"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: Shuttle design choices undercut success from the outset

NASA built us an "all-purpose" Shuttle that had state of the art cryogenic engines. But it was not the vehicle envisioned by von Braun, whose plan had been hijacked and contorted by congressional compromises. The cost/benefit ratio of the complex SSME and tile technologies were not justified, moreover, and ended up kicking us in the ass, for seeking beyond state of the art engineering and design, instead of cheaper, *more reliable, more reflyable second best alternatives*.

We were promised a vehicle that was "reusable." That was a considerable stretch of the truth , a Trojan Lie, if you will. We got a vehicle that was "overhaulable" *given ten thousand man hours*. Congress is to blame for giving us the ET-SRB booster system, instead of a manned reflyable booster such as von Braun had envisioned. Pennywise, and gigapounds foolish. Why should that not be called treason?

Wisconsin Senator William Proximate loomed as NASA's sharpest critic. We literally hated him back then, for claiming the Shuttle would be more costly, by a appreciable amount, than continuing to rely on proven expendable boosters. We were all so sure it would be much less expensive, as von Braun promised. But Proxmire would be proven right, all because Congress itself changed the plan.

There is nothing that can be done about what happened except to learn our lessons, lest we be condemned to repeat the same chain of mistakes. Government is government is government, however. And NASA, despite all the brilliant and well intentioned people who work for it with great dedication, is still, well ... "government."

We can get back into space, and back to the Moon "and beyond" la de la, much sooner via NASA than through private enterprise. Deep pockets trump! But, as in the past, it won't be to stay. Not because of NASA but because the government, by its very nature as a public creature, does not have staying power, and never will.

We'll get there one day, slowly and humbly, and to stay; but it will be on the backs of those who have a stake in the new frontier, pioneering enterprises and pioneering individuals. Meanwhile, Michael Griffin's new plan would use existing shuttle system components to get humans back to the Moon sooner and less expensively, but without any commercially designed and built components. Nor does Griffin's plan call for a heavy lift cargo launcher, shuttle-derived or commercial, which will be needed to launch habitat modules for any real moon base, temporary or "permanent." Griffin offers us an Apollo Sequel. [⇒ p. 2, col. 2]

Refueling "off the land," Mars Gashopper Flies

When the December 2004 flight over Mars' Grand Canyon by NASA's Mars Plane, the Kitty Hawk was canceled in the wake of recent probe failures, we mourned. But that would have been one short flight. Now Robert Zubrin's company has test flown a craft that can land, refuel itself from Mars' atmosphere, and take off again to explore other places, indefinitely! See the report on page 14.

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.

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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.

Where should we go from here?We *are doing the right think by separating human and cargo transportation!* If we go with a new manned vehicle that does not use the External Tank, the development of a new Crew Vehicle to be coupled with existing "safe" boosters seems the logical way to go. But both the crew vehicle and the boosters should be open-sourced. Let NASA decide the interfaces, but let the components be decided by enterprise and market place.

Griffin wants a NASA-designed crew cab to be coupled to NASA's existing SRB in a stretched version. Both can be fallback choices -- *if private enterprise does not rise to the occasion* and come up with alternatives with greater capacities, less cost, more safety, more reliability, and quicker turnaround. *NASA vehicles should be a last resort.*

Meanwhile, it is plain stupidity not to build upon existing space shuttle system components to build up a family of cargo-only shuttle derived vehicles. We need a fallback heavy lift vehicle, and the components are mostly off the shelf. Without a heavy lifter, we may be able to return to the Moon, but without the components needed to build an outpost. We'd only be returning to plant a new set of footprints. And that's all Griffin's new plan can offer.

Face it! *NASA can only do what it already knows how to do. And that isn't what we need.* NASA should gather knowledge, develop new technologies, and explore. Private Enterprise and Space Commerce and Space Tourism should build upon NASA's technological pioneering in an open-source manner -- if what we truly want is an "open-ended" human "civilian" presence on the Moon and Mars.

Those readers who grew up after Apollo will not appreciate these remarks. They are encouraged by the new Moon, Mars & Beyond vision. We are not. Even at best, all it would do is produce an Antarctic style presence on the Moon, not resource using settlement. Indeed, by lulling most supporters into unjustified optimism, the NASA plan will work to discourage private enterprise initiatives. In that sense, the current initiative may be worse than no NASA initiative at all. "We don't have to keep agitating. We have won!" wrote one reader in response to the Bush plan.

Alas, we're just being duped into laying down our arms. Without increased activism, aimed at getting NASA to adopt the open-sourced commercial route *and to build an outpost with a mission to grow increasingly dependent upon local resources* (not with a mission to do more scientific curiosity itch scratching) we will betray our own dreams. Let us not be Benedict Arnolds to our own dreams! PK

With regret, we decided to cut back this issue to 16 pages in order to avoid even further delays in its publication. The editor has been handicapped with a number of distractions in the past six weeks, leading to this short and tardy issue. - **PK**

"XITIES" Continued

2 more analogies bring home the differences between terrestrial Cities and Xities out there

[Settlements beyond Earth will be radicallly different meta-institutions from cities on Earth because they must create, incorporate, and maintain a biosphere that city-dwellers and city-fathers take for granted on Earth. We use *a divergent term* to refer to them: Xities, pronounced *Ksih* ties]

For more, read the original series of articles on Xities, just republished in MMM Classics #6, a freee download from www.lunar-reclamation.org/mmm_classics

And refer to the articles on this topic in last month's issue.

Desert Oases & Xities "out there"

The Arid, Barren Desert as a metaphor for vacuum or unbreathable atmospheres

by Peter Kokh

Definitions:

Desert: 1 a : arid land with usually sparse vegetation
2 *archaic* : a wild uninhabited and uncultivated tract
3 : a desolate or forbidding area

Oasis: 1 : a fertile or green area in an arid region (desert)

Comparisons: 1. The Desert

By a "desert", we commonly mean a barren and arid expanse of land of rock and sand. But the term is also used to refer to ice sheets that experience negligible annual precipitation and similar ocean expanses where life is sparse.

For our purposes, a desert is an area in which the biosphere life support system is thinner than that in the areas where most people live. Aqueducts, canals, and irrigation may be needed needed, except along rivers and wadis and where underground aquifers are close to the surface, sporting springs around which life is more abundant: oases.

Thus the desert is a soft analog of the vacuum of space, washing airless worlds like the Moon. It is also an analog of thin and/or unbreathable atmospheres, such as exist on Mars, Titan, and Venus. In other words, the desert is a weak analog of the conditions space frontier settlements will face: a need to provide an island of life-support, where not provided by the host environment at large.

Other Similarities

On the Moon, as in the desert, temperature ranges between day and night are exaggerated. Passive technologies to cool living spaces during the day and warm them at night are useful. Structures are designed with shade in mind. Shade walls are more effective away from the equator. Active cooling and heating under these conditions is very energy-consuming, and called for only where energy sources are abundant, as will be the case on the Moon.

On Mars, there is also thermal exaggeration, as without thicker moist air and vegetation, what little heat is gained during the Martian day (and summer) is quickly lost during the night (and winter.) Conserving heat, and banking it for future use will be important technologies. Insulation from the cool, cold, bitter cold and beyond will be essential.

The Xity is better prepared to conserve and moderate thermal flow than smaller outposts and isolated structures or individuals out in mars suits. Mars thin air provides little of the UV protection that is afforded by Earth's atmosphere. A terraformed Mars with vegetation out in the open is unlikely unless a thicker atmosphere is also UV-blocking. But no free oxygen, no ozone.

Comparisons: 1. The Oasis

On Mars, we have the opportunity to place settlements near underground water reserves. Once (and if) ESA's Mars Express MARSIS instrument successfully maps subsurface water sources on the ocher planet, we will have a good idea where we can create Martian Oases.

On the Moon, hydrogen is everywhere in low but retrievable concentrations in the form of protons from the incessant solar wind adhering to the fine particles of the regolith rock-powder blanket. But some types of regolith may prove to have adsorbed more hydrogen (literally, the water maker) than others, the dark, iron-titanium rich ilmenite soils in particular. Some consider the lunar poles the ultimate lunar oases, but while Lunar Prospector findings do indicate these areas as richer in hydrogen (presumably water-ice particles), the abundance may be only three times the concentration as in areas farther from the poles. Given the engineering difficulties of harvesting and refining such resources, and accompanying dangers to personnel in horizontally-lit terrain with very long shadows, the gain is low.

The Xity as an Oasis in a Desert

On Earth, oases are to be found in many desert areas. Water is available through rivers on the surface, or just below. Oases come small and quite large, up to many tens of thousands of square miles, the largest being the Okavango Delta in Botswana, n South Africa.

T he oasis is alive and teeming with vegetation and people. The desert is *relatively* dead and empty. But while there is some resemblance to the Xity, a strange entity in a strange land, the partial wall between desert and oasis just dimly prefigures the complete containment-hull we will need on the Moon and elsewhere humans settle . Terrestrial oases and the surrounding deserts are both *within* our biosphere, sharing air, light, energy, and life along the margins. An Oasis may have a richer flora and fauna, but this is given, not something the oasis fathers had to provide.

Out there, the Oasis Effect will be total. Nonetheless, the comparisons are useful. It will be surprising if the pioneers do not borrow many names and terms to fit their situation. In so far as the oasis is fragile, and its environmental sensitivities need to be paid maximum respect, it remains a useful analog of the space frontier xity. **<MMM>**

Polders & the Space Frontier Xity

Farm & Village Polders "Reclaimed" from the Sea as a Metaphor for Xities beyond Earth's Biosphere

by Peter Kokh

Readings from Back Issues:

• MMM #38 SEP '90 pp. 10-13 "POLDERS: a space colony model" by Marcia Buxton, republished in MMM Classics #4, download: www.lunar-reclamation.org/mmm_classics
• MMM #110 NOV. '97, p 3. "RECLAMATION is a Xity's Charter Function" by P. Kokh

Definitions:

Reclamation: 1. The transformation of waste, desert, marshy or other barren and for agricultural or other life-supporting use. **2.** The process of deriving usable materials from apparent waste.

Polder: (Dutch): a tract of low land (in the Netherlands) reclaimed from a body of water (as the sea)

Map of the Netherlands, showing two polders created from the sea in the past century: 1 Northeast Polder, 2 Flevoland, 3 Markerwaard (not built). These lands, as many other areas nearby, are below sea-level and protected by dikes, with rain water pumped out by windmills. The Netherlands is a densely populated country. The need for land is critical.

The Zuider Zee was a large body of water in north-eastern Holland. It was originally a lake, but heavy flooding joined it to the North Sea. A dike created the southern part, called the Ijsselmeer, where reclaimed land is used for agriculture.

Precursor for the Space Frontier Xity

In several respects, the Polder may be the closest analog and precursor of future xities beyond Earth. They embody a containment wall, the dike, that keeps the life-hostile outer surface environment at bay. The dikes must be vigilantly maintained, lest the insistent sea spill in and flood the low-lying areas that have been reclaimed from the shallow seabed that was there before. In the case of the polder, the pressure is outside and to be resisted and controlled. In the Xity, the pressure is from within, the life-supporting air that would leak outside to be lost forever. In both cases, polder citizens and space frontier xitizens must maintain a high state of vigilance. Survival against what lied without is always at stake.

Inside both are farms and one or more farming villages. The dikes are not for cities, but for farming villages and their farms. In contrast with the sea of water, or the sea of vacuum or unbreathable air outside, both the polder and xity zealously guard their dike/hull protected island of life.

That other symbol of Holland (the area of the Netherlands between the Ijsselmeer and the sea) is the Windmill. This passive, wind-driven pump lifts pooled rainwater and leach-water up over the dike into the sea or sea-feeding streams and canals. The xity will have its radiators, which take excess solar input leaking inside, and dumps it back out into the void above the lunar surface. Airlocks will be designed to minimize oxygen and nitrogen losses through repeated cycling. Loses need to be made up with fresh reserves processed from the dust

Towns in the polders tend to be small. Almere is the biggest, nearing 200,000. The polders were built to increase farmland, not rural settlement. In that respect, too, they prefigure the space xity, which must maintain a high ratio of vegetation to human life in order to be viable long term.

Reclamation

The Dutch, however, have made "reclamation" a national pastime. Nowhere else has the reclamation of wastelands or areas lost to the sea been practiced on such a wide scale, in so determined a way. Keeping the sea out (vacuum or unbreathable atmosphere analog) and plants, animals and humans safe from inundation (analog of decompression) requires both vigilance and a matrix of good habits. The result is human living space where none had existed before. Terms and symbols from dike and polder lore will find there way to the Moon and beyond. **<MMM>**

Mail For MMM

Two much vegetation can be as bad as too little

From Larry J. Friesen 9/08/'05.

I have read your two articles "Xities" and "Outpost vs. Xity, Two Very Different Games and Mindsets, the Implications for Agriculture" in Issue # 187 of MMM. I would like to offer some comments for the correspondence section of MMM. Much of what you write is on target, but with respect, I would like to offer a different point of view on one aspect of the agricultural situation, and try to explain my reasons why.

The tone of both articles seems to be that more [plants] are always better. If that understanding is correct, I respectfully disagree. I believe that it is possible to have too much, even of a good thing.

When I consider mass balances, it seems to me that if you have too many plants, they will produce more oxygen than we and whatever animals we bring along can consume. Even if we find ways to dispose of the extra, and I'm sure we can, too many plants may require more carbon dioxide than we and the other animals in a settlement on the Moon or Mars or an asteroid can provide. Perhaps the deficit will not kill the plants, just slow down their metabolism, but that will negate whatever benefits might have come from having the extra plants on hand.

It is true, as you wrote, that the plant biomass on Earth is many times larger than the human biomass. But remember that on Earth, the plants support an entire ecosystem, with many kinds of organisms, especially animals and fungi, not just humans. Even with our overpopulation today, humans do not make up the majority of Earth's animal biomass.

Furthermore, on Earth, any surpluses of biologically produced chemicals, whether oxygen, carbon dioxide, methane, or whatever, will eventually be recycled by geochemical processes, even if not by biochemical processes, on a sufficiently long time scale. But geochemical processes will no more run by themselves in an extraterrestrial settlement than will the ecosystem.

In a system as large and diverse, and with as many buffer systems as Earth has, we dare to depend on geologic cycles that may take thousands or even millions of years to complete. I don't believe settlers of the Moon or Mars can wait that long.

I think what we want to strive for, in the long term, is a balance. We want to grow enough plants to produce enough oxygen and food for the human colonists and whatever animals they bring, whether as livestock, as pets, as agricultural assistants (earthworms, for example, to help convert lunar regolith and recycled wastes into fertile soil), or to populate the "middoors" areas, plus supply oxygen for whatever useful fungi the settlers decide to bring. The idea is to produce the right amount of oxygen and consume the right amount of carbon dioxide, at least to first order, and at least over the long term.

As an aside, we may want to think carefully before turning loose too many animals into the "middoors". At least until we have figured out how to insure that, for instance, pigeon or squirrel droppings get recycled through the settlements ecosystem.

I would agree that an agricultural system for a long-term settlement needs to be larger, more diverse, and more robust than is often assumed. But more will not always be better, and it will be possible to have too much, even of green plants.

Sincerely,

Larry J. Friesen

EDITOR'S COMMENT: While it is true that by natural biological cycles, "too many plants may produce more oxygen than we and whatever animals we bring along can consume" and that "too many plants may require more carbon dioxide than we and the other animals in a settlement ... can provide," we are not obliged to rely on natural cycles alone.

Waste biomass can be processed in both biodigesters and compost piles to produce methane. Cf. our article, METHANE MMM #40, November 1990 Reedited and reprinted in MMM Classics #4 pp. 68-69, available in pdf format as a free download from

http://www.lunar-reclamation.org/mmm_classics/

In this article, we noted that "Methane is comparatively clean-burning in air (79% N2) so far as Hydrocarbon emissions and Carbon Monoxide are concerned - Nitrogen oxides are still a problem. So if we burn it instead with pure Oxygen stored in a tank just like the Methane, this will give us a Nitrogen-free combustion environment, an engine that exhausts only water steam and Carbon Dioxide needed by vegetation. Nor will that mean too much CO2.

"By taking the pains to produce compost, we are left with a fuel which can be used to run agricultural equipment - at no extra expense - dumping its CO2 rich exhaust into the farm areas right where it is needed. As far as this writer knows, there are no existing engines that burn Methane with tanked Oxygen. However, we will be developing them anyway for Mars applications, as it is the ideal fuel for that environment.

"Such engines could run plowing, tilling, harvesting, processing and drying equipment etc. They could also be used to generate extra heat needed in nightspan. Why not be the first to develop such an engine in your garage?"

In short, we have the means to address any such surpluses that might occur from "too many plants." But my main point is that there is far more danger that we will grow too few plants to support the biosphere, not too many. **<PK>**

Zero-Mass Products & Services

as a Major Part of a Lunar Frontier Economy

by Peter Kokh

At the Planetary & Terrestrial Mining Sciences Symposium in Sudbury, Ontario last June, we had the pleasure of meeting Klaus P. Heiss. Our initial misgivings based on his well-known support (on highfrontier.org) of Star Wars Space Defense initiatives, quickly gave way to respect and admiration for his clear brilliance and command of the issues involved in opening up the Moon.

Klaus correctly points out that the Lunar Settlements will not pay their bills (for imports) with material exports to Earth's surface. First, most anything that can be made on the Moon can be made here on Earth - with the rule-proving exception of Helium-3. Transportation costs will make "competing" lunar products anything but competitive, let alone an add on for amortizing the capital equipment needed for their manufacture on the Moon. The frontier will need to concentrate on "Zero-G" massless products. Among these he lists the following:

- **Information:** 40%+ of modern economies are based on information flow, not product flow.
- **Communications**
  - C-Band, Ku-Band, LEO-HEO-GEO
  - GPS, Navigation
- **Observations**
  - Earth Resources, Environment, Weather, Climate
  - Solar System, Milky Way, Galaxy
- **Energy: Enabling Resource**
  - Solar: Lunar Solar Power Arrays, Solar Power Satellites constructed of lunar materials
  - Nuclear: Fission, Fusion, He3

Non-terrestrial markets for lunar physical products

While the importance of massless products as a mainstay of the lunar economy is not disputed, Klaus (and others) overlook(s) the possibility that the main market for physical products made-on-the-Moon will be not current consumers on Earth's surface but those in other off planet markets that will arise during the same time frame as lunar settlements: In low Earth orbit space stations, orbiting manufacturing facilities and laboratories, in orbital tourist facilities and hotels; even the outfitting of space craft meant to ply the space lanes without ever landing on Earth; markets on Mars and its Moons, and out in the asteroids.

For these markets, anything the lunar settlements are able to produce for their own domestic consumption in place of expensive imports from Earth, can be competitively marketed to other concentrations of people in space at a transportation-cost advantage over similar products made on Earth's surface. Building materials, furniture, utility systems, even food products may come under this heading. We simply cannot and must not forget that the lunar settlements will not develop in a vacuum!

Additional Categories of Zero-Mass products & Services

In addition to those listed by Klaus, we feel the following product & service sectors will play a major role in the buildup of the lunar economy.

- **Virtual Tourism:** Teleoperable rovers can provide backgrounds for movies, electronic games, racing, and plain tele-exploring. The user on Earth will pay for the use of the equipment on the Moon to pursue his/her interests and curiosities. There will be major advances in Virtual Reality technologies to support this.
- **Virtual Employment:** Persons on Earth will take care of the many paperwork and bureaucratic tasks for lunar settlements, including tech support, analysis, and even teaching, freeing pioneers on the Moon for those duties that cannot be tele-outsourced and which more directly support the production of products for export.
- **Real Tourism:** the first lunar tourists will simply swing around the Moon without landing. This will be followed by self-contained landing excursions. Next will come landers visiting modest surface facilities, supporting short overland excursions. As settlements arise, income from tourists from Earth will rise significantly, as costs fall.
- **Archiving:** Lunar lavatubes, those intact have been intact for 3.8 billion years, are the most ideal locations in our solar system for archiving anything we want to outlast our own current civilization. The cost of archiving records and historical artifacts, genetic materials, samples of flora and fauna from around the world, paleontological fossils, and other "Ark" services, etc. will be worth it as there is no comparable alternative. The lavatubes provide vacuum, controlled low temperatures, dust-free environment, virtually no maintenance costs. Placement could be done robotically or tele-robotically, as could retrieval. In addition to public records, personal memories and memorabilia and time capsules could be so preserved for billions of years to come.
- **Technology Licenses:** Lunar settlements will develop biospheric know-how and methods because they have to. This know how will not be developed on Earth because we are not "under a similar gun." But once created, this know how along with other technologies developed on the Moon, will be a zero-G export category of significance. Lunans will develop new materials (e.g. glass composites), new alloys (making do with alloy ingredients available on the Moon - along paths unexplored on Earth), new production methods, etc. - all because they must: many materials used on Earth cannot be produced on the Moon, and methods used on Earth cannot be used on the Moon.

In short, those who can see no economic future for lunar settlements exhibit a major lack of imagination. The opportunities for making money on the Moon are abundant, and I am sure that those listed above will be proven to have just scratched the surface. **<MMM>**

Carved Basalt

by Peter Kokh

In a number of past articles through the years, we have talked about art forms that might be available for Lunan Pioneers, supportable by materials processed locally on the Moon. The Moon will not be a source of granite, marble, soapstone, sandstone or other materials favored through the ages by sculptors on Earth. Without an economical source of copper, brass, bronze, and pewter will not be available media. But Lunan sculptors, we noted, could work with concrete, glass, and various metals. Art du Jour temporary sculptures could be created by children from various garden stuffs. More recently, we introduced AAC, autoclaved aerated concrete, as a possible medium.

All this time we were ignoring an obvious sculpting material abundant on the Moon: basalt. Basalt has been carved into objects small and large throughout the ages by many peoples. Basalt carving continues today, with newer tools such as titanium tipped chisels and various abrasives. Now we had indeed written about "cast basalt" as a hard durable material that could be shaped into all sorts of useful and decorative items. But casting and carving are two different things.

The lunar maria or seas consist of congealed lava flows: basalt. But all available surface basalt has been pre-pulverized to several meters down by repeated meteoritic bombardment. That is why the use of basalt as as a carving material never occurred to us; we thought only of casting it.

But significant quantities of non-pulverized, non-fragmented basalt should be available for quarrying from the walls of the numerous lava tubes to be found below the surfaces of the various maria. Lavatubes are a natural feature formed by the way the lava sheets flowed across the lunar surface, filling the major nearside impact basins.

We did a Google search on carved basalt and on basalt carving methods and tools. This is indeed a promising medium for future pioneers, one that will yield many decorative objects for frontier homesteads. Perhaps more importantly, carved lunar basalt items could become a significant source of export income for the settlements.

To see for ourselves what promise this material holds, we ordered a 3" Scarab of basalt carved in Egypt, for about $30 plus shipping. This item will be on display at the next Lunar Reclamation Society Meeting on October 8th.

The Moon Society

JOURNAL

http://www.moonsociety.org

Please make NEWS submissions to KokhMMM@aol.com

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

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

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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!

Project Guidelines that Lead to Success

by Peter Kokh

Continuing the Discussion Begun in last month's issue, MMM # 187 August 2005, page 12, "Proposing a Project: Fully 'Homeworked' Proposals are more welcome!"

It may be helpful for Moon Society leaders and members to look at published project guidelines used by other organizations with a good record of achievement. We have two organizations in mind.

Space Frontier Foundation's "Frontier Enabling Test"

"Our definition of a "frontier enabling" technology or policy is one which has as its effect the acceleration of the creation of low cost access to the space frontier for private citizens and companies, enables or accelerates our use of space resources, and/or accelerates the rate at which wealth can be generated in space. In other words, is the project or policy going to provide a return on the national investment, if we define "return" to be the econo-mically sustainable human habitation of space?"

[bottom of: www.space-frontier.org/Policies/frontieragenda.html]

I propose that with minimal modification, the Moon Society adopt this test for our own guidance. A project can be exciting, promise a lot of publicity, etc. - *but will it help us get where we say we are headed?* If not, it is *probably* a waste of our manpower, our money, and our energies.

We must ask, will this project advance the day when we return to the Moon to stay? Or will it increase public support for such a development? It does not matter if it is an educational outreach or display project, a publication project, an artwork project, footwork for a research and development project, a software project, agricultural project, or on and on - *as long as its major effect is to advance our cause* . It is not hard to come up with a list of projects by various space organizations and/or by their chapters who have not met this test.

The Lunar Frontier Enabling Test should be our first project proposal filter.

Mars Society Canada Project Guidelines

"Project proposals must meet certain requirements:

- relevancy to the MSC mandate,
- technical merits,
- viability of the project plan,
- self-sufficiency of the project participants, and
- potential for drawing in greater member participation.

No fixed proposal format, but proposals must outline

- the project goals,
- strategies,
- tactics, and
- timeline of tasks, as well as
- project management and
- funding issues

[Mars Society Canada Project Guidelines Cont.]

Detailed specifications for technology development proposals are not necessary, though a general sense of your development plan would be welcome. Proposals that require no more than a few hundred dollars in start-up support will be favored. If further fundraising is necessary, strategies for doing so should be specified in the project plan. Keep your proposals to 5 pages maximum.

Mars Society Canada has undertaken some ambitious and respectable research & development projects in connection with its missions to the Mars Desert research Station in Utah, the most recent being MDRS Crew #30, Nov. 26 - Dec. 12, 2004, "Expedition Alpha"- see:

http://chapters.marssociety.org/canada/expedition-mars.org/ExpeditionAlpha/journals/

Defining "Project"

Gail Leatherwood, NSS Chapters Projects Coordinator, defines a project as "something that

- has a specific objective
- is measurable and attainable
- has a beginning and ending
- and has some quantifiable outcomes

Projects and You

If you would like to help the Moon Society identify, brainstorm, and "homework" a project idea that you think can meet the tests and constraints sketched above, why not print out this page, along with page 12 of last month's issue, and keep them handy for guidance.

Keep in mind that we need to do two things:

□ find (a) project(s) that are right for us
- a good match for our personnel resources
- a good match for our talent pool
- a good match for our financial capacity
- and above all projects that pass the Lunar Frontier Enabling Test

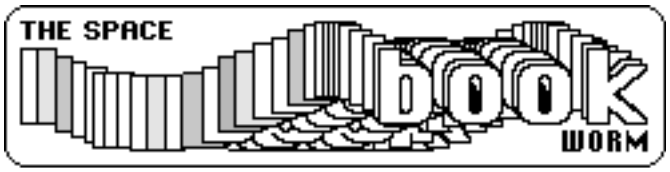
□ Define all the steps and requirements to make the project successful

But yet, ...

A good project must not be beyond our *exercised* abilities. That means that even though a project reaches beyond our past levels of achievements, it does so in a way that brings out capacities we may not have realized were in us. We have to aim high to hit the mark, and that means trying to reach the next level in personal and group achievement. We are all, individually, and together, capable of bursting our own envelopes of achievement.

Our project steps should be ambitious, yet not groundlessly so. Projects become a way not only to grow the Society, not only to advance our goals, but to more fully realize our own talents and abilities.

Let's look for good "right" projects, together! **PK**



Lunar Prospector: Against All Odds

by Alan Binder, PhD (Ken Press, email ken@kenpress.com or call 520/743-3200)

The book costs $44.95, has nearly 1100 pages of text, over 70 B/W pictures, and numerous appendices.

Lunar Prospector: Against All Odds is the highly personal and engaging story of how the Lunar Prospector orbital mapping mission was developed and carried out by the author between late 1989 and 2001 (see www.lunar-research-institute.org for an outline of the book and a photo essay of the mission).

While this is partly a technical story, it is much more a human-interest story about how an individual can, with persistence and a belief in the value of what one is doing, overcome all odds and obstacles and achieve an impossible goal. Further, like the Lunar Prospector Mission itself, this book was written to expose to the American taxpayer the basic flaws of an ever increasingly incompetent NASA and its major aerospace contractors.

Though the Lunar Prospector Mission was a small, inexpensive, unmanned, orbital mapping mission, the reader will, via the author's experiences in conducting his mission, become intimately acquainted with the inefficient and self-serving activities of the entrenched NASA bureaucracy and the big aerospace companies. As such, the reader will come to understand how NASA's increasing incompetence led to 1) the destruction of the Space Shuttles Challenger and Columbia and their crews, 2) the loss of the 1992 Mars Observer, the 1999 Mars Climate Observer, the 1999 Mars Polar Lander, 3) the never-to-be-finished International Space Station that is already five times over its $8 billion budget and a decade over its original schedule, and 4) many similar NASA failures that have cost the taxpayers tens of billions of dollars and have already taken fourteen human lives.

The reader will also find that the goals of the mission, originally conceived as a private effort, were to demonstrate that when missions are conducted in a commercial mode, outside of NASA, rather than as a government bureaucracy-driven program, the costs are reduced by up to a factor of ten and the time scale of development is cut by a factor of two or more.

Since the author could not find philanthropic support for such a private mission during the first seven years of the effort, he proposed the mission to the new NASA Discovery Program that was designed to show that missions could be done "Faster, Better, Cheaper." Lunar Prospector became the first peer reviewed and competitively selected Discovery Mission in 1995. Four and a half years later, the mission ended its completely successful, 19-month mapping program of the Moon at a total cost of just $65 million, a quarter of the cap for Discovery Missions and a fraction of the cost of normal NASA missions.

Lunar Prospector, the most cost effective lunar mission ever flown, was the first and only Discovery Mission to really show how to do missions "Faster, Better, Cheaper." And the author is the only scientist in the history of the NASA Space Program to have guided and led a mission from its inception through its ultimate success, despite NASA's resistance to his having total control over his mission.

After having succeeded in demonstrating the "commercial viability" of lunar exploration, the author turned to trying – unsuccessfully - to convince NASA and the Federal Government to initiate a commercially-based, lunar exploration program with the ultimately goal of utilizing its resources for the benefit of humanity and to obtain a return on investment for the American taxpayer.

However, perhaps as a result of the destruction of the Columbia high over Texas on the morning of February 1, 2003, or perhaps because President Bush had already realized that NASA is in a state of fatal decline, the President wisely announced his new Lunar/Mars Initiative in an effort to give NASA meaningful direction, the first it has had since the end of the Apollo Program over 30 years ago, and to get the commercial sector heavily involved in its implementation.

Though it is questionable that Lunar Prospector's success in demonstrating that lunar exploration can be done inexpensively as commercial ventures had any influence on the President's January 2004 decision to start a new Lunar/Mars Initiative, Lunar Prospector showed it could done several years before the President made his decision. And it is without question that Lunar Prospector did influence the provisions of Commercial Space Act of 1998 passed by Congress.

The new book, Lunar Prospector: Against All Odds will not only show the reader the technical and human sides of an exciting lunar exploration mission, it will also demonstrate why it is vital to the nation's interests that the exploration of the Moon and planets must be taken out of the hands of the bungling NASA bureaucracy, and transformed into a commercially-based program that provides a return on investment as initiated.

Alan Binder, abrbprospector@earthlink.net

[The above Review was writen by the Author, Alan Binder.]

[Books Ordered thru Ken Press will be signed by Binder]

Annual NASA Great Moonbuggy Races End There will be no 2006 event

[Moon Society had been invited to cosponsor 2006 event]

from Frank Brannon, NASA Marshall Space Flight Center, frank.brannon@msfc.nasa.gov *to* president@moonsociety.org

"As NASA works to implement the Vision for Space Exploration, NASA Marshall Space Flight Center is realigning its activities--including its education programs--to most effectively and efficiently support the NASA mission. That means making decisions about priorities, and allocating our human and financial resources to efforts that best contribute to accomplishing our goals. As a result, we must terminate the Great Moonbuggy Race, which we had conducted annually since 1994. Although it has been a popular and worthwhile educational event, the Great Moonbuggy Race required considerable resources which are now needed elsewhere.

"Thanks to you and your organization for support of the Great Moonbuggy Race."

Durlean Bradford/Frank Brannon
NASA Marshall Space Flight Center

NOTE to Readers & Members:

The Moon Society is always on the alert for ways to increase its visibility and public profile. If you know of, or hear of a project that the Moon Society Many want to consider cosponsoring, please let us know.

Drop an email to president@moonsoicety.org
Or send postal mail to the Milwaukee PO Box listed on page 9, bottom of column A.

Include useful articles, contact information, etc. pertinent to the opportunity in question.

Do keep in mind, that if cosponsorship involves more than lending our name and publicity (especially if it involves man-hours of work) that we will need to find volunteers to handle those things. That is not always easy to do.

Should the Moon Society form an Einstein@Home Team parallel to the Artemis Society's SETI@Home Team?

Einstein@home http://einstein.phys.uwm.edu/"

Einstein@home is a program that, like SETI@Home, uses your computer's idle time to search for spinning neutron stars (also called pulsars).

Any readers and/or members who are interested in learning more about this project or how a Moon Society Einstein@Home team would operate, should contact Team Manager Mike Delaney <mdelaneyis@eircom.net>

Chapters & Outposts

Bay Area Moon Society

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

From: Bill Clawson <billclawson@yahoo.com>

Regularly scheduled monthly meetings on the 4th Thursday of the month at various locations

NEXT MEETINGS: Sept. 22, Oct. 27

BAMS has put "chapter organization" on the agenda for upcoming meetings.

Moon Society St. Louis

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

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

NEXT MEETINGS: Sept. 14, Oct.12, Nov. 9

Chris Noble presents on Friday, September 16th

"Building A Colony On The Moon – The View From The Second Grade", a lecture by Christine Nobbe, of Rockwood Schools' Center For Creative Learning, will be featured at the September meeting of the Saint Louis Astronomical Society. The meeting will begin at 7:30 pm Friday, September 16, in McDonnell Hall, Room 162, on the Washington Univ. campus, Saint Louis, MO 63130.

Archon 29, September 29th – October 2nd

Moon Society St. Louis is hoping to have a big presence again at the St. Louis areas biggest science fiction convention, to be held again at the Collinsville, IL Gateway Center. http://www.archonstl.org/29/index.html

Last year, Moon Society President Peter Kokh came down to join us at this event. Peter has another commitment for this weekend this year.

Moon Society Chapters may now do Double Duty as Chapters of the National Space Society also

by Peter Kokh, Moon Society President and Chapters Coordinator

Per the affiliation agreement signed this past May at the International Space development Conference, Moon Society chapters may choose, if they so desire, to be an official presence of the National Space Society in the communities they serve. This idea was introduced by Greg Bennett, who as then Moon Society President, began sending feelers out to NSS about affiliation.

In communities not currently served by an NSS chapter, a Moon Society chapter could serve local NSS members as well, provided three of its members were NSS members also. We look forward to such a development.

GREAT BROWSING !

Travel the Interplanetary Superhighway
(when you have much more time than money)
http://www.cds.caltech.edu/~shane/superhighway/description.html

Can a shuttle-derived vehicle family serve both NASA and Defense Department ?
http://www.thespacereview.com/article/421/1

Mars Reconnaisance Orbiter
"most powerful suite of instruments ever"
http://www.space.com/businesstechnology/050727_mro_prepare.html

The Messenger Mission to Mercury
http://messenger.jhuapl.edu/

Dawn Mission to Study Ceres and Vesta
http://www.college.ucla.edu/dawn/

The View from Here: Lily-Livered Pansies
www.spaceref.com/news/viewsr.html?pid=17592

Towards a Suttle-derived Shuttle Replacement
www.spaceref.com/news/viewnews.html?id=1055

Safe...Simple...Soon — Benefits of STS-Derived (Shuttle Propulsion Backbone Elements) ETS
http://www.safesimplesoon.com/

Engineering simple solutions to complex problems
SpaceShipOne vs. Shuttle
http://www.thespacereview.com/article

Sociology + Space Hard Sciences = Astrosociology?
http://www.thespacereview.com/article/424/1

A (truly) *Inter*national Space Society?
http://www.thespacereview.com/article/431/1

Two New DVD Docudramas
Towards more accurate Science Fiction?
http://www.thespacereview.com/article/430/1

Human factors in commercial suborbital flight:
Failure modes and survival strategies
http://www.thespacereview.com/article/428/1

State Dept Directorate of Defense Trade Controls (DDTC) Okays Virgin Galactic Spaceship Plans
www.space.com/news/050815_virgingalactic_itar.html

Energiya hopes to harvest Moon's Helium-3
http://en.rian.ru/science/20050818/41181180.html

Klipper Shuttle: Rusian rockets, Euro Electronics
http://www.spectrum.ieee.org/WEBONLY/resource/aug05/0805nshut.html

Japan's Hayabusa Asteroid Sample Return Probe Arrives September 12th at Asterioid ITOKAWA

http://www.jaxa.jp/missions/projects/sat/exploration/muses_c/index_e.htm

Asterioid Itokawa: Asteroid 1998 SF36, the destination of "Hayabusa" (MUSES-C) spacecraft launched from Kagoshima Space Center on May 9, 2003, had been renamed ITOKAWA by International Astronomical Union after the name of late Prof. Hideo Itokawa, "the Father of Space Development in Japan". For orbital simulation, go to:
http://neo.jpl.nasa.gov/cgi-bin/db?name=1998+SF36
For more information on this asteroid, see:
http://newton.dm.unipi.it/cgi-bin/neodys/neoibo?objects:Itokawa;main
and for physical information,
http://earn.dlr.de/nea/25143.htm

Itokawa is a near Earth object with a perihelion just inside the Earth's orbit, and with an aphelion outside Mars' orbit.

Itokawa is small, only 607m x 287m x 264m (2000' x 956' x 870') and rotates about its axis every 12.12 hrs. Its year is 556.3 days long, 18.28 months, 1.52 Earth years.

On arrival of the Hayabusa probe, Itokawa was 2.143 A.U. from Earth (199 million miles) and 1.16 A.U. from the Sun (108 million mi.). Photo courtesy NAXA. . Hayabusa was hovering some 20 km (12.5 miles) above the surface.

The probe, launched on 28 months ago on May 9th, 2003, reached its destination courtesy of an ion engine. Itsmission, the most ambitious yet for Japan, is an asteroid sample return, something not yet attempted by NASA. [On Monday, 12 February 2001, four and a half years ago, the NEAR spacecraft touched down on another Near-Earth asteroid, Eros.] If successful, this will be only the second celestial body (after the Moon) to be sampled, discounting impact splashout sampling which was done spectacularly by the Deep Impact probe on last July 4th at Comet Temple 1.

"A soil sample from an asteroid can give us clues about the raw materials that made up planets and asteroids in their formative years, and about the state of the inside of a solar nebula around the time of the birth of the planets. However small the sample amount may be, its scientific significance is tremendous." [It] "will gather samples and observe the asteroid with various scientific devices and measures. It is equipped with a Telescope Wide-View Cameras and Light Detection and Ranging, as well as with a Near Infrared Spectrometer. It will also employ a hopping robot, which can move around on the asteroid's surface. When HAYABUSA returns to Earth, a re-entry capsule bearing a surface sample from the asteroid will separate from it and plunge into the atmosphere." [NAXA]

Mars Gashopper Airplane Takes Flight

From Robert Zubrin

July 29,2005 Pioneer Astronautics has demonstrated a new technology for flying around Mars.

The new flight system, called a gashopper, has now been sucessfully flown. The vehicle system works by acquiring CO_2 from the Martian atmosphere with a pump (Mars atmosphere is 95% CO_2), storing it in liquid form, then sending it through a preheated pellet bed to turn it into hot rocket exhaust to produce thrust for a flight vehicle.

The flight vehicle could either be a ballistic vehicle similar to the DCX vertical takeoff rocket, or a winged airplane that would take off and land like a Harrier, then transition to horizontal flight.

On Mars, a ballistic gashopper would be capable of flights of tens of kilometers per hop. A winged aircraft would be capable of hundreds of kilometers per flight.

After each landing, a small rover could be deployed for local exploration. While it is doing this, the gashopper would refuel from the atmosphere, using power from the solar panels on its wings to drive its CO_2 acquisition pump. This procedure would take about a month, then the rover would be recalled, the pellet bed reheated, and the gashopper flown to a distant landing site to explore again.

The net result is a system that can fly repeatedly on Mars, conducting numerous aerial surveys and surface exploration at many diverse sites with a single spacecraft. Furthermore, unlike surface rovers, the gashopper would not be blocked by terrain obstacles. Also, since its exhaust is CO2, it would not contaminate landing sites with organics from a conventional rocket exhaust (which might confuse sensors looking for indigenous organics).

In a series of tests conducted during the final weeks of July, 2005, Pioneer Astronautics demonstrated the gashopper concept in flight at the Platte Valley airport near Brighton, Colorado. The test vehicle, named "Mars Ship One," was run through fast taxi tests, then flown at speeds between 60 and 100 mph.

Mars Ship One has a wingspan of 14 ft and a dry mass of 118 lb, making it a full scale representative in mass and size of a gashopper airplane that might be used on a robotic mars exploration . During the late July tests, flight ranges of about 1660 ft were obtained, with the pellet bed preheated to 800 C and 13 lbs of propellant in the tank. On Mars, with a hotter pellet bed, high rocket nozzle expansion ratios, 1/3 Earth gravity, lighter aerospace grade materials, larger propellant loads, and higher flight speeds, such a system could be expected to travel about 100 kilometers per flight.

The Gashopper airplane program was funded by NASA Langley Research Center with an SBIR Phase 1 contract to Pioneer Astronautics. Robert Zubrin was the Principal Investigator at Pioneer Astronautics, while Chris Kuhl was the program Technical Monitor at NASA Langley. Other members of the Pioneer Astronautics team included: Gary Snyder, Electronics Lead; Dan Harber, Aerodynamics Lead; Nick Jameson, Mechanisms design; Mike Hurley, Pilot; Kyle Johnson, Intern; and James Kilgore, Machinist.

"We call her `Mars Ship One,'" Dr. Zubrin said, "because the desert skies of Mars are its oceans, and she is the first craft designed to navigate them. A 1600 ft flight is a humble beginning for Martian aviation, but then so was the 700 ft achieved at Kitty Hawk. All great things start out small. Someday vehicles descended from her with give us the freedom to travel at will across the Red Planet."

Mars Ship One will be on display for public viewing at the 8th International Mars Society Convention, university of Colorado, Boulder, August 11-14, 2005. Information about and Registration for the Convention is now open at www.marssociety.org.

Photos of Mars Ship one during takeoff and flight, and the Pioneer gashopper team, and a 10 mb video clip of Mars Ship One in flight can be found at:

www.pioneerastro.com/gha.html

Hubble Makes Dynamic Movie of Neptune's Atmosphere

http://hubblesite.org/news/2005/22

New NASA Hubble Space Telescope images of the distant planet Neptune show a dynamic atmosphere and capture the fleeting orbits of its satellites. The images have been assembled into a time-lapse movie revealing the orbital motion of the satellites.

Science Credit: NASA, ESA, E. Karkoschka (Univ. of Arizona), and H.B. Hammel (Space Science Institute, Boulder, Colorado)

Quicktime or Windows Media Player required.

Classic Issues of *L5 News* now available in pdf format

http://www.l5news.org/index.html

The L5 Society was born in the mid-1970s out of Gerard K. O'Neill's vision of Space Settlements and Solar Power Satellites built from Lunar Materials. The L5 News, edited by Carolyn Henson, was the monthly magazine that sketched out the vision and goals of the Society. Long available only in rare hardcopies, the first 34 issues are now available as free pdf downloads from the above site: the first four issues from 1975, twelve each from 1976 and '77, and the first six from 1978. More issues are being converted and preserved in pdf format.

On March 27th, the former L5 Society, and the former National Space Institute merged to become the National Space Society, at the 6th International Space Development Conference, in Pittsburgh, PA.

[From the Mars Homestead Project - www.MarsHome.org]

4 Frontiers Corporation
Announces its PlanTo Establish the First Mars Settlement to be previewed on Earth in a Mars Settlement Outreach/Reserach Center

Cambridge, MA, Sept. 6, 2005 - The 4Frontiers Corporation (www.4Frontiers.com), today announces its plan for the first permanent habitation on another planet, revealing technical and social aspects of establishing an initial human settlement on Mars. The bold plan is based in part on the work of the Mars Foundation (www.MarsHome.org) but will be carried out within an expansive 4Frontiers business plan. 4Frontiers is actively engaging with space transportation, technical, policy and financial partners to develop the systems and technologies needed to establish this new branch of civilization. The business plan also calls for the establishment of a revolutionary Mars Settlement Outreach and Research Center, here on Earth, to advance these efforts.

4Frontiers recognizes the economic potential resulting from the convergence of four frontiers – **Mars**, **Earth orbit**, **the Moon**, and **Asteroids**. The company envisions the emergence of an inner solar system economy, based on development of, and trade between, these locales. It intends to capitalize on opportunities within this new economy.

While a number of companies have set their sites on advancements in getting to Mars, few have laid out plans with technical reality and actual designs to quickly and affordably establish settlement. For example, Elon Musk of Space Exploration Technologies (www.SpaceX.com), is developing the human-rated Falcon 5 launcher, and has plans to develop a super-heavy lift rocket as part of a strategy to get to Mars. However, "4Frontiers is positioned to be the leader in actual "on-the-ground" settlement housing, life support, and industrial technology," said Mark Homnick, CEO of 4Frontiers. "We have utilized detailed knowledge of the planet and the extensive know-how of our technical team to develop a plan for a small but sustainable settlement, leveraging use of locally derived materials," said Joseph Palaia, VP of Research & Development.

A settlement on Mars would translocate the human genome to another planet effectively creating a new Biosphere. While it may take "rocket science" to get to Mars, once there "The lessons learned from large scale closed systems, such as Biosphere 2, a project supported by billionaire Ed Bass, have demonstrated a clear path for small-scale sustainability and offer critical elements for a Mars based ecologically sustainable settlement," said Bruno D.V. Marino, a consultant to 4Frontiers and former Director of Science and Research at Biosphere 2.

[Boxed material & more information at www.4Frontiers.com]

4Frontiers has begun a patent portfolio of over 25 applications– architectural, eco–technical, mechanical and related space items, methods and processes.

4Frontiers has already begun extensive research programs covering in-situ manufacturing of building materials, extraction of oxygen and water, and the establishment of Martian ecosystems to produce diverse food crops. The company plans to unveil additional research and development programs in the near future.

4Frontiers is making strides in establishing a Mars Settlement Research and Outreach Center. "This unique facility will serve as a nexus for space technology development and consultancy, focused initially on technologies having commonality with those needed both for Mars settlement and for the President's Moon Mars Initiative," said Bruce Mackenzie, 4Frontiers VP and Director of the Mars Foundation. The 25,000 sq foot facility, assuming the form of a full-scale replica of the actual first settlement, will provide the public an unprecedented glimpse of life on the early Mars frontier, and will allow the public to interact with scientists and engineers who will be turning this vision into reality. 4Frontiers is presently in negotiations with a number of agencies, investigating the possibility of locating this facility in New Mexico, Central Florida or Colorado.

While the motion picture industry has brought us a cinematic version of Mars drama, 4Frontiers brings a hands–on Mars settlement to the masses. Simulation and education around Mars will attract young minds and plant the seeds of future interest while many will become more familiar and acclimated to our ultimate mission. 4Frontiers is building a Mars village similar to that designed for Mars itself and making it available to the public. This approach contrasts with remote simulation habitats in the Arctic and elsewhere. Although primarily a demonstration facility, the village will also support a Research and Development effort in testing structures, patterns of living, specific items, etc., as appropriate and useful. A suite of educational materials, products, videos, etc., will be developed around this effort. 4Frontiers' goal is to make this village the premier site world–wide for education and innovation in Mars settlement activities.

Mars Homestead Project - www.MarsHome.org

To Arrive, Survive, and Thrive!™

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!

2005 LRS OFFICERS / Contact Information

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Newsletter Mailing - Carol Nelson 414-466-2081

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

LRS News

• **September 8th Meeting:** We were booted out of our usual meeting space, for this month only, and met outside in the hall, adjourning to the 2nd floor food court. We do not know why we were displaced because no one seemed to be using the room in our stead.

• **IMAX "Magnificent Desolation: Walking on the Moon"** is to debut nationally on Friday, September 23rd. However the Milwaukee IMAX is not set up to show 3D features. We talked about a Field trip to Chicago where 4 IMAX outlets are showing the film, but did not agree on a date.This film rerenders footage shot on the Moon by the Apollo astronauts, giving you the feeling of actually being there. Tom Hanks is the man behind this undertaking.

LRS Upcoming Events – October, November

Saturday, October 8th, 1–4 pm

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

Reports on NASA Plans for first new manned mission to the Moon; Show & Tell on Cast Basalt Sculpture, an artform suitable for the Lunar Frontier. Updates on space and space mission news, conferences etc. A look at the calendar ahead.

Saturday, November 14th, 1–4 pm

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

Plans for the upcoming Holiday Classic Film and Potluck annual special December meeting on December 10th.

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**
September 17, October 15, November 19

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

September 20th meeting, Southdale Public Library, 7001 York Ave. S., Edina, with Ron Schmit, JPL Solar System Ambassador, on Cometary and Asteroidal Science.

Mars Society Convention Pictures
freemars.org/mnfan/MarsSociety/2005/Boulder-Conference/
All Ship Picnic Pics: freemars.org/mnfan/AllShip/2005/Picnic/

Tuesday, October 11, 7-9 pm, Rockford Road Public Library, 6401 42nd Ave. N., Crystal. Dave Buth will speak on the Gaia Theory Updated.

Tuesday, November 8, 7-9 pm, Rockford Road Public Library, 6401 42nd Ave. N., Crystal. Ben Huset, Scott Shjefte, Craig Borchard, Rich Brown will speak on Shuttle Replacements.

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**

SEP 15th: UW-Sheboygan, Room 6101, **Sheboygan**
OCT 20th The Stoelting House, **Kiel**
NOV 17th: UW-Sheboygan, Room 6101, **Sheboygan**

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: September 17, October 15, November 19

No report filed this month as of press time.

SOLAR SYSTEM AMBASSADORS
www.jpl.nasa.gov/ambassador/

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CALI FORNIA

OASIS

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

Upcoming Events

- **Sat. Sept. 17th, 3:00 pm –** OASIS Monthly Business Meeting at the home of Craig and Karin Ward, 1914 Condon Avenue, Redondo Beach.
- **Sat Oct. 15th, 1:00 pm –** OASIS Monthly Business Meeting at the LBPL El Dorado Neighborhood Library, 2900 Studebaker Rd. Long Beach. A public presentation will follow.
- **Sat. Oct. 15th, 4:00 pm –** OASIS Lecture Series, *Orbital Machanics for Real People*, presented by Seth Potter at the LBPL El Dorado Neighborhood Library, 2900 Studebaker Rd. Long Beach. The presenter will be Seth Potter. *This event is not library sponsored.*
- **Sat. Nov. 19th** - OASIS Monthly Business Meeting, details to be announced
- **Sat. Dec. 17th** - OASIS Monthly Business Meeting, and Holiday Party. details to be announced

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 Editor

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❍ **$45 National Space Society** dues includes **Ad Astra**
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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 <=

❍ $15 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

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❍ 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

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