"Towards an Earth-Moon Economy Developing Off-Planet Resources"

Moon Miners' Manifesto

& The Moon Society Journal

www.MoonMinersManifesto.com

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In FOCUS: Dear Santa: a Moonbase

It's not about "what" we want! It's about "the best strategy" to get what we want

It is sad to watch the continuing "debate trap" intoi which many devoted "Moon first" and "Mars first" true believers fall. For in truth, not only would either Moon or Martian settlement prove economically non-viable without each other as a trading partner, both face the very high likelihood of being stillborn, if not summarily aborted, if either one is pursued alone. Politics is the reality, and Collaboration the strategy.

Consider the track record. George W. Bush emasculated the International Space Station by summarily reducing its design manning from seven to three (it takes 2.5 crew man time just to maintain the facility.) Yet he boasts that we have a Space Station.

A Moonbase, designed and pursued as an end in itself, would most likely suffer a similar fate. Reduced manning. No capacity to pursue resource utilization (oxygen production, cast basalt, metal alloys, building materials, etc.) We'd be able to boast that we have a "permanent" outpost on the Moon. Congress would care little, so long as it did not cost any more.

designed "to work on Mars."

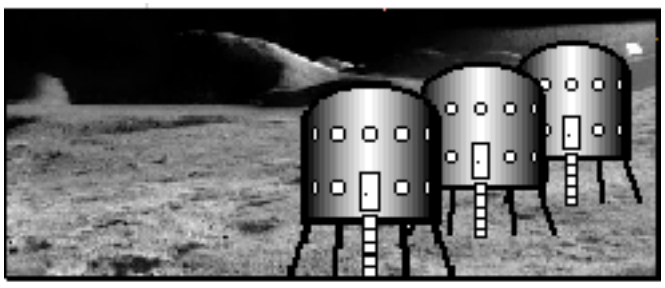
But if the goal is to build a workable Mars Base and try it out on the Moon first, then guess what we'd have?

- **A life support system that went beyond umbilical cord style resupply, rescue, and repair**, but had to work without relief for extended periods of time, two years or more. This most likely would involve a considerable greenhouse food-growing operation, something that could be easily dropped from a Moonbase-only program, given inevitable budget pressures.
- **A design that had to take "shieldability" into account** because the long stay times on Mars demanded such protection. On the Moon, in contrast, you could do without shielding if you rotated crews frequently enough.
- **A robust machine shop and repair facility**, because on Mars, one might have to fabricate a critical part if the last spare had been used.
- **Development of an adequate power system** *not reliant on "eternal sunshine"* which is something that would not be available on Mars. We might end up with a power system that would let us operate anywhere on the Moon, not just in the polar cul de sacs of *"eternal sunshine."*

[⇒ p. 2, col. 2]

Robert Zubrin's Concept for a Moon Base

Making the most of the architecture he proposes for an outpost on Mars and its delivery systems, this concept employs a trio of 2-story, 27" wide Hab modules. The shape is familiar, as the Mars Analogs on Devon Island and in Utah both employ it. We'd prefer a "ranch" design of double-stacked separable single floor units, much easier to cover with protective shielding.



Moon Miners' Manifesto

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

• **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

• **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 2006; Ph: (202) 429-1600 <= NEW HQ

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• **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 => 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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⇒ IN FOCUS Editorial continued from p. 1.

□ **Inclusion of a superior medical facility** that with aid of the latest computer software programs from Earth would allow treatment of almost any medial emergency. In a Moonbase-only operation, we'd have emergency transport back to Earth as a crutch to fall back on.

□ **Quicker development of expansion architectures that relied as much as possible on locally produced building materials, modules, and parts.** In a Moonbase-only operation, we'd continue to rely on shipment of made-on-Earth modules (hard hull, inflatable, or hybrid) and parts.

□ **The living spaces would be more likely to include the perks and amenities needed to ensure sustained crew morale and productivity over yearlong plus stays.** In a Moonbase-only operation, we'd make do with submarine style living standards, or less. Such perks are an essential step towards the introduction of optional re-upping, signing up for continued stay duty - one small step on the road to the first "settler."

□ I am sure there are still more points to make!

The one thing that wannabe Lunans and wannabe Martians both don't seem to get, is that while Mars offers an atmosphere rich in oxygen, carbon, and nitrogen, plus a hydrosphere of unknown size, a more day-like rotation cycle, and other amenities, *it remains initially a much harder nut to crack,* because it lacks the one thing that the Moon offers: "location, location, location."

Ironically, however, that "location benefit" *can and will serve as a crutch* that will be used by bean counters and politicians to restrict full development of any "government" (national or multinational) outpost to the bare minimum to allow boasting that "we have one."

I write this article as a solitary individual, as editor of Moon Miners' Manifesto, not as President of Moon Society,many of whose members, and perhaps directors will be hard to move off previous turf-protective positions. But I counsel them to consider that it is in our best interests as advocates of lunar outposts, and resource-using settlements that on this point of posture towards the Bush Exploration Initiative, it is very much in our own best interests to ally ourselves with the well-articulated position of the Mars Society and standing side by side with them, work in unison for a Moonbase Designed for Mars.

It's not suicide. It's not a paradox. It's simply far and away the only strategy that makes sense. Now I suspect that younger readers and members (not old enough to have vividly remembered our retreat from the Moon at 8:42 p.m. EST on December 16, 1972) will disagree. But if you don't remember history, you are doomed to repeat it!

Let's not be fools. To one who lived through the Apollo era, the naiveté of many younger enthusiasts is both incredulous and discouraging. We must take the longer view, and that means playing our strategies to the hilt. PK

ALUMINUM WINDOWS

Safer Windows for Spacecraft & Surface Vehicles? A Solution for Some Lunar Architectural Challenge?

[sources: Google.com: ALONtm]

by Peter Kokh

Well, windows of a new *ceramic* aluminum oxynitride rather than aluminum alloy, actually. Trade named ALONtm [no, that's not ALON™] this new material is being tested at Army Research Laboratory at Aberdeen Proving Grounds, Md., and University of Dayton Research Institute, Ohio adjacent to Wright-Patterson Air Force Base. The driver here is to come up with a superior transparent window for hummers and other vehicles at high risk in Iraq. But the implications for safer vehicles and structures in space are what interests us.

ALONtm research to date

ALONtm is a ceramic material with high strength under compression, superior impact resistance, and superior abrasion resistance. It is lighter weight than traditional multilayered glass windows with which armored vehicles are now being outfitted.

Lighter, thinner, stronger, longer lasting - is there a downside to this new miracle material? Cost is currently a problem. $10-15 per square inch as compared to $3 for multilayered glass now in use. But that should not be of concern to anyone familiar with the downward cost curve of any newly introduced product. As more efficient ways are found to process the material, and mass production is introduced, costs should fall substantially. After all, and this is something few of our readers under 70 will be aware of, when the commercial products made of the new miracle alloy "aluminum" first appeared, they were *astronomically* expensive. Aluminum is now very affordable, no longer in the Platinum cost range. In fact, it is now a "common" material.

Drivers for development of ALONtm

The need for protection from road side bombs in Iraq, and from terrorist threats in general, is driving this research. That the R&D is being done by the military means that all the money needed to be thrown at it, will be.

We can feel confident that this technology will be available commercially without too much delay. Armored vehicles used to transport millions of dollars in gold bullion or paper currency between banks, are logical early users. Once the cost becomes competitive, if not lower than armored multilayer glass, more commercial applications will appear. Wherever wealth or political clout makes someone a target, there will be a premium on "the best protection."

But we see a big market for ALONtm windows and portholes on the space frontier.

ALONtm windows on tourist craft and orbital hotels

Sometimes, the enemy is none other than ourselves. This is certainly the case with the growing problem of space debris in low Earth orbit, almost all of it avoidable for the cost of a few added measures and procedures. [See MMM ##31 DEC '89, "Space Debris: cleanup and prevention" p1 - included in MMM Classics Vol. 4 available as a free PDF download from www.lunar-reclamation.org/mmm_classics/] Larger, safer ALONtm windows in tourist spacecraft and tourist hotel complexes in orbit will be demanded by both would-be tourists and the insurance industry. The cost of minimizing risks will be more than made up by the overall fall in ticket prices by a greater volume of tourist traffic driven by the realization of higher safety levels, less risk.

Yes, it is true that the likelihood of an impact from a debris particle of size sufficient to cause vehicle or structure decompression is low, it is getting ever less so. It is clear that the public regards the 1 in 50 chance of loosing a shuttle too high, and the first such debris-impact decompression fatality will have a very chilling effect on the infant space tourism industry. Commercial vendors and fliers of tourist vehicles will be happy to pay any extra cost that reassures potential customers. A century ago, had we the technology to go into space without the current culture of risk-aversion, no one would have hesitated. But these days, the public believes everyone should be guaranteed to live to a "ripe old age." That's nonsense, of course, but that is the depth of cowardice to which we have now fallen. It is going to be difficult to populate a frontier given this culture.

The risk of a debris or micrometeorite decompression accident beyond low Earth orbit falls substantially, but once it is common practice to equip space vehicles and living spaces with ALONtm panes, they will become standard. Even where there is a low incidence of risk, the cost and great inconvenience of changing a window out in the open, as opposed to inside a pressurized "garage" would make the higher protection worth additional cost. Apart from greatly improved failure protection, the fact that ALONtm is significantly more abrasion resistant will make vehicles so equipped very attractive, especially on Mars where wind-driven dust is expected to be a real problem. ALONtm windows remain clear, glass gets sandblasted to a state of translucency without transparency.

ALONtm windows for habitats and other structures on the Moon and Mars

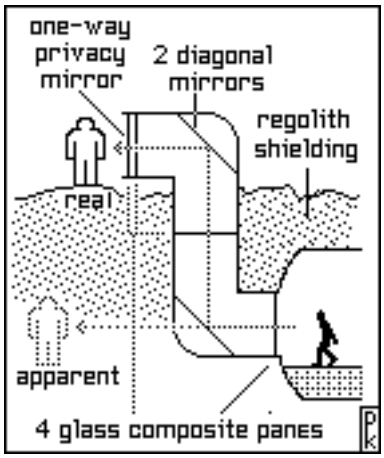
We personally, have always believed that television screens and monitors are no substitute for actual vision when it comes to keeping in touch with the outside world. Electronic devises can always be fed a misleading signal, and they just do not convey the same sense of immediacy. Our interest in such devices as periscopic picture windows had a lot to do with the birth of Moon Miners' Manifesto in the first place: our belief that "Lunans may have to live underground, but they won't have to live like moles. They can bring the views and the sunshine down underground with them." [Cf. MMM #1, December '86, now online, fully-illustrated at: http://www.lunar-reclamation.org/mmm_1.htm]

Many articles have appeared since then in MMM in which the use of windows was central. Here are but a few:

#74 APR '94, p 6. Visual Access; p. 7. Sun Moods
75 MAY '94, p 4. Lunar Appropriate Modular Architecture
#124 APR. '99, p 4. Windows Focused on Earth
#132 FEB. '00, p 8. Skylight Domes for Lavatube Towns

Also see:
www.lunar-reclamation.org/papers/habitatmoonmars_1.htm

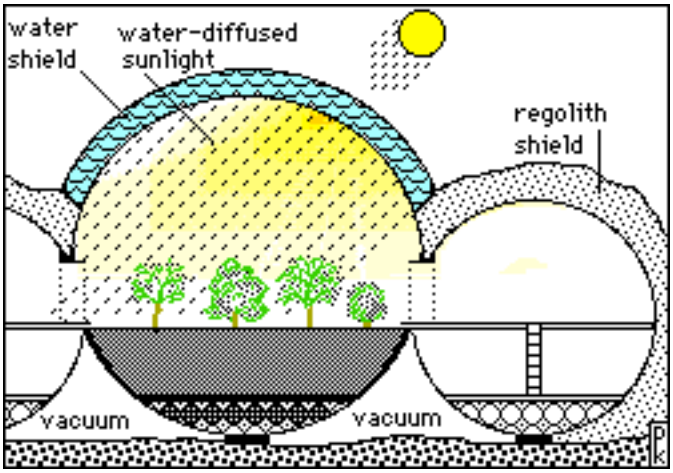
Realizing that exposed glass would lose its transparency over time due to micrometeorite and dust abrasion, we postulated a loose "sacrificial" pane in front of the window, that could easily be replaced. But the superior qualities of ALONtm would make such replacement much less frequent. Even if ALONtm was used just as a replaceable weather shield, its value would be significant.



For the periscopic window which would have several panes stepping down the pressure differential between inside and the out-vac, it might be prudent enough to make only the outermost pane of ALONtm, doubling the protection offered by an ALONtm sacrificial pane.

If costs every plunged to the point where ALONtm panes could compete with ordinary glass, then they could be used for the convex facets of a lunar geodesic dome type skylight. Convex or inward curving panes would take advantage of the fact that ALONtm is stronger in compression. However, any direct path visual or solar access, unless seldom used by any one person, would provide severely insufficient shielding against cosmic radiation and solar flares. That's why the periscopic window makes use of a zigzag pathway.

Why not store water overhead where, within a double layered glass dome, as translucent shielding? This is a suggestion of Marshall Savage (Millennium Foundation). You will notice that while from the outside, it looks like a dome, the true nature of this structure is a sphere which better handles the pressure loads. Now this is a neat idea, but the water would have to be circulated to prevent freezing or boiling (in lunar versions). Thermal management will be a major part of any such design, and a lot of homework and trial and error prototype demonstrations need to be done here on Earth with sun/heat/cold loadings that simulate the proposed environment (Moon or Mars). And now that both the domes "glass" layers could be made of ALONtm instead of glass, makes this suggestion somewhat more practical, *provided that* the plumbing systems to manage the thermal swings can be perfected.



Can we have translucent shielding without water? Glass, if it is thick enough, or in enough layers to provide shielding (6-13 feet!) loses its transparency and even its translucency. It would be interesting to see how much light is lost per mm or cm of ALONtm as compared with the same thickness of glass. If ALONtm is a sufficiently more efficient transmitter of light, it might make some new architectural options possible.

Recently, a form of concrete has been reduced that is translucent, not transparent (you can see someone's silhouette but not make out the details). Read about it at: http://optics.org/articles/news/10/3/10/1

> "Thousands of optical glass fibers form a matrix and run parallel to each other between the two main surfaces of every block," says inventor Áron Losonczi. "Shadows on the lighter side will appear with sharp outlines on the darker one. Even the colors remain the same.

All these new wonder materials will in time open up exciting new options for lunar, and Martian architecture, just as they are sure to do sooner, here on Earth. In ALONtm, we have what could be a wonder material whose further development and application will be abundantly funded by both military and civilian consumer interests. The offshoot will be a safer, and perhaps more pleasant life for those who pioneer worlds beyond Earth's life-supporting biosphere. Windows, skylights, solar access for homestead gardens and greenhouses, revolving restaurant observation towers over Luna City or Marsport. Ceramic aluminum, made of everyday elements, has a role to play.

A lesson that younger readers can take away from all this is that all the excitement is not in propulsion science. A career on the new frontiers of Materials Science can help as much or more open the space frontier. The Rocket guys can get us there. It will take the Materials Science guys, the chemical engineers, the experimental agriculture people and others to help us find a way to stay on that frontier, and to make it just as much our own as has been the planet of our birth. Plus, there's money to be made advancing materials science right her and now. **<MMM>**

COLOR THE MOON II

63 March '93, p 10. Color the Moon "anything but gray"

To be included in MMM Classics Vol. #7 scheduled for publication as a free download pdf file in January 2006.

Color the Moon

"anything but gray?"

by Peter Kokh

The Moonscapes are studies in gray tones from near black to near white. Exceptions are rare. When Apollo astronauts stumbled on a small patch of regolith with a faint orange tint to it, there was a great deal of excitement on two worlds.

Living in such an environment while maintaining morale will require doing something about this situation of sensory deprivation. We have the capacity to see colors, and as in other matters, appetite follows capacity. Colorizing the lunar environment, both in indoor and out-vac settings, will take some careful forethought and prior experimentation. There follows a short quote from the previous article cited.

> The principal avenues for introducing color on the Moon as in Space Settlements built mostly of lunar materials are these: **1)** luxuriant green vegetation and colored foliage and flowers; **2)** naturally colored cotton and natural organic fabric dyes that do not stress water recycling systems; **3)** vitreous stains for coloring glass and glazing ceramics; **4)** inorganic "paints" that do not tie up precious carbon or nitrogen; finally **5)** colored "neon" lighting using noble gases scavenged from regolith-moving activities.

In this article, we'd like to talk about bringing color to the Lunar outdoors. Now that may sound a bit ambitious! We do not mean to colorize whole moonscapes, only the external faces of settlement structures: the shielding mounds, the airlock "porches," etc. things that personalize one family's homestead from another's when viewed from out-vac, from out on the surface. [See MMM #55 May 1992, p 7. MOON ROOFS. This article has been republished in MMM Classics #6, available as a free download pdf file from http://www.lunar-reclamation.org/mmm_classics/]

Early Colorizing Agents

Perhaps the first colorizing agent to appear will be **rust-ochre** from harvested pure iron fines that are allowed to oxidize in a humid environment. This will happen quite naturally inside lunar homesteads if regolith is brought inside along with large rocks to create a Japanese style sand garden. The regolith will have to be sifted to remove the troublesome fine powder portion, but any of the iron fines remaining, or any large particles to which iron fines adhere. will inevitably rust. This will be a welcome "splash" (if you dare call it that) of color.

Out-vac, a regolith shielding mound could be lightly "dusted" with rusted iron fines to customize it. As this would be but a thin coating, in a windless environment, a little will go a long way.

Probably next will be **white**. Lime, calcium oxide, can be produced from highland regolith which is very rich in calcium. But perhaps the first source of white dust available to those who want to put their digs in the "limelight" will be titanium dioxide, a byproduct of producing iron and oxygen from ilmenite, FeTiO3, Iron Titanium Oxide. Ilmentie is not found everywhere. Regolith rich in this ore are very dark, the Taurus-Littrow valley Apollo 17 site being an example. But it offers one of the easiest routes for both oxygen and iron extraction, with titanium dioxide as a byproduct. Oddly, the very same people who propose beginning lunar industry with ilmenite want us to go to the polar "eternal light" [PEL] sites, and the two are nowhere collocated. But assuming NASA and the planetary scientist bandwagon comes to its senses and does not choose a polar dead end site, ilmenite-derived white TiO may be available early on.

Now many of the virtually unlimited colors we are used to enjoying will not be sourceabe on the Moon because they incorporate one or more elements found on the Moon only in trace proportions: copper, lead, cadmium, etc. But feasible possibilities include:

- **Pale Yellow:** Sulfur, as a pale yellow powder, alone, or mixed with titanium dioxide, it could give a faintly creamy look to surfaces dusted with it.
- **Red:** aluminum oxide mixed 4:1 with ferric oxide Fe2O3. A spinel, FeO.Fe2O3, produces a darker red. A tomato red can be prepared from Uranium oxide which can likely be found with known Thorium deposits
- **Red-brown:** (in addition to rusted iron) might include the reddish brown of iron chromate FeO.Cr2O3, the Indian red-brown of magnesium-iron oxide MgO.Fe2O3, and the red-brown manganese titanate MnTiO4
- **Pink:** the least expensive approximation of pink will be a mixture of iron oxide rust with white lime or titanium dioxide. Feasible alternatives are a manganese-alumina pink and a chromium-alumina pinkish red. Cobalt-magnesium combinations might produce a pink to lilac range .
- **Yellow:** in addition to the pale yellow of sulfur, the only feasible options would seem to be vanadium-zirconium and titanium-iron oxide preparation
- **Orange:** the cheapest route is adding iron rust to sulfur powder, *slowly*.
- **Green:** The deep emerald green of chromium oxide may be the standby. This could be blended with available yellows and blues to produce neighboring tints. Chromium oxide can also be pasteled by adding titanium dioxide. Later on, and more expensive to prepare, a blend of yellowing vanadium and bluing zircon in the presence of sodium fluoride (if fluorine can be produced, a difficult but high industrial priority) is an option. Praseodymium

(from KREEP deposits) phosphate with a calcium fluoride additive is another.

- **Blues:** Cobalt aluminate yields the most beautiful matte blue*, and cobalt silicates and oxides produce mazarine blue, royal blue, flow blue, and willow blue. A titania-alumina blue, TiO2.Al2O3, with a corundum structure is a possibility but hard to prepare by synthesis as opposed to starting with Ti-rich bauxite. Alternatives include a vanadium-zirconia blue and a silica-zirconia-vanadia-sodium fluoride system of blues, turquoises and greens.

  ** at a local chemical supply house, I paid $128 for a few ounces of cobaltous aluminate ten years ago. So blue will not be cheap. However it can be mixed with lime or titanium dioxide to produce lighter pastel tints , or with manganese dioxide or ferrous oxide black to produce grayed blues for a proportionately diluted bottom line.*

Back to our Out−vac Applications

To colorize anything out-vac, by dusting stabilized surfaces with colored powder will not be cheap both because of the expense of preparing some of these powders, and because of the amount needed to make an effect on large surfaces. We can predict that except for iron oxide rust, titanium dioxide white, calcium oxide white, and sulfur yellow, all of the above mentioned compounds will be too expensive to apply liberally. In that case, except for those to whom money is no object, *we are talking about subtle colorations, tinted grays, not expanses of pure colors.* The less you can afford to shell out, the more subtle the color shading of the basic regolith. That said, one could fairly cheaply specify lighter highland regolith, and against that background, less colorizing powder will go further.

Grayed Colors as particularly appropriate

For the visitor or traveler, to come upon a patch of surface that was colored in some pure, ungrayed fashion, would probably be offensive and grotesque. Gray regolith tinted with colorants, however, would seem to pay due homage and respect to the host terrain. Regolith mounds so shaded would stand out, but not garishly. They would set the tone of synthesizing human tastes with the host palette.

Lime white, and iron rust will be the two options inexpensive enough to be used liberally so as to minimize graying by the regolith on which which they are dusted.

Now there will be gaudier displays of color out-vac, but in the form of road-signs etc. where there is a need to have the item in question stand proud from the surface so as to be recognized and understood. But our point is that we can subtly colorize the external manifests of human occupation on the Moon while still paying all due respect and blending in. We wonted be substituting pure colors for gray. We will be subtly colorizing the grays. This economics-reinforced practice will serve to wave our basic human pride, and at the same time proclaim to all that we are proud to be Lunans. Grayed colors will be part of Lunan culture. **<MMM>**

Astronaut Wings

Time to Create Stepped Achievement Goals?

Comment by Peter Kokh

Standards of Attainment

According to the Wikipedia entry "astronaut," in the United States, people who travel above an altitude of 50 miles (c. 80 km) are designated as astronauts. The FAI defines spaceflight as over 100 km (c. 62 mi). As of Oct. 12, 2005, 448 humans have reached the 50 mile standard, 6 fewer have reached the FAI mark, 4 fewer orbit or beyond.

What that tells us, is that only ten people have gotten their astronaut wings at a level lower than orbit. Should not the 438 who made it to orbit and beyond have something more to show for it than those who have just taken a suborbital joyride?

Encouraging the Infant Space Tourism Market

We do need to encourage suborbital tourism. At the same time, we also need to recognize those who have gotten to orbit or beyond as part of their job or via the thickness of their pocketbook or wallet. In other words we need to encourage those who can only hope to reach the lowest standard of achievement, as well as those who want to take their space experience to higher levels.

The "5 star System"

In the U.S. there are one star, two star, three star, and five star generals. I propose that we have a "star level" of attainment for "astronauts" as well.

***** A one star astronaut will be anyone who has made it to the same 100 km/62 mile standard set for the winning of the Xprize. The 50 mile standard should be rejected.

****** A two star astronaut will be anyone who has made it into orbit, circling the world at least once.

******* A three star astronaut will be anyone who has spent an aggregate time in space of more than one month

******** A four star astronaut will be anyone who has reached beyond Earth orbit into cislunar space

********* A five star astronaut will be anyone who has circled the Moon or landed upon its surface

Obviously, this leaves ample room for levels not yet attained, space beyond the Earth-Moon system, e.g. enroute to Mars or beyond. The above suggested levels are put out for discussion. We can draw the lines in a different manner.

We could use names rather than stars, for a more flexible system. Suborbital astronaut, orbital astronaut, Moon-looper, Moonwalker, Mars explorer and so on. What is needed, however, is a system that is easy to remember, instantly familiar, and which above all encourages individuals to strive for higher goals. If ever there was a blatant case of mixing apples and oranges, it is giving a suborbital tourist and a Moonwalker the same badge of merit! **<PK>**

THE FIRST LUNAR MANUFACTURING INDUSTRIES

or, "Before we Start Building HABITAT MODULES"

by Peter Kokh

Before we can start manufacturing items needed on the growing lunar outpost settlement-to-be, we have to start producing manufacturing materials: metal alloys, glass and glass composites, etc. But this article is not about that. In two previous articles, we looked at manufacturing items in general out of sintered iron fines (using powdered metal technology) [MMM #63 March 1993 p 5. Sintered Iron from powder] and out of Cast Basalt using solar concentrators [MMM #35 MAY 2000. p 7. Cast Basalt: Industry Perfect for a Startup Outpost] Here we want to look at what our overall manufacturing diversification strategy should be.

ASSUMPTIONS: [1] When it comes time to expand our starter outpost, we can't just start building habitat shells without also producing the items needed to outfit them: utility systems, interior partitions including floors and ceilings. [2] To start manufacturing both habitat shells and innards is too big a bite all at once.

PROPOSAL: [3 Why not have the first interim hard hull expansion modules manufactured on, and shipped from Earth built to the same desired cross-section dimensions of our planned made-on-Luna Habitat modules and with the same interior and exterior interfaces? Then we can start manufacturing the sundry outfitting items. When we are ready, we can take on the manufacturing of additional modules on the Moon. [4] The empty made-on-Terra Hab shells can be filled, for transit, with equipment needed for other purposes on the Moon.

Relevant Articles from MMM back issues

MMM #18 September 1988, pp 3-4, "'MUS/cle' Strategy for Lunar Industrial Diversification." Online at: www.lunar-reclamation.org/papers/muscle_paper.htm

MMM #74 April 1994; p. 8. "KGB" Drop-in Cores (KGB: Kitchen, Garden, Bath)

MMM #75 May 1994
p 4. Lunar-Appropriate Modular Architecture

MMM #76 June 1994,
p 4. Inside Mare Manor; Interior Walls
p 5. Wall Surfaces & Trimwork
p 8. On the Wall: How to hang stuff;
p 9. Ceilings, Flooring

The "MUS/cle" strategy

Lunar industry should concentrate on the **M**assive and/or **U**nitary (we need a lot of such units) and/or **S**imple items that will make the biggest dent in the gross tonnage that must be imported from Earth and to let terrestrial suppliers continue to produce the more **c**omplex and/or **l**ightweight and/or **e**lectronic components that in aggregate comprise a lesser gross tonnage to be imported. The earliest lunar manufactures will be things that do not have to be made of refined advanced materials, which are not complex in assembly, and of which we need a lot of, if not in numbers, then in total gross tonnage. Both habitat modules and many of the outfitting items needed to make them occupiable will fit into this category.

Bypassing the dilemma

Now this may seem another instance of the "which came first, the Chicken or the Egg?" dilemma. But I suspect, just as with the age-old question above, the choice is moot if there is no "Rooster" involved. In our case, the question is which to manufacture first: outfitting or habitat shells? The dilemma is solved by the "rooster measure" of having all pressurized modules imported for outpost expansion shipped unoutfited, basically empty except for things the infant lunar industry cannot yet handle, e.g. the utility runs and electrical harnesses, and so on. The modules of which *the original outpost core* is built will have come ready to use, of course. But now it is time to expand beyond that core.

The cheapest way to import more habitable space will be with inflatable structures and/or empty and not-yet-outfitted hard hull units. The time for this momentous switch will come when lunar industry has begun producing metal alloys, cast basalt, glass fibers, glass and cement. Made-on-Luna habitat modules could be made of metal alloy, fiberglass reinforced concrete or (fiber)glass-glass(matrix) composites. But meanwhile, these same materials can be turned into modular sections for interior wall partitions, flooring and ceiling systems, tables and other furnishing items which do not need to be made of sophisticated modern materials.

"Size matters"

To make this strategy work, a decision must be made very early on about various interfaces, critical dimensions, etc. What we manufacture on the Moon to outfit empty inflatables and hard hull modules from Earth should ideally be designed to fit the kind of modular architecture and units we will want to build on the Moon. The most critical decision would seem to be radius or cylindrical cross-section. As it will be much more efficient to build two story units, it would be better to use the ET's 27 ft. girth as a guide, than the 15 ft inner diameter of the Shuttle Payload Bay. New launchers may give us more freedom but we should not count on a Heavy Lifter being developed, no matter how much sense it makes. There is an

old maxim about "infrastructure lasting forever." In very old cities, usually the only thing that survives the ravages of time are the road right of ways. So if we know where we want to end up. perhaps we should design our launchers accordingly. Their capacity enables everything.

Substitution shipments

If for the shipping stages, the shape and size of the cargo alone matters, and weight is less of an issue, other items needed on the Moon, including manufacturing equipment, tools, and small, lightweight "cle" components ca be shipped inside the empty habitat hulls in place of the weight that the various outfitting items to be added on the Moon would have totaled. The bottom line is the same. Less shipments and less total tonnage leaves Earth for the Moon. The infant outpost-settlement-wannabe makes up the difference and perhaps then some.

The "Stowaway Import" Option

Let's say that the infant lunar industry is not yet quite ready to produce some of the outfitting items, but is ready on most. An elegant choice if to ship the Earthmade module with the items that cannot be made yet on the Moon, but manufacture those items out of materials sorely needed on the Moon but in which the Moon is deficient. Copper, lead, zinc (or bronze, brass, pewter); silver, gold, even thermoplastics that can be melted down and recast into items difficult to make from metals, glass, ceramics etc. Such outfitting items can be replaced by made-on-Luna equivalents made of cruder lunar materials, when lunar industry is up to it. At that time, the replaced items can be cannibalized for their rare and precious elements. In effect, copper and the other elements in question get "stowaway" passage to the Moon. [See MMM #65 May 1993, p7. "Stowaway Imports"]

Outfitting for All Modules, or just Some?

Before we begin to develop interfaces and standards for a modular lunar architecture that is versatile enough to meet most needs, we will want to have spent some quality time designing a modular lunar-appropriate architectural "language." In this language, the interfaces are the grammar, the various types of modules are the nouns and verbs. In our article in MMM #75 on Modular Lunar Architecture we postulated that a successful Lunar-appropriate system would be one that incorporates these Six Elements:

- □ the smallest number of distinct elements
- □ the greatest layout design versatility
- □ the most diverse interior decorating options
- □ fabricated with the least labor and equipment
- □ assembled with the least EVA and equipment
- □ pressurizable after the least total crew hours

Now it is conceivable that Lunar industry will be ready to outfit some kinds of modules, say dormitory units residence units, or agricultural pods, before it is ready to produce drop-in kitchen-bath units, for example. In this case, we make the most appropriate choice between shipping some modules fully outfitted, others empty, still others with temporary replaceable and cannibalizable items. The point is that the transition from shipment of fully outfitted units to shipment of wholly unoutfitted ones need not be an all or none decision. We can phase this in, easing the transition, building up confidence and experience in the new lunar industrial teams.

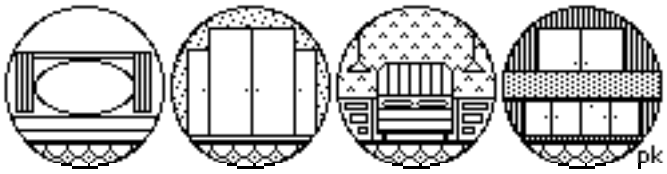
What outfitting items will be manufactured first?

We go back to the MUS/cle strategy for guidance. What outfitting items, easy enough for lunar industry to tackle now, will, multiplying individual item weight by the numbers needed, make the biggest dent in the import burden? Interior wall, flooring, and ceiling systems perhaps. If these are modular, combinations that fit inflatable interiors should produce no extra manufacturing burden. Planter trays for the agricultural units, for sure.

If we can come up with a modular way of making a number of case goods items (cabinets, tables, dressers, desks, etc.) then the various components of those. What about utility components? Pipes and conduit would get the nod over switches and valves, even over elbows and tees. You get the idea. The MUS/cle strategy makes decisions and diversification strategizing a fairly straightforward process in which consensus replaces power plays by those seeking personal economic advantage.

Special Assemblies

As manufacturing volume and diversification both increase, the market for special assemblies will grow to the point of making it worthwhile to produce them. For example, the round hemispheric end of a habitat module Teed off of a residence modular complex, provides a specially shaped concave area right for mass-production of alternative units made to fit. The illustration below illustrates possibilities.



L-R: periscopic picture window unit, closet system, bed headboard wall, countertop with upper & lower cabinets.

The point is to get started. Here is a path from outpost expansion to settlement building in earnest, that is just-on-time, versatile, and which makes economic sense . For most writers, getting from the starter outpost to the first settlement is a mysterious transition to be taken for granted. MMM is all about life on the early frontier, not about the first foothold outpost. "Getting There" for us is not the rockets that emplace the starter outpost, but rather the staged rocket of infant lunar industry that will get us to the early lunar frontier populated by pioneers who have left Earth behind, ready to make this new world their new home.

<MMM>

The Moon Society

J O U R N A L

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/

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/

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!

BBC (TV London, UK) to interview 3 Artemis Moonbase Sim 1 Crew Members *on location*

from Peter Kokh

Wednesday, December 7th, crew members Peter Kokh (Milwaukee) and Leslie Wickman (Long Beach, CA) will be flying in to Salt Lake City. The next morning, we will rendezvous with a BBC videotaping team and drive down to MDRS, the Mars Desert Research Station, some 250 miles to the SSE in the southern Utah desert. Crew member William Fung-Schwarz (Salt Lake City) will have driven down the day before to turn on the lights, warm up the place and make sure everything is presentable. Thursday afternoon will be spent touring the Hab and its surroundings while videotaping everything and interviewing Leslie, William, and myself for a major documentary that the British station is doing about the Moon. BBC's schedule did not allow them to wait for the real simulation exercise next February 25 - March 12th. For us, this will be an "all expenses paid" free opportunity to do some on location homework to ensure that our projects go well when we return in two plus months.

For Leslie, this is an unexpected chance to see the GreenHab, take photos, measurements and make diagrams, allowing her to better prepare for her Lunar Life Support Systems Study project. It will give me a chance to take some helpful measurements also. William and I had served on MDRS crews last season, #s 33 and 34, respectively.

In our interviews, we will be giving our gracious hosts, the Mars Society, due credit. MDRS is known the world over as the site of an ambitious program of simulation exercises from which we have learned much that will lead to better equipment for geological and biological exploration, improved life support systems, better human resources management, improved spacesuits, and much more. NASA has its paper exercises, of course. But we are limited in what we can learn on paper. There is no substitute for going through the motions in an environment sufficiently analogous to the real thing to put the experimenters in a productive frame of mind. Now it's our turn to learn, and contribute.

Thanks to BBC, many more people around the world will have heard about the Moon Society and what it is doing. Publicity, of course, is one of our motivations in undertaking this project. But the long range goal is to better prepare us to locate, design, lay out, build, staff, and maintain our own Lunar Analog Station someday as part of Project Leto. This preview trip is a great opportunity for some of the crew to "pre-gel" and will make us all more eager for February.

Artemis Moonbase Sim 1 web pages

William has been working on a special mission web site where visitors can learn about the mission, our crew, our projects: http://www.moonsociety.org/moonbasesim/

Once the mission starts on February 25th you will *also* be able to follow the exploits of "Crew #45" at:
http://www.marssociety.org/MDRS/fs05/

Artemis Moonbase Sim 1: The Moon Society Exercise at MDRS:

FREQUENTLY ASKED QUESTIONS

What useful things can a Moon Society crew do at a Mars Society Station in a landscape that screams "Mars"?

It is true that the MDRS site is not suitable for simulating lunar geology methods. The terrain here is sedimentary and water-carved. The coloration is a detail we can ignore, however, just as even Mars Society crews must ignore the blue sky. But there are many things a lunar outpost and one on Mars will have in common. We will be concentrating on these for our first mission: Lunar Life Support Systems Study; Site Management; Ergonomics of outpost design; Human Factors & Perks needed to maintain crew morale and productivity over the long run; Modeling a Space Frontier Diet, etc. We hope to produce some studies that will help both the Mars Society, and ourselves someday at our own research station.

Why rent? How much is the rent and what does it cover? Will the rental cost be a problem?

The smaller Moon Society cannot yet afford to deploy our own research station. The $7,000 rent includes food, transportation both ways between Salt Lake City and the Hab, Mission Support, and fuel and power. The Lunar Reclamation Society has sent a check to cover the first 20% of this amount, and written Challenge Letters to other organizations to donate at some level. The Moon Society has sent letters to a number of enterprises and corporations.

Will this be a one-shot deal?

We anticipate that this will be a very successful and productive exercise. If events bear that out, we will put in our request to the Mars Society for a sequel slot in the next (2007) field season.

How long will the mission take?

Two weeks *and a day*, allowing the next crew to arrive before the previous one departs, ensuring continuity, especially in the area of Hab and equipment maintenance, as well as helping new arrivals get familiar with everything.

How many crew members will there be and how much does it cost them to participate? Do you have to be a current Moon Society member?

Six. There is sleeping space for six. During crew changeover, newcomers sleep in the ward room floor or in the "attic" storage space. We will have a full crew of six. A 7th crew person will be arriving in our 2nd week to take the place of a crew member who must depart several days early.

Crew members must pay their transportation to/from their homes and Salt Lake City. The rest is provided.

What will our crew members eat?

Some Mars Society crews have tried to simulate a frontier diet. Others have not. Until this year, there was no refrigerator or freezer in the Hab living quarters, meaning that they bought dry goods and canned goods, anything with a shelf life of two weeks. We will not use canned goods as they contain water and hydrated foods which would be very expensive to import from Earth. Basically, we will hopefully enjoy crock-pot vegetarian creations from dry and dehydrated ingredients, herbs & spices. But that's not all.

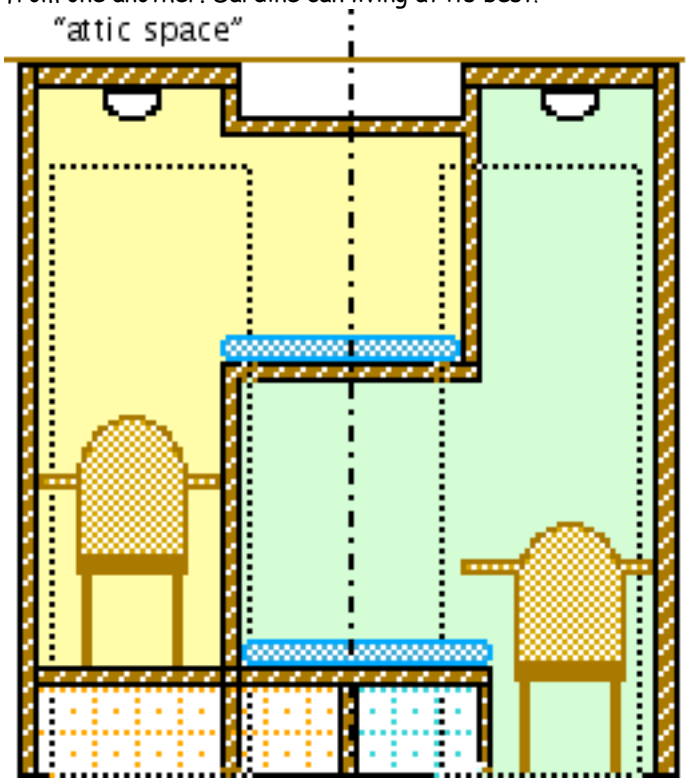
Anticipating greenhouse production of fresh fruits, vegetables, and salad stuffs, some of these will be brought with us from Salt Lake City, with more purchased in nearby Hanksville for the second week.

Nor will we forget the meat-eaters in the crew. Between-meal beef, turkey, and other jerky snacks.

We will be getting thumbs up, thumbs down input from crew members and hope to produce the start of a lunar frontier cook book.

What are crew quarters like?

The "staterooms" are hardly stately. The closet sized cubbyholes have a card table chair, small shelf/desk, 31" wide sleeping platform, and storage for luggage and clothing. There is a light and an ethernet port. Pairs of staterooms are cleverly designed to borrow sleeping space from one another. Sardine can living at its best!



What is the weather usually like at MDRS?

http://www.weatherbase.com/weather/weather.php3?s=116324&refer=

What are the "simulation rules?"

Crew members arrive in their street clothes. But when they want to go outside, they must follow procedures and don an EVA Space Suit, with the help of a buddy, and go through a brief airlock cycling routine. When they entered, they were in a Marslike area on Earth. When they come out all suited up, they are on "Mars." The suits reinforce the illusion. For us, we'll have to disregard the Mars coloration and pretend we are on the Moon.

How accurately are the MDRS EVA Space Suits designed?

The MDRS EVA suits are not designed to be pressurized. Rather they are designed to simulate the weight and awkwardness of a real suit and all its equipment. The backpacks do contain a life-support system of sorts: radio and a ventilation system that pumps fresh air into the helmet. This is essential, as it can otherwise get very warm inside the suit. It also keeps the air inside the suit fresh.

The gloves are standard heavy duty work gloves. Over time, they have sprouted some accessories: a mirror on the top side to enable the wearer to see what's behind; various tools taped to the top of fingers.

We will be trying to come up with further non-permanent add-ons to increase productivity and safety. A new type of suit, a form fitting "MarsSkin" suit is under development, and one of our crew members will have one. The whole idea is to come up with suit designs that are much less cumbersome than present NASA designs, much less tiring to work in, and not requiring extensive pre-breathing.

What are the short term goals of the project?

We hope for some good publicity, both nationally and abroad. There will be videotaping by Moon Society member Chip Proser for a future documentary as well as advance videotaping by BBC for its own documentary (page 9 col 2), and we hope to do major publicity in the home town areas of our crew members: West to East: Long Beach/Los Angeles, Salt Lake City, Twin Cities, Milwaukee, Montreal, Miami, Bonn. We hope that this effort makes the Society better known to the public and the media, and leads to increased membership growth, and to energizing our talented members. Last but not least is strengthening our new collaboration ties with the Mars Society.

What are the long term goals of the project?

This effort should be seen as a first step towards the realization of the Project Leto Masterplan: an effort to build a full-scale simulation of an initial lunar exploration base. It will be marketed for outreach purposes, analog research, and as a tourist destination. This simulation and, hopefully, those to follow will give us the experience and insights to better locate, design, equip, maintain, & operate our own Lunar Analog Research Station down the road.

What is the tie-in with the Artemis Project™?

While we are endeavoring to gain experience and know-how that will help us with Project Leto, they will clearly also help us in deploying a commercial moonbase. We will be learning how to approach moonbase design ergonomically, finding off-the shelf modules that are suitable to the functions and facilities of an outpost, rather than finding one off-the-shelf module and trying to stuff all the functions inside. In other words, these exercises will help us switch from a function-limited-by-form approach to a form-follows-function design. This will have major consequences for how we grow the moonbase from one initial habitat module to a fully functional beachhead on the Moon that will support startup manufacturing based on local resources.

We will be working on site management policies and practices, space suit design, operations procedures, options to ramp up greenhouse food production in the life support system. We'll also be working to develop a culture for pioneers in which there are sufficient perks to maintain crew morale and productivity at the highest level.

All of these initiatives lie in areas where the present Reference Mission is inadequately developed.

Are other Moon Society affiliate organizations participating?

The Lunar Reclamation Society (NSS-Milwaukee) has its research arm, playfully dubbed the Copernicus Construction Company, busy altering off-the-shelf items to create an in-Hab lunar ambiance: table settings that look like they could be produced on the early frontier from lunar materials, music instruments and board games that could be produced on the early frontier, a collection of Moon Sci-Fi DVDs & tapes, the start of a lunar "filk song" collection.

The American Lunar Society may help us plan a program of Moon observing with the MDRS telescope. Other groups have been approached for project or other support.

Is there a tie in with Moon Society chapters?

None of our crew members come from Moon Society chapters, but two come from partnering NSS chapters: LRS and Minnesota Space Frontier Society. Two more come from the same city, Montreal, Quebec, Canada. They have only to find one more to become our first Canadian chapter. We are on the lookout for ways to involve our two most active U.S. chapters: Moon Society St. Louis and the (South San Francisco) Bay Area Moon Society.

Meanwhile. this event is a dynamite subject around which Moon Society chapters and outposts can arrange public outreach presentations: information tables, talks, letters to the editor, free lance articles, etc. Please do email president@moonsociety.org for help in putting together an Artemis Moonbase Sim I exhibit/presentation

Coming Soon to the Members Area: Newsletters of our affiliates in PDF format

from Peter Kokh

American Lunar Society "Selenology"

Hopefully, by the time you read this, we will expand our Members area to include directories from which you can download the Selenology quarterly publications of the American Lunar Society, an association of amateur astronomers fascinated with the Moon. You will find ALS Selenology files at:

http://www.moonsociety.org/members/als/

ALS members interested in the exploration and development of the Moon will likewise have password protected access to Moon Miners' Manifesto pdf files

For members interested in journeying to the Moon through an eyepiece, ALS has a number of active projects.

Currently, ALS is off-line while its website is being redesigned and moved to a new server. As soon as we have this address, you will find the link in the Lunar Directory in the right hand destinations menu on our front page.

The Moon Society already cosponsors ALS Lunar Study & Observing Certificate Program (check the left hand destinations menu on our front page) and one Moon Society website visitor has already completed this program, giving him an $8 credit towards his membership dues.

Planetary Society of Youth (India) "Newsletter"

We just received the first TPSY newsletter in pdf format as I write this on November 28th. It is packed with news about India's ambitious lunar exploration program. You will find TPSY Newsletters at:

http://www.moonsociety.org/members/tpsy/

TPSY members interested in the exploration and development of the Moon will likewise have password protected access to Moon Miners' Manifesto pdf files

Last year we cosponsored (and helped write) TPSY's Moon Mission contest for students from India, Bangladesh, and North America.

The Affiliation Strategy

What's this "affiliation" business all about? The turf-protectionist strategies practiced by the various space enthusiast /supporter organizations in the last two decades of the 20th Century have got us nowhere. In fact, the appearance, well grounded, of a fractious pro-space contingency has done all of us no good, making it easier for neutral persons in the media or government to dismiss us.

It's the 21st century and time for a better approach. Despite differences, it makes sense to collaborate, network, cosponsor, and do things together when we can. "Networking and Leveraging our Connections!"

Attention Moon Society Members

Keeping your Membership Information Current

This is a quarterly reminder for those of you who are online, to check, and update if necessary, your personal contact information that the Society keeps on file, most importantly, your mailing address and your preferred email address if you have one.

Go to: **http://www.moonsociety.org/mymoon/**

If any of the information in the box Member Information needs updating, click on the link Edit Member Info

If you don't yet have a Team Director account, you won't be able to log in to My Moon Society, but you will get the login form where you can request a login account.

Chapters & Outposts

Bay Area Moon Society

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

Contact: Jonathan Goff <billclawson@yahoo.com>

Because our regular 4th Thursday night of the month meeting slot fell on Thanksgiving Day in November, we met Thurs., December 1st at Henry Cate's in San Jose.

Moon Society St. Louis

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

Contact: Keith Wetzel <kawetzel@swbell.net>

The regularly scheduled monthly meetings are 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.

Strategies for increasing our local presence

1. Partner Project: encouraging like-minded locally based organizations to represent the Moon Society in their area. Examples: other NSS chapters that share MMM could represent us in Los Angeles and Philadelphia.
2. Encouraging active members who live in an area served by an active NSS chapter, to join that chapter, and report to them on Moon Society activities, and in time encourage them to come aboard as a partner chapter.

   Now that the Moon Society is an official affiliate of the National Space Society makes both these efforts reasonable. We in turn encourage any of our active chapters in areas without an NSS chapter, to represent NSS and NSS projects in their area in turn.
3. Leveraging our growing connections overseas in India, Canada, the UK, and elsewhere.

GREAT BROWSING !

The Planetary Society's Redesigned Website
http://planetary.org

"The Debate Over ESAS"
http://www.thespacereview.com/article/482/1

Download the Proceedings of The Moon Base Conference - Venice Workshop, May 26-27, 2005
http://www.moonbase-usa.org/proceedings.htm

Download the Proceedings of The Moon Base Conference - Washington Workshop, Oct.11-12, '05
http://www.moonbase-usa.org/was-proceedings.htm

Will India join US,Russia, China in Manned Space?
"Have launcher; unmanned precursor capsule in '06"
http://www.hindu.com/2005/11/20/stories/2005112006890800.htm

Big Plans for SpaceDev
http://www.thespacereview.com/article/497/1

A British Astronaut Program *Finally?*
http://www.thespacereview.com/article/496/1
http://news.bbc.co.uk/1/hi/sci/tech/4351688.stm

Masten Space Systems Chases the Challenge
http://www.thespacereview.com/article/493/1

Changing the focus to growth of Life beyond Earth
http://www.thespacereview.com/article/488/1

To Mars, by way of one of its moonlets
http://www.thespacereview.com/article/501/1

Is Pluto a "Planet?" A Common Sense Answer
http://www.thespacereview.com/article/498/1

SETI takes aim at Red Dwarf Stars
http://www.spacedaily.com/news/seti-05f.html

25th Anniversary of our only attemt to phone ET
http://www.news.cornell.edu/releases/Nov99/Arecibo.message.ws.html

How to Deliver a Robust Moonbase: R. Zubrin
http://www.marssociety.org/news/2005/0228.asp

Survey on Zero-G Parabolic (Suborbital) Sports?
http://www.ipxentertainment.com/6.html

The New 36 ft. SALT Telescope
http://www.salt.ac.za/

Planetary Society Weblog - planetary play by play
http://planetary.org/blog/

Interplanetary Mechanics for Dummies
www.learner.org/resources/series42.html?pop=yes&vodid=264404&pid=548#program_descriptions

Why Democrats should support space exploration
http://thespacereview.com/article/499/1

Boldly Going: Star Trek & Spaceflight
http://www.thespacereview.com/article/506/1

Mail For MMM

11/17/05 **re: Lunar Prospector: Against All Odds**

I am impressed by Dr. Alan Binder's competence, and ability to launch a wildly-successful space mission at an unbelievably low cost, but there is one statement in his review of his own book in the Moon Society Journal [MMM #188, p. 9.] that I think is worth commenting on.

Binder's article says that the Lunar Prospector "succeeded in demonstrating the 'commercial viability' of lunar exploration," and, somewhat later, stated "Lunar Prospector's success in demonstrating that lunar exploration can be done inexpensively as commercial venture."

Unfortunately, Lunar Prospector ended up proving exactly the opposite. Despite being a well-conceived mission, clearly focussed on an interesting task of critical importance to exploration and colonization, despite being incredibly low in cost, and with a topnotch team that was creative, competent, and cost-cutting... in seven years of trying, Binder's team *couldn't* find commercial or philanthropic support. In the end, despite being conceived as a private effort, the mission wasn't able to fly until they asked for money from NASA.

Lunar Prospector is a cautionary tale. It's easy to propose a private lunar effort, with no government involvement. It's harder to actually do it.

Which shouldn't be seen as a criticism of Binder, or his team: when it counted. *They did what worked!*

Geoffrey A. Landis
http://www.sff.net/people/geoffrey.landis

Note: Both Geoffrey Landis and Alan Binder are now Moon Society Advisors. www.moonsociety.org/about/advisors.html

Attention MMM Readers

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so IF your address changes, and you want your MMM to follow,

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If your copy of MMM is late,

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The National Space Society's 25th International Space Development Conf.

Los Angeles – May 4–7, 2006*

Co-hosted by The Planetary Society**

http://isdc.nss.org/2006/

Sheraton Gateway Los Angeles

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6101 West Century Blvd, Los Angeles, CA 90045
Phone: 310-642-1111 Fax: 310-645-1414
The hotel is at LAX - free shuttle

**Three weeks before the customary Memorial Day Weekend slot, and the earliest that ISDC has been held since '87 when it was held the last weekend in March in Pittsburgh.*

*** This is an historic event in NSS-TPS Collaboration. Previously, The Planetary Society had sponsored a half-day seminar at ISDC '89 in Chicago. An effort to cosponsor ISDC jointly with the Mars Society, the event to serve as the Mars Society Annual Convention as well as the ISDC, failed when the two Societies could not agree on dates.*

Looking Ahead:

• ***Gala Celebration of the dawn of Space Tourism***, on Thursday night, in partnership with the Space Tourism Society. All three space tourists, Dennis Tito, Mark Shuttleworth, and Greg Olsen, will be invited to attend, as well space tourism entrepreneurs.

• ***Day-long Space Venture Forum***, in cooperation with the Venture Forum, bringing together top leaders from venture capital, internet business, space entrepreneurs and media to discuss the future of the industry.

• Special screenings of the all-time top space films

Tours:

□ NASA-Caltech Jet Propulsion Laboratory (JPL)
□ The future Mojave Spaceport
□ The Vandenberg AFB Launch Facility

Registration: Online Registration now available!
Conference registration fees are as follows:

Early Bird	Preregistration	At Door	Daily	
Member/Cosponsor	$ 75	$100	$125	$45
Join both organizations	$ 95	$120	$145	$65
Nonmember	$100	$125	$150	$55
Student *	$ 25	$ 35	$ 50	$20

Visit the ISDC 2006 website above:

For the latest on programming, tracks, workshops, speakers, meal functions, tours, and hotel registration rates.
[None of this information was available at print time.]

Note: Local Volunteers needed. This event is currently not supported by any of the California NSS chapters. The last two ISDCs in California were ISDC 2003 San Jose, and ISDC 1990 Anaheim, and the 1st ISDC, 1982 Los Angeles.

Whenever possible the annual ISDC is hosted by a local NSS Chapter. Exceptions have included 1994 Toronto (The Canadian Space Society) and 2001 Albuquerque (AIAA)

ISDC 2007 is slated for **Dallas** and will be hosted by the NSS North Texas chapter at the Intercontinental Hotel. You can follow their conference planning at:

http://nssnt.org/ISDC2007

9th International Mars Society Convention

August 3–6, '06 L'Enfant Plaza Hotel, Washington DC

A unique opportunity for those interested in Mars to come together and discuss the technology, science, social implications, philosophy and a multitude of other aspects of Mars exploration. Highlights of the convention will include latest results from the *Spirit*, *Opportunity*, *Mars Express, and Mars Reconnaissance Orbiter* missions now exploring the Red planet, as well as reports from the 7th field season of the Devon Island Flashline Mars Arctic Research Station, and the 5th season of the Mars Desert Research Station. Extensive political discussions / planning meetings on how we can turn President Bush's announcement of a new space policy into a real exploration initiative that can get humans to Mars in our time. A wide assortment of panels and debates concerning key issues bearing on Mars exploration and settlement, a banquet with lots of fun entertainment, and plenary addresses from many prominent leaders of the effort to get humans to Mars.This year's conference should be the most exciting event to date.

Conference Sessions

1. The Search for Life on Mars
2. Latest Findings from the Mars Probes
3. Plans for the Missions of 2007 and 2009
4. The Cross Contamination Threat - myth or reality?
5. Concepts for Future Robotic Mars missions
6. Piloted Missions to Mars 7. Advanced Propulsion
8. Launch Vehicles for Mars Exploration
9. Long Range Mars Mobility 10. Life Support technology
11. Biomedical /Human Factors Issues in Mars Exploration
12. Options for Producing Power on Mars
13. ConstructionMethods on Mars 14. In Situ Resource Use
15. Water on Mars – Accessing the Hydrosphere
16. Permanent Mars BaseConcepts 17. Colonizing Mars
18. Terraforming – Creating an Ecology for Mars
19. Analog Studies Relating to Mars Exploration
20. The Flashline Mars Arctic Research Station
21. The Mars Desert Research Station
22. The Mars Analog Rover project
23. The Translife Mars Gravity Mission
24. The Value of Mars Exploration to the Earth
25. Public Policy for Mars Exploration
26. Concepts for Privately Funded Mars Missions
27. International Cooperation in Mars Exploration
28. Law and Governance for Mars
29. Moonbase: Steppingstone or Stumbling Block?
30. The Significance of the Martian Frontier
31. Philosophical Implications of Mars Exploration.
32. Mars and Education 33. Mars and the Arts
34. Outreach Strategy for the Mars Society
35. Proposed Projects for the Mars Society
36. Open Mike Mars Literature Reading, songfest, gallery

Call for Papers: Presentations are invited dealing with all matters (science, engineering, politics, economics, public policy, etc.) associated with the exploration and settlement of Mars. Abstracts of no more than 300 words should be sent by May 31st, 2006 to: The Mars Society, P.O. Box 273, Indian Hills, CO 80454, or to: msabstracts@aol.com. (e-mail submission preferred.) **Conf. Registration Fees:** $150 for MS members before May 31st, 2006, $210 non-members. After June 1: $210 members, $270 non-members. Students & Seniors: $40 members, $75 nonmembers before May 31st, $70 members, $105 non members after June 1st.

Mars Express

MARSIS Instrument Detects Subsurface Ice

Sources: http://news.bbc.co.uk/1/hi/sci/tech/4479612.stm

www.esa.int/SPECIALS/Results_from_Mars_Express_and_Huygens/SEM7ZTULWFE_0.html

The MARSIS [Mars Subsurface and Ionospheric Sounder] radar experiment carried onboard appears to have discovered water ice 2km into the subsurface. [see MMM 145 May 2001, p. 6. "THEMIS & MARSIS"]

Many observers have suspected that the bulk of any water still remaining on Mars was to be found in underground reservoirs, as permafrost, or at lower levels where the temperatures may be warmer, as liguid water. Such places could harbor microbe ecosystems.

We look forward to the completion of the MARSIS subsurface water/water-ice mapping survey.

Venus Express

ESA Press Release N°50-2005 11/09/05 -*abridged by MMM*

Venus Express en route to probe planet's hidden mysteries

Venus Express is en route to an April rendezvous with the planet Venus, Earth's prodigal" twin sister. The craft is a near carbon copy of the Mars Express spacecraft orbiting the Red Planet since December 2003. It will eventually maneuver itself into orbit around Venus in order to perform a detailed study of the structure, chemistry and dynamics of the planet's atmosphere and its extremely high temperatures, very high atmospheric pressure, its huge greenhouse effect and as-yet inexplicable "super-rotation" (the atmosphere speeds around the slow-rotating planet in just four days.) The ESA craft will also be the first orbiter to probe the planet's surface while exploiting the "visibility windows" recently discovered in the infrared waveband.

The 1240 kg (2728 lb.) probe was developed for ESA by a European industrial team with 25 main contractors from 14 countries. It lifted off onboard a Soyuz-Fregat rocket from the Baikonur Cosmodrome in Kazakhstan.

The solar arrays on Venus Express are shorter than those on Mars Express, and interspersed with aluminum strips to help reject some solar flux to protect the craft from temperatures over 250°C.

Venus Express will endeavor to answer many of the still unanswered questions raised by previous missions. It will focus on the characteristics of the atmosphere, its circulation, structure and composition in relation to altitude, and its interactions with the planet's surface and with the solar wind at various altitudes.

Of seven instruments onboard, three are flight-spare units of instruments flying on Mars Express, two from comet-chaser Rosetta and two designed specifically for VE.

- **PFS high-resolution spectrometer:** measure atmospheric temperature and composition at varying altitudes. It will also measure surface temperature and search for signs of current volcanic activity.
- **SPICAV/SOIR infrared & ultraviolet spectrometer** and the **VeRa** instrument will also probe the atmosphere, observing stellar occultation and detecting radio signals; the former will in particular seek to detect molecules of water, oxygen and sulfuric compounds thought to be present in the atmosphere.
- **Virtis spectrometer:** map the various layers of the atmosphere and conduct multi-wavelength cloud observation in order to provide images of atmospheric dynamics.
- **ASPERA 4**, assisted by a magnetometer, will analyze interaction between the upper atmosphere and the solar wind in the absence of magnetospheric protection such as that surrounding the Earth (for Venus had no magnetic field). It will analyze the plasma generated by such interaction, while the magnetometer will study the magnetic field generated by the plasma.
- **VMC camera**: monitor the planet in 4 wavelengths, to exploit one of the "infrared windows" revealed in 1990 by the Galileo probe flying by Venus en route to Jupiter, making it possible to penetrate cloud cover through to the surface. The camera will also be used to monitor atmospheric dynamics, and to observe the double atmospheric vortex at the poles, whose origin remains a mystery.

Venus Express's findings will further constrain Speculation

How can the hell planet fit into a future in which Humans have made themselves at home throughout the Inner Solar System? Before Soviet probes revealed the oven-cleaning 850 °F plus surface temperatures and lung-crushing air pressure 90 times what we enjoy here on Earth, writers were free to imagine Venus as a steaming ocean world with a few islands, or as a world of vast deserts and super-tropical jungles. Once probes spilled the true dirt on Venus, science-fiction speculation screeched to a halt.

In a series of articles in MMM (1992, 1998, 2000), we tried to rehabilitate Venus as a future human destination. These articles are collected online at:

www.lunar-reclamation.org/papers/venus_rehabpaper.htm

Our speculations hinge on an expectation that the level just below the high cloud deck, at which height the surface of the planet should be generally visible, is also a level where both atmospheric pressures and temperatures are near what we can tolerate.

Venus Express findings may scuttle that expectation. But what we really need is a series of balloon probes to do actual readings *on location*, at various levels below the cloud deck. Our vision of aerostat outposts floating high above Venus, extracting raw materials from the atmosphere to make expansion modules will be vindicated in part or in full, or cruelly squelched. The truth is the truth! **‹PK›**

[coming soon to an IMAX theater near you]

IMAX: ***ROVING MARS*** (2006)

Distributor: **Buena Vista** Release Date: **January 27, 2006**

40 Minute Documentary Synopsis: Is there life on Mars? That is one of the questions posed by this IMAX film, which details the journey of ***Spirit*** and ***Opportunity***, the two rovers exploring Mars..

NEXT MONTH

The Next Issue of **Moon Miners' Manifesto** will be #192, to be published in February.

There be no **Moon Miners' Review** issue in January. We discontinued **MMR** last year to save printing and postage costs.

Instead, those of you with online access will be able to download volumes #7 & #8 of the **Moon Miners' Manifesto Classics** as free access **pdf** files.

(You do not need to have a Moon Society username and password to access them.)

This is part of our continuing effort to re-edit, reillustrate, and republish the classic articles from MMM's first ten years, Dec. 1986 - Nov. 1996 in a format that can be read on any computer, and printed out in color for your library. Each issue covers one full year of ten issues. This project is scheduled for completion in July 2006 with the publication of MMMC #9 & MMMC #10. Extension of the Classics project through #140 is being considered. That target could be met in July 2007.

Our next project will be creation of an **online keyword-subject hyper-index** to MMM back issues in their MMM Classics republication.

Also on our MMM Projects list is an **online Glossary of "MMM-speak"** – familiar words given new meanings; and new words coined for concepts that no existing word can be stretched to cover.

MMM Classics pdf files are online at:
www.lunar-reclamation.org/mmm_classics/

There is a direct link to this page from www.MoonMinersManifesto.com

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Have a Topic or Subject idea that you would like to see MMM take up?

Email kokhmmm@aol.com - *no promises!*

China & India in Hot Moon Probe *Race*

Source: Lunar Enterprise Daily

China's Lunar Orbiter on Schedule

Beijing, China: Ouyang Ziyuan, chief scientist of the first China Moon probe, **Chang'e-1**, sees no problems ahead for a 2007 launch **as early as the first quarter of 2007**. He noted that the Chang'e-1 project "has been going smoothly," with carrier rocket, probe, digital control equipment, launching site, and ground operations systems all "meeting the initial requirements and various technical indexes defined." Testing on the preliminary sample satellite is finished and development on the "formal" satellite is now underway.

The Moon probe project has undergone long prepa-rations and ten years of demonstra-tions and research. Chang'e-1 will be launched from Xichang Satellite Launch Center in south-western China via Long March 3A rocket

The orbiting probe is the first of three phases for the Chang'e Moon Program. The second phase is expected to occur between 2007 and 2012, during which a robotic soft landing on the Moon will be attempted. The third phase anticipated between 2012 and 2017 will involve collecting lunar samples, returning them to Earth. These phases will lead to a human lunar landing, in the 2015-2018 timeframe.

India's Lunar Orbiter on Schedule

Bangalore, India ISRO Satellite Center: **Chandrayaan-1** Lunar Orbiter Passes 1st Major Milestone, Says Project Manager Mylswamy Annadurai. "All the technical activities are picking up to initiate hardware realization to meet the **targeted launch schedule of September 2007**." ...The first major milestone has been passed in the form of Spacecraft Preliminary Design Reviews ... on 21 and 22 November in Bangalore, India with Principal Investigators (PI), Project Managers, engineers and scientists in attendance. Mini-SAR PI Paul Spudis, Moon Mineralogy Mapper PI Carle Pieters and SIR-2 PI Urs Mall were among 20 foreign delegates. India Foreign Secretary Shyam Saran recently co-chaired the 3rd meeting of the India-US High Technology Cooperation Group, which took place in Washington DC on 18-19 November. He credits the Next Steps in Strategic Partnership initiative with allowing the inclusion of Spudis and Pieters' USA instruments on Chandrayaan-1 even though they include sensitive information technology.

If you need to keep Up to Date with Developments around the World related to a Return to the Moon, you might want to subscribe to

http://www.spaceagepub.com/

Lunar Reclamation Society, Inc.

P.O. Box 2102
Milwaukee
WI 53201

www.lunar-reclamation.org

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

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Newsletter Mailing - Carol Nelson 414-466-2081

(*Board Members & Ken Paul < kenpaul@cape-mac.org >)

LRS News

• **Peter interviewed by BBC "on location" :** British Broadcasting Corp. TV (London, UK) is producing a documentary about the Moon, and hearing about the Moon Society's upcoming moonbase simulation exercises at the Mars Desert Research Station in southern Utah next February 25 - March 12, flew Peter and two other mission crew members to Salt Lake City on December 7th, wined, dined, and put them up overnight. The next morning, the three MDRS Crew #45 members drove down to MDRS with the BBC crew for videotaping on location. They returned to Salt Lake City and flew home on the 9th. For Peter, this was just in time for the annual LRS Holiday event the next day. This opportunity gave Peter and the other crew members to take pictures, measurements, and diagrams with which to better prepare their projects for the actual exercise in February/March.

LRS Upcoming Events – December, January

Saturday, December 10th, 1–4 pm

LRS Meeting, Mayfair Mall, Garden Suites Room G110
AGENDA: www. lunar-reclamation.org/page4.htm

Annual pre-Holiday Potluck & Classic Sci-Fi Film

Saturday, January 14th, 1–4 pm

LRS Meeting, Mayfair Mall, Garden Suites Room G110
AGENDA: 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.

U.S. CHAPTERS

NSS
Chapter Events
MMM
6 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**
December 17 – January. 21 – February 18

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/]

MN SFS News & Pictures

For those keeping score, **Ben Huset** has now passed the 7,500 units processed level in the **SETI@home** project. Here's hoping that in the New Year, one of the units Ben has processed will prove to contain a message from ET!

Ben will be joining the Moon Society crew at **MDRS** (crew #45) for the last week of their exercise, namely March 6th-12th. If the clouds oblige by staying away, the Moon will be well-poised for observation with MDRS' 14" Celestron, and Ben will help run a program that will allow students at home to pick features to look at, with commentary by the American Lunar Society on what they are seeing.

Nov 2005 Star Wars Theme Movie Nite Pics
http://freemars.org/mnfan/mnsfs/2005-Nov-Movie/

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@excel.net>
››› DUES: "SSS" c/o B. P. Knier
22608 County Line Rd, Elkhart Lake WI 53020

[http://www.tcei.com/sss/]

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

DEC15th The Stoelting House, **Kiel**
JAN 19th UW-Sheboygan, Room 6101, **Sheboygan**
FEB16th 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/]

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: January. 21 – February 18

Meeting location: For December, no formal meeting. We traditionally meet during the Philcon convention at the Marriott at 12th and Filbert streets, just west of the Reading Terminal Market. Usually on Saturday evening. Our next formal meeting is on January Twenty First.

November 19th Meeting Notes: Due to various commitments, ranging from starting a new business to going to relatives for the holiday of Thanksgiving to planning for Philcon, we initially had sparse attendance. Our potential new member, Ray Katz, had found us on our website and decided to check on our little band of advocates. Besides us, Dorothy and Larry had arrived and we began talking on the background of the group and Rays activities as an entrepreneur (Web development & marketing). Then Janice and Mitch, members, and Monte Davis, a previous guest, arrived almost simultaneously. Due to the nature of what followed we altered our format to allow the discussion that developed to proceed.

Monte is a writer in both print and web format with a long term interest in space exploration and , ultimately, colonization. We began branching off to this general topic from talk on bringing people in to our site and then our group. Both Monte and Ray began participating in this wide ranging talk with Ray adding in material on attracting "eyeballs" while we also discussed the problems of "going there," with Monte bringing much historical and practical detail on what has happened and where we may be going. Monte is doing research for a book on space advocacy and this is one of the reasons for his return to our meetings. Our "frank" discussion on what has worked and what may not (i.e.: the assumption of massive public support under even the "best" circumstances (the small possibility of a big rock maybe coming our way creating a selfish (my phrase) interest in space for the average public) and our past exercises in viewing what would happen, as opposed to what has.

Wide ranging discussions like this, with facts being the major components, are one of the reasons for our public meetings. Our particular group does not work directly on this goal for at this point but is more directed to our hope for the future. This was not a conscious plan on my part (I have been President for several terms) but we, as a group, have not drawn in many younger members. They tend to be the "doers" in most cases. This was pointed out during the conversation with Monte asking questions about those present and our memories. Most of us saw Apollo land and a number saw Allan Shepard's ride.

Of course, exceptions exist, but those members who would have altered the age curve were engaged elsewhere. But it is a fact that our members who are doing engineering, I.T., medicine and educational activities tend to not be in leading edge fields now nor are part of activities that directly contribute to the goal of a spacefaring society. We do have a few dynamic members and helping them, when needed, is one of the reasons for our formation. Supporting the future by promo-ting education is a worthwhile activity but is only part of what we should be doing. Monte and Rays presence and opinions where thought provoking and will benefit us I think.

Mitch Gordon brought material from NSS and The World Future Society that was gist for the discussion. The Fall issue of ***Ad Astra*** had a number of good articles with space based defense, or a resurrection of the same, produced several thoughtful reports. These included "All Along The Watchtower" on a revision of the Brilliant Pebbles" program and, on a more hopeful note, announcement of the competition that NASA is holding on extraction of oxygen from lunar soil. I pointed out that I thought such work had been done back in the 70s or early 80s by the

Space Studies Institute which had major conferences on space industrialization until *Columbia* burned up. I suspect that several authors in this publication could win this contest.

Mitch also brought ***The Futurist*** published by the World Futurist Society. The November / December issue included an article on "The Hydropolis Hotel" and Mitch likened it to the training facilities that astronauts use. This is to open in 2006. Monte and I noted that such undersea ventures where part of Marshall Savages' "Millennium Project" book. This place may be fun!

Dorothy brought in several things from ***National Geographic*** for November with a note on the discovery of an extra solar planet at 149 light years distance. This one is unusual in that it is in a three sun system.

Larry brought up the website and blog sites and what we can do to bring in people. This engendered much talk and continued after the main meeting. Larry appreciated the input and the offer to discuss what he is trying to do with Ray and others including Janice and Monte. Since the website is how Ray found us, it is useful. But the need for "attracting" content is part of our overall organizational problem we have. For now, this reaction to Larry's report may give us a spur that could draw those doers who start out as guests. Thank you Larry.

In the interest of time I did not verbally report on several things, two being related in a sense. From The ***Amsat Journal*** for September/ October there was a report on SuitSat which is a clever idea for both publicity and education. The idea was to use an old Russian space suit to carry some instruments, a slow scan camera, and communication gear that works in the amateur radio bands. This is to be launched from the International Space Station any time now! The other "out-vac equipment" article appeared in ***Nuts and Volts f***or November entitled The Well Dressed Astronaut by the author of the Near Space column L. Paul Verhage. This report starts with the very first flight suits, for Willy Post, trying for a 50,000 foot record, up through the needs of the crewmen who will go back to the Moon and those later Mars explorers. This is primarily an article on our suits with the last page (75) on the new Planetary Suit.

Much other good material here and, finally, from ***High Frequency Electronics*** in the October issue, starting on page 28, a report on "Recent Activity in Satellite Technology and Applications" including interesting facts like the Department of Defense let secret spy satellite images with high resolution be used for hurricane emergency work. There was also a report on the then upcoming Tether climbing competition that NASA sponsored. This was also noted in ***Popular Science*** in October. That article includes a listing of competitors and design details. Page 40.

All until next year, submitted by Earl Bennett

[And thank you, Earl, for reporting so thoroughly on your busy Chapter's many activities! From the MMM Editor]

CALI FORNIA

OASIS: Organization for the **A**dvancement of **S**pace **I**ndustrialization and **S**ettlement
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

[http://www.oasis-nss.org/]

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.

December 10 – January. 21 – February 18
Information: OASIS Hotline, 310/364-2290; website.

Upcoming Events

- **Sat. December 10th, 3 pm –** OASIS Monthly Business Meeting at the home of Bob Gounley and Paula Delfosse, 1738 La Paz Road, Altadena. Call the *OASIS Hotline,* 310/364-2290, for more information.
- **Sat. December 10th, 6 pm –** OASIS Annual Holiday Party at the home of Bob Gounley and Paula Delfosse, 1738 La Paz Road, Altadena. Call the *OASIS Hotline,* 310/364-2290, for more information.

Looking Ahead

- **May 4–7, 2006** -- International Space Development Conference (ISDC), the annual meeting of the National Space Society, Sheraton Gateway Hotel, Los Angeles. The theme for the conference is Exploring Together. More information at http://isdc.nss.org/2006/ or contact us by email. oasis@oasis-nss.org

Recuring 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/.

Note to readers:

As OASIS does not publicize its events on its website more than a few weeks in advance, we regret that we cannot give you advance "heads up" on upcoming events in the month or two ahead. Do consult the website for the latest information. - The MMM Editor

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❍ **$45 National Space Society** dues includes **Ad Astra**
❍ **$20** NSS dues if under 22 / over 64. *State age* ___
600 Pennsylvania Ave SE #201, Washington DC 20003

Moon Society dues include **Moon Miners'Manifesto**

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- **Hardcopy MMM**: U.S. & Canada **$35** Elsewhere: **$60**

P.O. Box 940825, Plano, TX 75094-0825, USA

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Member Dues -- MMM/MMR Subscriptions:
Send proper dues to address in chapter news section

=>for those outside participating chapter areas <=

❍ $12 Individual Subscriptions to MMM/MMR: Outside North America ❍ $50 Surface Mail -- Payable to "LRS", PO Box 2102, Milwaukee WI 53201

CHICAGO SPACE FRONTIER L5
❍ $15 annual dues

LUNAR RECLAMATION SOC. (NSS-Milwaukee)
❍ $15 reg. ❍ $20 family ❍ $12 student/senior

MINNESOTA SPACE FRONTIER SOCIETY
❍ $25 Regular Dues

OREGON L5 SOCIETY
❍ $25 for all members

O.A.S.I.S. L5 (Los Angeles)
❍ $25 regular dues with MMM

PHILADELPHIA AREA SPACE ALLIANCE
❍ Annual dues for all with MMM $25, due in March or $6 times each quarter before the next March

SHEBOYGAN SPACE SOCIETY (WI)
❍ $15 regular, ❍ $10 student,
❍ $1/extra family member

"SSS" c/o B. P. Knier, 22608 County Line Rd, Elkhart Lake WI 53020

Moon Miners' MANIFESTO

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