotelsgroup.com/h/d/ic/1/en/hd/dfwha>

The Hotel is handy to DFW airport with flights from everywhere. Amtrak serves Dallas from Chicago & points East, and from San Antonio and points East & West.

### **Moon Society Roommate Matchup Requests:**

If you would like to share room expenses, let us know: send requests to [dunlop712@yahoo.com](mailto:dunlop712@yahoo.com) (Dave Dunlop) or [kokhmmm@aol.com](mailto:kokhmmm@aol.com), 414-342-0705 (Peter Kokh)

### **Register Early to same money!**

<http://isdc.nss.org/2007/register.html>

Register by December 31st to save. If you are not an NSS member, you can save \$5 by including NSS registration, normally \$35 separately.

### **ISDC Program Under Construction**

<http://isdc.nss.org/2007/program.html>

Preliminary 3-track program structure: (1) Space Transport, (2) Moon & Cislunar Space, (3) Mars & Beyond. Plus a few smilus aller tracks.

## **Moon Society Activities at ISDC 2007**

### **Our own "Hospitality Suite"**

We are currently looking at reserving a room suite to serve as a gathering spot to be open at set times.

### **Friday evening Mixer-Reception**

We will host a "Mixer-Reception" in our own hospitality suite for Moon Society members current or former plus the curious, with refreshments and displays. This is your opportunity to meet other members as well as Society leaders, chapter and outpost leaders, and others. Share common interests and ideas! Get to know Society leaders. Get charged up! Network with others who have similar interests or project ideas.

ISDC begins on Thursday, but we have picked Friday Evening for this event as many attendees will not have arrived by Thursday evening.

**Town Meeting:** Location and timing to be determined.

Society Leaders will constitute a panel and take any and all questions and suggestions. This is your chance to have effective input on what the Society is doing, not doing, could and should be doing, and how we can realize our goals

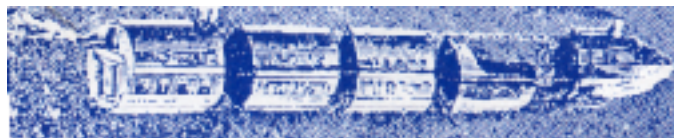
**Workshop:** Location and time to be determined.

We are organizing a bold and ambitious "meta-project" that will move the society confidently forward, coordinate and structure all our efforts, attract new members and new talent, while significantly raising our profile in the space enthusiast constituency and among the public in general. Details will follow in the coming months as MMM articles discuss the relevant issues.

Yes, of course you are perfectly free to go to other ISDC events which may be going on in the same period as our workshop!

***Come to Dallas for ISDC 2007  
and help us propel the Moon Society  
into a trajectory towards  
Thriving Lunar Settlements!***

Many people come to these conferences to hear great talks, meet and mingle with the speakers and other movers and shakers. In the end, the essence of what happens at an ISDC is not what goes on in the presentation rooms, but networking, finding collaboration partners, getting joint projects off the ground, getting your own personal batteries recharged. So put this on your calendar!



*Moon Society Moon-bound Train à la Jules Verne*

## Moon Society Board Appoints Advisor David A. Dunlop "Director of Project Development"

by Peter Kokh

**The Need** – There are many exciting project ideas that we have been unable to advance for lack of volunteers to do the work needed. Since taking on the job of Moon Society President, I have tried to do some interesting things. Many worthwhile and doable ideas, some of them quite ambitious, come to mind. But I have had to choose the few that I felt qualified and energized to handle. Thus quite a few ideas "sit on the back burner."

**A Volunteer** – Out of the blue, a couple of months ago, long time friend, fellow brainstormer, and collaborator David A. Dunlop, now also retired, volunteered that he had the time and the interest to unburden me of any projects near and dear to my heart that I had not found the time or energy to tackle. For me, that was as good as winning the lottery!

**Background** – I met Dave the long evening of August 25-26, 1989, at an observatory in Neenah, WI where we both by



chance had gathered to watch the feed from JPL as Voyager passed Neptune and made a close flyby of Triton (4-5 am!) I had brought along some Milwaukee Lunar Reclamation Society chapter exhibits. These caught Dave's attention, and he signed up as an at

large member of our NSS chapter. Together, we got into quite a bit of mischief. LUNAX, the Lunar National Agricultural Experiment Corp. was first, with Dave as Exec. Dir., then the Wisconsin Space Business Roundtable. On the way home from ISDC '93 in Huntsville, we together decided to take the plunge and bid on ISDC '97. Orlando got that but we bid again and won the 1998 slot for Milwaukee. Since then Dave organized the Rockets for Schools event, still an annual affair in Sheboygan, WI.

Dave has spent many years in management and administrative roles in Mental Health Institutions. More recently, relocated to Chicago for a few years, he got his education degree and did some teaching.

Dave has considerable experience not only with project management but with grant proposal writing. All these talents are a windfall for the Moon Society.

Dave's "front burner" project is to organize the Moon Society presence at ISDC 2007 in Dallas and help the ISDC chair with the Moon Track. Something much bigger, a "Meta" or "Master" project is in the works. Watch MMM for clues starting next issue!

<MSJ>

## Options for a Moon Analog Research Station

by Peter Kokh, MDRS Crews #34 and 45

*Right now*, choosing from among many design (and location) options for the society's very own Lunar Analog Research Station is an exercise in daydreaming. Unfortunately, we are too small, our financial resources, *and connections*, too meager to do real planning.

**Locations:** Meanwhile, it does not hurt to add to the list of potential options, just in case the money situation changes. On the *growing* shortlist are the lava flow and lavatube areas of central Oregon, BLM land neighboring Craters of the Moon National Park in Idaho, El Mapais National Monument near Grants, NM, and the vicinity of the new Spaceport America north of Las Cruces, New Mexico.

Some lava flow areas are highly vegetated. We should not automatically rule them out. They demonstrate the fertility of basalt and lava, and symbolize the promise of future lunar regolith-based agriculture!

**Design Options:** Architecture options are many. We are leaning towards a modular outpost design. Cramming everything into one can seems realistic only if you are planning a one shot visit to the Moon. For a permanent outpost, the *unican* is a self-fulfilling "stopping point" to planned growth.

Both a permanent research station design and a mobile modular "pick-up-and-go" option are being looked at. With the later, you could park at one "lunar analog" site one year, go on tour around the country between seasons, and park at another "lunar analog" location next season. No one terrestrial site is ideal for moon simulations, just as no site is ideal for Mars outpost simulations. That's why we have one on Devon Island at 75° N latitude, another in Utah, another going up in Iceland, another in Australia. Svalbard (Spitzbergen) and the Antarctic Dry Valleys are options.

So the mobile option would allow us to alternate seasons in lava flow areas where lavatubes were accessible, in vegetation free, dust and pulverized gravel areas, at universities with ongoing biosphere type experiments, inside large hangers or warehouses where we could control the lighting to mimic the long lunar dayspan and nightspan cycle, etc. No site is going to be perfect, so why settle, when you can, in turn, sample them all?

A mobile base would always have the option of settling in at a permanent location. Meanwhile, during the off-season, it could park at major space conferences, at major theme parks and at space-interest locations. It could visit universities in the hope of sparking the formation of a strong student chapter. Of course, touring in this fashion also eats money. So we'd want to use tours to help raise funds, not just for the tour, but for all our related projects.

So while location and design decisions are on hold. But the brainstorming continues.

<MSJ>

## The International LUNAR DECADE

by Louis Friedman <tpsmb1@planetary.org>  
Executive Director, The Planetary Society

"...Europe is orbiting the Moon now with SMART-1. China and Japan are launching orbiters next year, India and the U.S. the year after, and Italy might join the crowd a couple of years later.

"All those missions are part of national programs that seek to establish independent capabilities as space-faring nations.

"I believe the confluence of these national interests creates great international opportunities:

"(1) building worldwide participation in space science, and (2) building a global space exploration effort to extend human presence into the solar system.

"That's why I'm off to Beijing, China this week with Planetary Society Vice-President Bill Nye the Science Guy. During the 36th Scientific Assembly of the Committee on Space Research (COSPAR) of the International Astronomical Union, the Society will propose an International Lunar Decade."

**Read the full report at:**

[http://planetary.org/about/executive\\_director/20060718.html](http://planetary.org/about/executive_director/20060718.html)

## Moon Society Offers to Cosponsor "The Lunar Decade"

Dear Dr. Friedman:  
July 21, 2007

*The Moon Society is a small group with a general focus on the Moon, it's exploration, permanent outposts, use of lunar resources to alleviate environmental and energy problems on Earth, astronomy from the Moon including farside SETI, and ways in which through a lunar presence, we might promote further exploration of the solar system.*

*I am very interested in your proposal of "The Lunar Decade." The Moon Society would be very happy to come aboard as a cosponsor of this effort.*

*And perhaps we can work together in other ways.*

*We are embarking on a joint effort of interested parties to work on a position paper on "Astronomy from the Moon." The American Lunar Society, the National Space Society, The Stanford on the Moon project, and other organizations and efforts are potential partners in putting together a definite paper that can serve as a platform for promoting telescopes on the Moon when and where they promise better results than orbital/space-based instruments. Perhaps the Planetary Society would like to provide input in writing this position paper, and in cosigning it.*

Peter Kokh  
President, the Moon Society

## Chapters & Outposts

### Bay Area Moon Society

<http://www.moonsociety.org/chapters/bams/>

Contact: Henry Cate <hcate2@offshore.ai>

Meeting the 4th Thursday each month at a member's home.

### Moon Society St. Louis

<http://www.moonsociety.org/chapters/stlouis/>

Contact: Keith Wetzel <kawetzel@swbell.net>

.Meeting at 7:30 PM on the 2nd Wednesday of the month at the Buder Branch Public Library, 4401 S. Hampton, in the basement conference room

### July 12th Meeting Report

From Bob Perry <surfer\_bob@sbcglobal.net>

The July meeting consisted of myself, Rufus, Dave, and Chris, meeting minutes to be posted later.

At the meeting Chris mentioned that the Omnimax film "Magnificent Desolation / Walking on the Moon", narrated by Tom Hanks, showing at noon and 4, is one of the shows in the St. Louis Science Center's daily cycle of Omnimax films. I checked their website and learned that this coming Saturday, July 22, SLSC will celebrate the Moon landing and the anniversary of WoodStock.

Perhaps we should make it a club event.

### Moon Society Milwaukee Outpost

<http://www.moonsociety.org/chapters/milwaukee/>

Contact: Peter Kokh <kokhmmm>

The Moon Society Milwaukee Outpost now consists of two active persons, myself, and David Dunlop of Green Bay, Wisconsin. Dave is a Moon Society Advisor and has now been granted the title Moon Society Director of Project Development, with the Board's approval. Peter and Dave met at the Neptune-Triton Encounter on August 25, 1989 and have been in regular contact for the 17 years since and are always scheming up something. Together, on the drive back from ISDC 1993 in Huntsville, we brainstormed ISDC 1998 Milwaukee. In 1990 we had founded LUNAX (The Lunar National Agriculture Experiment Corp.) and Wisconsin Space Business Roundtable in 1991. Dave has an extensive background in project management and grant writing among other things. If we find a SE Wisconsin member third, we'll really be dangerous! Prospective 3rd parties please apply!

Dave's front burner project is helping put together the ISDC 007 (Dallas) Moon Track. This ISDC should be a very big one for the Society. On the back burner? It would take more pages than are left in this issue to go into that!

NASA offers a \$250,000 prize for a better glove:

<http://www.courant.com/technology/hc-space0425.artapr25,0,666931.story?track=rss>

Relative Size of Earth to Planets, Sun, other Stars

<http://home.comcast.net/%7Ersteff/earth-sun-stars/>

- **Earth and Smaller Planets**  
---/earth-sun-stars/images/image-1.jpg
- **Earth and Outer Planets**  
---/earth-sun-stars/images/image-2.jpg
- **Outer Planets and the Sun**  
---/earth-sun-stars/images/image-3.jpg
- **The Sun vs. Larger Stars**  
---/earth-sun-stars/images/image-4.jpg
- **And vs. even larger Stars**  
---/earth-sun-stars/images/image-5.jpg

**Rough Times Ahead for Baikonur?**

<http://www.thespacereview.com/article/647/1>

**Lag in Progress: SpaceShipTwo**

<http://www.thespacereview.com/article/646/1>

**Failures necessary for progress**

<http://www.thespacereview.com/article/651/1>

**Actually, we need more successful failures**

<http://www.thespacereview.com/article/662/1>

**Spaceflight and Human Survival Debate**

<http://www.thespacereview.com/article/657/1>

**Genesis: milestone towards a future Space Hotel**

<http://www.thespacereview.com/article/660/1>

**Two different pictures of Neil Armstrong**

<http://www.thespacereview.com/article/659/1>

**Space Adventures 100 million dollar Lunar Tour**

[http://www.space.com/news/050810\\_dse\\_alpha.html](http://www.space.com/news/050810_dse_alpha.html)

**Constellation Services Lunar Express Lunar Tour**

<http://www.constellationsservices.com/lunarexpresssmsystem.html>

**Martian Dust poses Major Challenges**

[http://www.space.com/scienceastronomy/051101\\_science\\_tuesday.html](http://www.space.com/scienceastronomy/051101_science_tuesday.html)

**Planning for the Moon – on the Ocean Floor**

<http://quantumeditons.com/league/>

**Europa on Earth: Expedition to the Sulfur Springs of Canada's far north Ellesmere Island**

[http://www.planetary.org/news/2006/0621\\_Europa\\_on\\_Earth\\_Expedition\\_to\\_the.html](http://www.planetary.org/news/2006/0621_Europa_on_Earth_Expedition_to_the.html)

**Ellesmere Island Sulfur Springs Map**

[http://planetary.org/image/borup\\_location\\_map\\_lg.gif](http://planetary.org/image/borup_location_map_lg.gif)

## Calling All Space Artists!

**An Opportunity to Strut Your Stuff – and Help  
Promote the realization of Space Settlements,  
while gaining due recognition.**

### NSS SPACE SETTLEMENT CALENDAR CONTEST

<http://www.nss.org/settlement/calendar/index.htm>

The National Space Society (NSS) is looking for

**Visions of a spacefaring future - a future of space  
settlement, be it on the Moon, on Mars, on asteroids,  
or orbiting independently in space.**

To bring attention to our goal of creating a spacefaring future, NSS is sponsoring a contest for such artwork to be used in a calendar promoting a future of humans living and working in space. The best of the submitted artwork will be selected for inclusion in the 2008 NSS Space Settlement Calendar.

1st, 2nd & 3rd place prizes will be awarded in 4 categories:

- 1. Orbital settlements**
- 2. Settlements in and on asteroids**
- 3. Settlements on the Moon**
- 4. Settlements on Mars**

In addition, in place of a category winner, one image will be awarded a grand prize for being the best artwork overall. This work will be honored with an award at the annual International Space Development Conference and featured on the cover of the NSS Space Settlement Calendar.

NSS is actively soliciting additional prizes,

#### Image Specifications

Submitted artwork must depict permanent human space settlements. Preference will be given to those works featuring views of the settlement that clearly establish the settlement's setting. Space settlement refers to large, permanent habitats off Earth. For additional information about space settlement and space colonies, see the NSS Space Settlement Art Contest Resources Page [<http://www.nss.org/settlement/calendar/resources.htm>].

Artwork must be submitted in *all three of the following formats*:

**JPEG Thumbnail version** [pixel size TBA]\*

**JPEG Screen version** [pixel size TBA]\*

**Print version that meets the following criteria:**

Format: **TIF, BMP, flattened PSD**

[pixel size TBA]\*

Resolution: **300 dpi**

Color Mode: **RGB**

**\* Check website above for latest information**

Artwork must be submitted in digital format suitable for use in the calendar, **14x11 inches at 300 pixels per inch**. Artist must give NSS non-exclusive rights to use the artwork for the calendar, the NSS website, and other venues.

**Artwork due date is April 1, 2007 - not the September 1, 2006 date listed on the website.** Please see the website above for further details and the latest contest information .



## Lunar Geology vs. Selenology

from Alan Binder <abrbprospector@earthlink.net>

Regarding your editorial comments on the "Lunar Geology" vs. "Selenology" in the MMM # 195, May 2006 - *I totally agree with you.* As a planetary scientist with a background in astronomy, I firmly believe that the use of Lunar Geology, Mars Geology, etc. is totally wrong, historically, linguistically, and scientifically, as I point out in the preface of my book "**Lunar Prospector: Against All Odds**" - the pertinent parts of which are as follows:

### Terminology:

One of my pet peeves is the use of the terms geology, geophysics, geochemistry, etc. by planetary scientists to describe the study of other solar system bodies besides the Earth. As everyone knows who has taken a geology course, geology is derived from Greek, in which **geo** means the Earth and **logy** means science or study. When **geo** is combined with other suffixes, we get geography, geophysics, geochemistry, geodesy, geocentric, etc.; in some cases, **geo** is a suffix itself, as in perigee and apogee (the nearest and farthest points of a orbit around the Earth).

Since the earliest beginnings of the study of the planets, astronomers have used the same linguistic logic to name the study of each planet, i.e., selenology is the study of the Moon, where Selene is Greek for the Moon, areology is the study of Mars - Ares, hermeology is the study of Mercury - Hermes, Zenology is the study of Jupiter - Zen, etc. and, e.g., selenography, selenophysics, etc. follow the same linguistic logic used in the geosciences for the naming of these branches of the study of the Moon. Thus, there is a rich literature in which astronomers used the proper terminology in discussing the various planets (and the Sun, e.g., helioseismology, perihelion, aphelion, etc.) for over four centuries.

Unfortunately, when geologists, geophysicists, etc., became involved with the study of the Moon, mainly during the Apollo era, and later with the rest of the planets, they were either ignorant of the correct terminology and/or they took the lazy way out and just called everything geology. Hence, today we see in the literature and hear in scientific talks the incorrect phraseology of "the geology of the Moon", "the geology of Mars", etc. - though no one ever talks about "the geology of the Earth", because - *gee - that would be redundant!*

I not only object to the usage of the term geology to describe the study of the Moon and the other planets from the linguistic and historical standpoints, but also from the scientific standpoint. When we look at the terrestrial bodies in the solar system, i.e., the Earth, the Moon, Mars, Venus and Mercury, and the rocky and/or metallic asteroids, we find that the Earth is very atypical among the terrestrial bodies - the Earth has abundant water, very active erosion, plate tectonics, few impact craters, a highly evolved atmosphere containing abundant oxygen and abundant life, to mention just a few things. In contrast, the other terrestrial bodies have little or no water, very low erosion rates, no plate tectonics, unevolved atmospheres of carbon dioxide (if they are big enough to hold an atmosphere), no life (unless Mars does have some primitive life forms), and impact craters are a major or the dominant land form.

Thus, the Earth is the worst possible body to serve as a reference point for the study of the other planets (the general

term for which is planetology) and I have heard more than one "planetary geologist" objecting to some conclusion regarding one of the properties or characteristic of one of the terrestrial bodies, e.g., the Moon, by saying, "But that's not the way it is - or works - on Earth." To which I say, "So what, it's not the Earth, it's the Moon." Thus, the geocentric thinking of many "planetary geologists" has, at times, lead them down the path to incorrect conclusions and that might have been avoided if they would accept the fact that they are studying selenology, areology, etc., instead of the geology of the Moon, Mars, etc.

Thus in keeping with my philosophy and the fact that **Lunar Prospector** was sent to the Moon to study it and not the Earth, the reader will see the correct prefix or suffix "seleno" when I refer to the Moon and "geo" when I refer to the Earth.

Alan Binder

## Naming a Holiday after Armstorng's 1st Moonstep

from Kim Peart <kimpeart@keypoint.com.au>

I was enjoying a mid-winter Yule [Kim lives down under in Tasmania] in front of a blazing fire outside the studio beneath the stars, when I began to wonder about the most famous footprint in the Solar System. You have probably seen the photo many times, as Neil Armstrong said, "One small step for man. One giant leap for mankind." This was our first step on another celestial world beyond the Earth, a most momentous event in human history. I wondered if a good term for the Moon landing could be -

### First Step

These two words might even merge to become **Firststep**, which is what these words sound like when spoken. This is a simple term that might be embraced around the World. How about that?

When I could find no events celebrating the Moon landing through Google, I suggested International Space Day and this captured some interest. Then I found World Space Week 4-10 October each year, initiated at the Third United Nations Space Conference in Vienna in July 1999. October 4 was the launch of Sputnik 1 in 1957. I started pondering further. I found that Space Day falls on the first Thursday in May, honouring the first American in Space and Yuri's Night on April 12 each year celebrates the first man in space in 1961. David Baxter in Utah alerts me to the fact that the Moon landing event has been celebrated on July 20 as Space Exploration day for decades. Then Spaceweek was moved to October. Well, in all this shuffling of cards with space celebrations, the momentous event of the Moon landing has been losing significance. So it goes, but perhaps now we can breath new life into an event that caused the whole world to stop and wonder.

In the light of all that Moon dust, I have been seeking a catchy name that describes the Moon landing in simple terms that would work for people around the World as well as into the future and among the stars. Could **FirstStep** be that term? If there is a better one, I would love to see it.

Kim Peart, Lauderdale 7021, Tasmania, AUSTRALIA

## Mars Society Exercises at the Mars Desert Research Station in Utah and at the Flashline Mars Arctic Research Station on Devon Island enter ambitious new phase!

Report & Comment by Peter Kokh (Mars Society Sources)



It's hard to believe, but the 6th season for the Mars Desert Research Station will begin this October. While the Flashline Mars Arctic Station on Canada's far north arctic Devon Island opened the summer before MDRS, its field seasons have been constrained to date to 4-6 weeks at most. Meanwhile, MDRS has been operated for several months each year, making it the workhorse of the Mars Society's Analog Research Program.

### The Big News for MDRS in Utah

But things are a-changing! First, the Mars Society and NASA have signed an agreement whereby NASA student "Spaceward Bound" crews will open the MDRS season earlier than usual (right after the MDRS Engineering Team, crew #51, does a one week season opener "test drive.") These NASA student crews will take the first five 2-week crew rotations (#s 52-56) from October 15th thru December 24th. There is every indication that this NASA student usage will become an annual affair. On my personal presumption that NASA will be paying rent to the Mars Society for these ten weeks, as it has been for the one NASA mobile agents crew each year, this is good news for the Mars Society's Analog Research Program financially. But NASA's extended use also conveys approval and high regard for this facility, something that will not be lost on the media and others who might be tempted to undervalue MDRS.

### The Big News for FMARS on Devon Island

<http://www.marsociety.org/news/2006/0626.asp>

On the other hand, due to insufficient funding "in hand," the summer 2006 season at the Arctic station, usually now underway in July, has been canceled. Not too worry! Next year, the Society will more than make up for it with a first ever extended arctic season. One single 7 person crew, without replacements, will spend four whole months on Devon Island in the summer of 2007, from early May 2007 through the end of August 2007.

There is a lot more to this than might be apparent.

- For one volunteer crew to spend four months in relatively total isolation in the often hostile Devon Island climate and environment, is unprecedented. Surely, this experience will provide much information for Human Factors researchers. It is not clear whether these seven will all be FMARS veterans, but they will do a practice run together in Utah as MDRS crew #61, February 17-March 4, 2007, giving them a two month break before the "real thing" just 900 miles from the north pole.
- This "practice session" at MDRS will not be automatically

helpful. For one thing, MDRS' life support systems are not the same as those at FMARS. Because the latter *has been* used only briefly each year, while the Utah station has seen constant uninterrupted service for months each year, MDRS life support systems, notably the power generation systems, have become much more advanced through continual upgrades than those simpler ones that have done the trick in the Arctic.

### That poses a 2-edged problem:

1. The FMARS utilities, if not upgraded, may very well fail before the four months are out. Of concern are not only the power generation system itself, but the supply of fuel for the generators, the supply of potable water, and the disposal of both gray and black (human waste) water. By agreement with the Nunavut Territory authorities, these wastes must be transported off island. So the Society faces a major challenge in making upgrades to both the utility systems and to the supply agreements. As supplies are delivered by air, weather permitting, this is much more expensive and less convenient than the situation in Utah.
2. Non FMARS veterans volunteering for this extended MDRS season, are presumably veterans of MDRS, or will be, and that prior experience may be quite misleading as to what is in store for them up north.

### Everything to gain, nothing to lose

As an MDRS veteran of two crews, #34 and #45, I have the greatest respect for the Mars Society's Analog Research Station program and have been an ardent supporter of it since the day it was announced seven years ago. To the outsider, the exercises may seem repetitious. To the informed, there has been clear progress as experiments have continued to become more varied and more ambitious, breaking new ground, learning new lessons.

But it is understandable if both to media and to those members who do not follow the exploits of the volunteers closely, everything seems to be repetitious. It was great in the beginning, they might admit, but "what have you done lately?" they challenge.

Ramping up both programs, in Utah and on Devon Island, to higher gear with longer seasons at both, and a first ever four-month crew in the arctic, will hopefully recharge members and admirers alike, attracting revisits by the media. While the research itself remains of paramount importance, there is no argument that the attendant publicity has been vital in attracting new members and expertise as well as additional financial support.

Make no mistake. The season extension at FMARS is not without real risks. But as explorers and pioneers, risk is our game. Take it or die! In the process, we are forging a Martian pioneer culture of "can do" and (ugh) "bring it on" eagerness to take human achievements to a new level. For Mars, as for the Moon, that is most necessary. <PK>

# **“The Lunar Decade”**

## **The Lunar Beijing Declaration**

### **July 27, 2006, ILEWG 8**

<http://sci.esa.int/science-e/www/object/index.cfm?fobjectid=38863>

*[Italics and ✓ bullets added by the MMM Editor.]*

We salute the SMART-1 team for a successful technology and science mission, as the spacecraft approaches its grand finale. This small spacecraft has initiated an exciting International Lunar Decade that will inspire a new generation of lunar explorers.

*Within the next two years, four independent spacecraft (SELENE, Chang'E 1, Chandrayaan 1 and Lunar Reconnaissance Orbiter) will orbit the Moon carrying an extensive array of sophisticated science and exploration instruments.*

*Our understanding of the Moon and its resources will be revolutionized when the rich array of data from this flotilla is analyzed by scientists and experts around the world.*

Since the *first phase of lunar exploration is centered on remote-sensing observations*, we endorse the following actions as being of long-term mutual benefit:

1. *Internationally coordinated analyses should be carried out to facilitate the validation of data sets produced by different instruments* and to enhance the usefulness of information acquired by multiple spacecraft
2. A small number of specific targets are recommended to facilitate both the *cross-calibration of different instruments* and to train young explorers in lunar science issues. After initial calibration, data should be made available for coordinated analyses by the international community
3. All *solar monitor data from lunar orbital missions should, to the extent possible, be made available as rapidly as possible*. Cross correlation of this information will improve calibration of all the instruments dependent on knowledge of solar fluxes
4. Every effort should be made to *coordinate development and utilization of a common, improved Lunar Coordinates Reference Frame*
5. Lunar mission teams are encouraged to *archive final mission data products in a PDS-compatible form, to implement international standards for access, and to support Unicode, or other necessary format*
6. The establishment of *Common standards for S-band spacecraft communication, with potential for common tracking operations and backup support* to other missions, if necessary
7. A coordinated campaign to provide *data cross-check and validation for modern-era missions that have overlap in coverage*, with data and experience from Past missions (including. archived and digitized Apollo and Soviet-era lunar data) is recommended
8. *Information about the five impact events/probes [SMART-1, Chandrayaan-1, LCROSS, SELENE RSAT, and VSAT] and subsequent impacts of lunarcrafts should be coordinated with other space missions*. Ground-based and space-based measurements are encouraged for

near-side events. All of the planned four orbital missions are asked observe the SMART-1 impact site. Before, after, and real-time measurements should be planned by all spacecraft that are in orbit during the impact events.

To strengthen exchange between lunar experts and to enhance collaboration, we recommend to international science and space organizations join in and support the International Lunar Decade.

For the subsequent phase of Lunar Global Robotic Village and preparation for human exploration, we further recommend:

9. To promote use of standardized telecommunications, navigation, and VLBI support for future orbiter, lander and rover missions. We propose that ILEWG and agencies *study the opportunity to embark some payload technologies for navigation and guidance on orbiters and landers as part of a Global Moon Navigation and Positioning System.*

10. Lunar Missions should *document their plans for end of operations*. Before completing their mission, *future orbiters could be placed on frozen stable orbits where they can participate in a joint infrastructure for data relay, aid to navigation and lunar internet, in addition to landed surface beacons*

11. Recognizing

✓ the importance of the *geophysical studies of the interior of the Moon* for understanding its formation and evolution,

✓ the necessity for a *better monitoring of all natural hazards (radiation, meteorites impacts and shallow moonquakes)* on the surface, and

✓ the series of landers planned by agencies in the period 2010-2015 as *an unique opportunity for setting up a geophysical network* on the Moon,

we recommend the creation of *an international scientific working group for definition of a common standard for future Moon network instruments*, in a way comparable to Earth seismology and magnetism networks. We encourage interested agencies and research organizations to study inclusion of network instruments in the Moon landers payload and also piggyback deployment of a Moon Geophysical and Environmental Suitcase

12. The importance of protecting the Moon becomes more urgent than ever before, as we enter a decade with many planned lunar exploration missions, including orbiters, impactors, penetrators and landers. We encourage space agencies to give their attention to the *protection of the Moon for sustainable exploration, research and utilization*. A dedicated task force should .. study this issue & produce a recommendation for all future missions

13. Lunar Exploration is ideal for outreach activities that are accessible and inspiring for the next generation of explorers. We encourage *student participation in lunar payloads and missions*. We propose to *use milestones of lunar missions for public outreach events* promoting exploration, space science and technology

We reaffirm our commitment, with the international lunar missions and research community, to prepare the way for global participation in the extension of human presence on the Moon and beyond, for the benefit of all mankind.

*Unanimously approved by the participants ###*



**Lunar Reclamation  
Society, Inc.**

**P.O. Box 2102  
Milwaukee  
WI 53201**

**[www.lunar-reclamation.org](http://www.lunar-reclamation.org)**

*Ad Astra per Ardua Nostra  
To the Stars through our own hard work!*

**2006 LRS OFFICERS / Contact Information**

**PRES. / MMM Editor - \*Peter Kokh NSS**  
< kokhmmm@aol.com > ..... 414-342-0705  
**VICE-PRES. Doug Armstrong NSS** ..... 414-273-1126  
**SECRETARY - James Schroeter NSS**  
< James\_Schroeter@excite.com > ..... 262-827-4281  
**TREAS./ Database - \*Robert Bialecki** ..... 414-372-9613  
**Newsletter Mailing - Carol Nelson** ..... 414-466-2081  
(\*Board Members & Ken Paul < kenpaul@cape-mac.org > )

**LRS News**

• **No planned summer activities:** Peter has finished the first fourteen volumes of **the MMM Classics**. Each volume contains the non-time-sensitive articles from one year of MMM, reedited, reillustrated with much color, and republished in PDF format. Covering issues #1 December 1986 through #140 November, 2000, these free downloads are at:

**[www.lunar-reclamation.org/mmm\\_classics/](http://www.lunar-reclamation.org/mmm_classics/)**

• **ISDC 2007 Dallas** This ISDC, next Memorial Day Weekend promises to be a great one. Peter has registered. Dave Dunlop is also planning to attend. Major new projects will be announced. Anyone else planning to go?

**LRS Upcoming Events - September, October**

 **Saturday, September 10th, 1-4 pm**

**LRS Meeting, Mayfair Mall, Garden Suites Room G110**

**AGENDA: [www.lunar-reclamation.org/page4.htm](http://www.lunar-reclamation.org/page4.htm)**

Reports on Summer events, Updates on space and space mission news, conferences etc. A look at the calendar ahead.

Our front burner project will be our 20th anniversary party (for both LRS and MMM) at the December 9th meeting. Come help us plan that event as a kickoff to the future!

 **Saturday, October 14th, 1-4 pm**

**LRS Meeting, Mayfair Mall, Garden Suites Room G110**

**AGENDA: [www.lunar-reclamation.org/page4.htm](http://www.lunar-reclamation.org/page4.htm)**

**U.S. CHAPTERS**



**NSS**  
**Chapter Events**  
**MMM**  
**7 Chapters Strong**

**Space Chapters HUB Website:**  
**[ <http://nsschapters.org/hub/> ]**

**OREGON**

**Oregon L5  
Society**



**P.O. Box 86, Oregon City, OR 97045**

voice mail / (503) 655-6189 -- FAX (503)-251-9901

**[ <http://www.OregonL5.org/> ]**

Allen G. Taylor <allen.taylor@ieee.org>

Bryce Walden <moonbase@comcast.net>

(LBRT - Oregon Moonbase) moonbase@comcast.net



**Meetings 3rd Sat. each month at 2 p.m.**

**Bourne Plaza, 1441 SE 122nd, Portland, downstairs**

**Aug. 20 - Sept. 16th - Oct. 21st**

**ILLINOIS**

**Chicago Space Frontier L5**

**610 West 47th Place, Chicago, IL 60609**

**INFORMATION: Larry Ahearn: 773/373-0349**

**MINNESOTA**



**Minnesota Space  
Frontier Society**

**c/o Dave Buth 433 South 7th St. #1808  
Minneapolis, MN 55415**

Tom Greenwalt (w) 763-784-6244 (h) 763-442-6015

David Buth (w) (612) 333-1872, (h) (763) 536-1237

Email: tomg@mnsfs.org

**[ [www.mnsfs.org/](http://www.mnsfs.org/) ]**

**MN SFS News & Pictures**

**MN SFS Sci Rm (mostly) pics from Convergence 2006**

<http://freemars.org/mnfan/Convergence/2006/sci-rm.html>

**MN SFS ISS-13 / STS-121 Space Displays - 2 locations:**

1. Minneapolis Community Technical College (MCTC)  
Astronomy Dept., 1501 Hennepin Ave., Minneapolis
2. Radio City Inc., 2663 County Road I, Mounds View, MN

# WISCONSIN

## Sheboygan Space Society



728 Center St., Kiel WI 54042-1034

c/o Will Foerster 920-894-2376 (h) <willf@tcei.com>

SSS Sec. Harald Schenk <hschenk@charter.net>

>>> DUES: "SSS" c/o B. P. Knier

22608 County Line Rd, Elkhart Lake WI 53020

[ <http://www.tcei.com/ss/> ]

We meet the 3rd Thursday of the month at 7-9pm

**AUG 17th** The Stoelting House, Kiel

**SEP 21st** UW-Sheboygan, Room 6101, Sheboygan

**OCT 19th** The Stoelting House, Kiel

# PENNSYLVANIA

## Philadelphia Area Space Alliance



PO Box 1715, Philadelphia, PA 19105

c/o Earl Bennett, EarlBennett@erols.com

215/633-0878 (H), 610/640-2345(W)

[ <http://pasa01.tripod.com/> ]

[ <http://www.phillypasa.blogspot.com/> ]

**PASA regular** business luncheon/formal meeting from 1-3 pm, the 3rd Saturday of every month at the **Liberty One** food court on the second level, 16th and S. Market. Go toward the windows on the 17th street side and go left. Look for table sign. Parking at Liberty One on 17th St. Call Earl or Mitch 215-625-0670 to verify all meetings.

**Next Meetings: August 16 (? in Atlantic City ?), Oct. 21st**

**Website Note:** in addition to our Tripod.com address we also are at :phillypasa.blogspot.com where members can post space related opinions, commentary and pictures. We are working on improving its contend and should have more material in the fall.

**June Meeting Notes:** We had a small, but talkative, crowd in June with topics ranging from where the L.E.M. is that had been located at the Franklin Institute to the current Al Gore movie on the environment (specifically global warming) to future events, like going to the shore in August. Hank Smith began our session with his future activities as Philcon Head of Space Science. Philcon will be held from Nov. 17 to

the 19th. at the Sheraton on the Parkway. Hank is also our Planetary Society Coordinator and will be reporting on that groups many activitiescientific devices that can be made from relatively easy to find materials (Bismuth and Pyrolytic Graphite being excep. We will get his WorldCon report in September after he attends this pre Labor Day event.

Michelle Baker gave our financial support and member renewals have been deposited. We also briefly discussed a neat book I had discovered: Gonzo Gizmos projects and devices by Simon Quellen Field. This is primarily about interesting scctions). The other thing about it is the explanation of why the device works. Michelle considered it interesting enough to buy. I am considering purchasing it as well.

Mitch Gordon will search out the location of the L.E.M. that sat for many years in the back of the Franklin Institutes garden area. He has contacts at the Institute and will tell us about what happened and begin setting up our Fall participation in U.N. Space Week in early October (?). Mitch is also working on us giving a talk at a venue in University City where much of his report centered. Due to the changes in that area we may have our major postal facility move from the edge of the Universities. But: a public meeting location for groups like us may be made available as one result of the public spirited educational institutes taking over the current location. Educational organizations are a major employer in our area. Mitch will be writing an article for one of the college papers espousing Space Studies as a worthwhile focus for a curriculum.

Earl Bennett brought the September (received in June) issue of Analog, Science Fiction and Fact with good article on; "the Right Stuff: Materials for Aerospace and Beyond" by Kyle Kirkland. Most of the story is materials as many of us (MMM and Analog readers) know them presently: Composite structures of carbon and other fibers bonded with epoxies or embedded in ceramics. An amazing part of the article, at least initially before reflection, was the resistance to the use of these materials for the applications we see as obvious. Only now are these materials being used as the major parts (by weight) of aircraft. The 787 is cited for its going to 50% composite construction. This will make it 30 to 40,000 pounds lighter than a competing Air Bus (A330-200). There is more on applying the materials to various craft such as the X-33 and X-43 and the C.R.V. and its optimistic roll out timing.

Towards the end are the "fantastic" or "gee whizz" parts. If you have seen Babylon 5 you have seen the idea of a transforming craft that gives the basic feature of some hardware that may developed: for atmospheric flight the whole wing structure may be warped or even reconfigured as needed during flight. Current versions in fighter aircraft and the clever design of Space Ship One gives good control but aren't shape changers as are being researched now. And in the June issue of Nuts and Volts is a description of the

use of piezoelectric properties of Nano Tubes that are flexed by the probe tip of an Atomic Force Microscope probe tip. The result of the deformation and the probe tips properties is the generation of several milli volts of electricity. This could be raised by lengthening the tubes and other mechanical excitation methods. Work done at The Georgia Institute of Technology. I recently received the July issue and it has the second part of the Near Space Geiger Counter Telescope. The author , L. Paul Verhage, mentions his book and a fix for a wiring error in it which appears in this column. See the website: parallax.com for this and other neat things.

Janice brought us the latest (June) issue of Science with the results from analysis of Mars Global Surveyor material: three and a half Billion years ago there was much water on Mars. Title: "Global mineralogical and aqueous Mars history derived from Omega/ Mars Express data". This is basically on the loss of surface water. See the report for more. We also received a report from Dotty via phone and tape recorder (thanks Mitch ! ) on the New York Hall of Science which has undergone an expansion. This is a historic location in that it was part of the 1964 Worlds Fair. This was where the Space Science exhibits had been and there are old rockets out front. Belated social note: while visiting a talk at Balticon, in May, on Interstellar Flight I pointed out that many of the points and concerns raised by the lecturer where also brought up by Adrian Barry in his book The Giant Leap. This brought a response from audience member Dr H.. Paul Shuch on the generosity of Mr. Barry in contributing some of his proceeds from books to the SETI League which I also belong to. Serendipity!

Earl Bennett for P.A.S.A.

And don't forget to check our Blogsite and consider contributing to the discussions

<http://www.phillypasa.blogspot.com/>

#### SOLAR SYSTEM AMBASSADORS

[www.jpl.nasa.gov/ambassador/](http://www.jpl.nasa.gov/ambassador/)

**Miki Baker**  
Princeton/Philadelphia  
MikiBis@gmail.com

**Bill Higgins**  
Chicago, IL  
higgins@fnal.gov

**Bill Hensley**  
Kenosha, WI  
bil\_h51@yahoo.com

**Harold Schenk**  
Sheboygan, WI  
hschenk@excel.net

**Attn: MNSFS, Oregon L5, OASIS:** If a member of your chapter is a JPL Solar Syestem Ambassador and you would like him or her to be listed above, please email MMM c/o kokhmmm@aol.com

CALI FORNIA

# OASIS

**OASIS: Organization for the Advancement  
of Space Industrialization and Settlement  
Greater Los Angeles Chapter of NSS**

**P.O. Box 1231, Redondo Beach, CA 90278**

Events Hotline/ Answering Machine: (310) 364-2290

*Odyssey* Ed: Kat Tanaka - [odyssey\\_editor@yahoo.com](mailto:odyssey_editor@yahoo.com)

**[ <http://www.oasis-nss.org/> ]**

[oasis@oasis-nss.org](mailto:oasis@oasis-nss.org)

***Odyssey* Newsletter Online**

**<http://www.oasis-nss.org/articles.html>**

 **Regular Meeting 3 pm 3rd Sat. each month**

Microcosm, 401 Coral Circle, El Segundo.

• **August 20th – September 16th – October 21st**

Information: OASIS Hotline, 310/364-2290; website.

#### Upcoming Events



- **Sat. Aug. 19th, 3:00 pm** – OASIS Monthly Business Meeting at the home of Steve Bartlett & Tina Beychok. This will be the final planning meeting for Worldcon.
- **Fri-Sun. Aug24-26th, WorldCon** – The World Science Fiction Convention (Worldcon) will be in the US this year at the Anaheim Convention Center. OASIS will be helping with the science program and participating as an organization. We will need volunteers at the information table each day and assistance with the children's program "Build Your Own Spaceship" session and hospitality party. Contact the our convention liaison for more information and to volunteer! For more information about Worldcon, visit [www.laconiv.org/](http://www.laconiv.org/). OASIS can not provide memberships to the convention for volunteers. One day memberships are available to reduce costs. Riverside Astronomical Society General Meeting. Cossentine Hall, La Sierra University, 4500 Riverwalk Pkwy, Riverside. Free. [www.rivastro.org/index.html](http://www.rivastro.org/index.html)
- **Sat. Sept. 24th, 3:00 pm** – OASIS Monthly Business Meeting, location TBD. Call the *OASIS Hotline*, 310/364-2290, for more information.

#### Recurring Events

- **Fridays** -- Mike Hodel's Hour 25 webcast. The world of science fact and fiction with interviews, news, radio dramas, artists, writers, stories, reviews, and much more. Information: <http://www.hour25online.com/>.

For the latest information, call the OOASS Hotline or check our website!

NAME _____ STREET _____ CITY/ST/ZIP _____ PHONE #S _____	<p><b>Member Dues -- MMM/MMR Subscriptions:</b>  Send proper dues to address in chapter news section</p> <p>=&gt;for those outside participating chapter areas&lt;=</p> <input type="radio"/> \$12 Individual Subscriptions to MMM/MMR: Outside North America <input type="radio"/> \$50 Surface Mail -- Payable to "LRS", PO Box 2102, Milwaukee WI 53201 <hr/> <p><b>CHICAGO SPACE FRONTIER L5</b>  <input type="radio"/> \$15 annual dues</p> <hr/> <p><b>LUNAR RECLAMATION SOC. (NSS-Milwaukee)</b>  <input type="radio"/> \$12 low "one rate"</p> <hr/> <p><b>MINNESOTA SPACE FRONTIER SOCIETY</b>  <input type="radio"/> \$25 Regular Dues</p> <hr/> <p><b>OREGON L5 SOCIETY</b>  <input type="radio"/> \$25 for all members</p> <hr/> <p><b>O.A.S.I.S. L5 (Los Angeles)</b>  <input type="radio"/> \$25 regular dues with MMM</p> <hr/> <p><b>PHILADELPHIA AREA SPACE ALLIANCE</b>  <input type="radio"/> Annual dues for all with MMM \$25, due in March or \$6 times each quarter before the next March</p> <hr/> <p><b>SHEBOYGAN SPACE SOCIETY (WI)</b>  <input type="radio"/> \$15 regular, <input type="radio"/> \$10 student,  <input type="radio"/> \$1/extra family member</p> <p>"SSS" c/o B. P. Knier, 22608 County Line Rd,  Elkhart Lake WI 53020</p>
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## Moon Miners' MANIFESTO

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