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

Moon Miners' Manifesto

& The Moon Society Journal

www.MoonMinersManifesto.com

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20TH ANNIVERSARY ISSUE

After 10 issues a year for 20 years, it's a "Go" to keep on writing!

A Tale of Two Origins: I: The Moon as a Challenge

In the late 1970's the editor was already a life member of the National Space Institute, since 1974, and of the L5 Society, since 1977 0r 78. I decided that I would try to write an alternative history novel of "where we could be now (then) if we had not retreated from the Moon with the liftoff of the Apollo 17 Challenger LEM on December 17, 1992.

Surely, I thought, we'd be on Mars or headed that way. Believe it or not, I was a "Mars man" back then. But we'd had have to have "done the Moon" first. So I began trying to figure out how we would "do the Moon." Here we have what appears to be a round rubble pile, lacking in many elements we are used to having in great abundance, not just as traces. I became hooked by the challenge.

That the Moon is deficient in key elements is not an issue. I began to see the Moon as the Japan of the solar system -- Japan, at the start of the Industrial Age found itself in a similar position. It turns out that natural resources are not the key. Human resources of creativity, resourcefullness, enterprise and determination are!

I began to brainstorm how we would substitute for wood, paper, plastics, and many other things. I was soon thoroughly hooked on the "Lunar Challenge."

This brainstorming soon gave birth to a deep conviction that pioneers would learn to make themselves "at home on the Moon" and be able to support a growing economy based first on local import-substitutes and on exports to a growing off-Earth economy including facilities in Low Earth Orbit: research, industrial, and tourist installations in the "suborbs" of Earth.

II. Then one Sunday morning in May. 1985

Eureka moments happen only for those who are prepared to receive it. I was looking through the Home section of the Sunday Milwaukee Journal and my eye was caught by an ad about a "unique" underground home that was be open for tours 20-some miles NW of where I lived. I got in my car and headed out to see "TerraLux" - Earth-Light. Prior to this day, I had accepted that future Lunans would live like moles, in underground warrens as Robert A. Heinlein described them in his classic science fiction novel, "The Moon is a Harsh Mistress." Life underground would be protected from harsh cosmic weather, meteorite impacts and thermal extremes.

But here was a home, unlike the usual "Earth-sheltered" homes of the period, without an exposed southern exposure window wall for thermal input. It was all underground, with access through a partially exposed garage. But enter, and wow! The home was flooded with sunlight, and in every wall was a picture window showing the beautiful Kettle Moraine glacial countryside without.

You can read about this in "M is for Mole", [⇒ p. 2, col. 2]

L: TerraLux exterior - R: Lunar Homestead Model

Moon Miners' Manifesto

Moon Miners' Manifesto / Moon Society Journal is published every month except in January and July.

• **Moon Miners' Manifesto CLASSICS:** The non-time-sensitive articles and editorials of MMM's first fifteen years have been re-edited, reillustrated, and republished in 15 PDF format volumes, for free downloading from either of two locations:

www.lunar-reclamation.org/mmm_classics/
www.moonsociety.org/publications/mmm_classics/

• **MMM's VISION:** "expanding the human economy through off-planet resources"; the early era of heavy reliance on Lunar materials; early use of Mars system and asteroidal resources; and establishment of permanent settlements supporting this 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 additional 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 nonprofit 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 50 chapters, dedicated to the creation of a spacefaring civilization.

National Space Society, 1620 I Street NW, Suite 615, Washington, DC 2006; Ph: (202) 429-1600
FAX: (202)463-8497; nss@nss.org - www.nss.org

•• **The Moon Society** is "dedicated to overcoming the business, financial, and technological challenges to the establishment of a permanent, self-sustaining human presence on the Moon." — Contact information p. 9.

• **NSS chapter**s 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.***

• **Submissions**

√ EMAIL to KokhMMM@aol.com (***preferred***)
√ Mac compatible CD / typed hard copy to:
Moon Miners' Manifesto, c/o Peter Kokh,
1630 N. 32nd Street, Milwaukee WI 53208-2040

• **MMM is mailed 2nd Class:** *Second Class bulk mail is not forwarded.* If you move and rely on forwarding instructions at your former local Post Office, you will not receive your copy. It is the reader's responsibility to inform LRS or whatever other organization through which the reader receives MMM as a membership benefit, of any change in the reader's mailing address.

⇒ "Two Beginnings" Essay continued from p. 1.

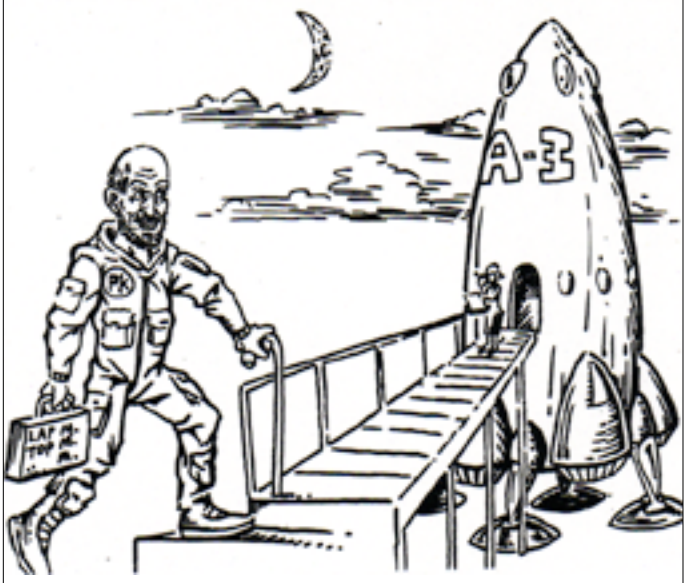
MMM #1, online at:
http://www.lunar-reclamation.org/mmm_1.htm
This article is also reprinted in MMM Classics #1
http://www.lunar-reclamation.org/mmm_classics/

Well, the long and the short of it is that I never wrote the novel, but all the research I had done to show just how we could rise to the Challenge of the Moon would find its way into articles in Moon Miners' Manifesto illustrating how pioneers would live and thrive on the Moon, and become "at home" there. Sixteen months after the "Eureka" experience at TerraLux, a team of L5 Society "colonizers" from Chicago and the Twin Cities descended upon Milwaukee to talk to at large L5 members in the area, and the rest is history. These two beginnings are still "powering" MMM, and the Lunar Reclamation Society.

We have every intention of keeping on going. **PK**

[***Out of the Past,*** from MMM #101, ***ten years ago!***]

The Dennis Cripps Cartoon



The MMM Editor boarding the Moonship for Luna City

On Completing the First Ten Years of MMM

Someone in the Artemis Society asked me, then that with the next issue, MMM #101, we'd be celebrating our 10th anniversary of continuous publication, where I'd like to see us, and myself in another 10 years, on the eve of publishing MMM #201, the 20th anniversary issue. Without hesitation, I said that it was my dream to publish that issue on the Moon.

Here it is, December 3, 2006, LRS and MMM will be celebrating our 20th anniversary at our annual holiday party in a few days, and the only way we are going to get to the Moon in time to publish #201 from Luna City, is aboard an alien UFO!

But it feels good, in the interim, to have completed archiving all the timeless articles from the first fourteen years. The MMM Classics will be extended through #150 (the first 15 years) as there are individual pdf files from there on.

It continues to be a very rewarding blast! *Peter Kokh*

Beyond Our First Moonbase:

The Future of Human Presence on the Moon

by Peter Kokh

Beginnings

If all goes as planned, U.S. budget crises notwithstanding, mankind's first outpost on the Moon will start to become real around 2020, a historic event, that were it not for politics, might have happened decades earlier.

The vision outlined in **The Moon: Resources, Future Development and Colonization**, by David Schrunk, Burton Sharpe, Connie Cooper and Madhu Thangavelu is a bold one, showing how we could set up our first outpost so that it would become the nucleus from which human presence would spread across the face of the Moon.

NASA itself has such a vision, but the agency can only do what it is authorized to do. If the history of the International Space Station offers clues, NASA's official goal, which only includes setting up a first limited outpost as a training ground for manned Mars exploration and nothing more, will be under increasing budgetary pressures to slim down into something with no potential for growth at all. The intended crew size, the planned physical plant, and the capabilities that are supported, will all be tempting "fat" for budget cutters who cannot see, or appreciate, the possibilities beyond. This is the risk of publicly supported endeavors in space. It is difficult to get political leaders, and the public itself, to look beyond very near future goals. The chances that our first outpost will be born sterile cannot be dismissed.

But if private enterprise is involved and ready to take over when and where NASA's hands are tied, there could be a bright future for us on the Moon. Much of that promise may involve finding practical ways to leverage lunar resources to alleviate Earth's two most stubborn and intertwined problems: generating abundant clean power, and reversing the destructive pressures of human civilization on Earth's environmental heritage.

Cradlebreak: early lunar building materials

The Moon has enormous resources on which to build a technological civilization. But first things first. How can we break out of a first limited-vision outpost? A humble start can be made by demonstrating the easier, simpler ways to start lessening the outpost's heavy dependence on Earth. Oxygen production comes first. Close behind is hydrogen harvesting, whether from lunar polar ice deposits or from solar wind gas particles found in the loose regolith blanket everywhere on the Moon.

If we have access to basalt soils in the frozen lava floods of the maria, we can cast this material into many useful products. Not the least of those are pipes, sluices, and other components of regolith handling systems: cast basalt is abrasion-resistant. If we expand the outpost with inflatable modules shipped from Earth at significant savings in weight per usable volume over hard-hull modules, we can use cast basalt products, including floor tiles and tabletops to help outfit these elbowroom spaces. We can learn from a thriving cast basalt industry on Earth.

Experiments done on Earth with lunar simulant, of similar chemical and physical composition to lunar regolith, then repeated with precious Apollo moondust samples, give us confidence that concrete and glass composites will be very important in any future construction and manufacturing activity on the Moon. We could make additional pressurizable modules from fiberglass reinforced concrete or glass composites. We can make spars for space frames and many other products out of these composites as well. The Moon's abundant silicon will allow us to make inexpensive solar panels for generating power. Production of usable metal alloys will come later. The Moon is rich in the four "engineering metals:" iron (steel), aluminum, titanium, and magnesium.

An Industrial Diversification Strategy with maximum potential for cutting dependence on Earth imports

The name of the game is Industrial "MUS/CLE." If we concentrate on producing on the Moon things that are **M**assive, yet **S**imple, or small but needed in great numbers (**U**nitary) so as to provide the major combined tonnage of our domestic needs, we will make significant progress towards lessening the total tonnage of items needed from Earth to support the expansion effort.

Until we can learn to make them ourselves, we continue to import the **C**omplex, **L**ightweight, and **E**lectronic items we also need, but which together mass to much less. It would be very helpful to the success of such a strategy, to design everything needed on the Moon as a pair of subassemblies, the MUS assembly to be manufactured locally, and the CLE assembly to be manufactured and shipped from Earth, both being mated on the Moon.

Simple examples are a TV set: works manufactured on Earth, cabinet on the Moon; a metal lathe built on Earth, its heavy table mount manufactured on the Moon; steel pipe and conduit on the Moon, all the fittings and connectors from Earth. You get the idea.

As the population of pioneers and settlers grows, and our industrial capacity becomes more sophisticated and diversified, we can assume self manufacturing of many of those items as well. Making clear and steady progress in assuming an every greater share of self-manufacturing physical needs is essential if we are going to encourage both continued governmental support and attract every greater participation by private enterprise.

Paying for the things we must import

Seeing that Earth seems rather self-sufficient, and products from the Moon would be expensive, many writers have concentrated on trying to identify "zero-mass products" such as energy, to provide the lunar settlements with export earnings. The need for exports is indeed vital. As long as the settlement effort must still be subsidized from Earth, there will always be the risk of unrelated budgetary pressures on Earth fueling support for those who would pull the plug on lunar operations.

Thus it is vital that settlers develop products for export to help them pay for what they must still import. Only when we reach import-export parity, will the lunar settlement have earned "permanence." Permanence can't be simply declared. Tagging NASA's first moonbase as "a permanent presence on the Moon" is in itself just so much empty bravado. If we do not begin developing and using lunar resources seriously and aggressively, the effort will fail of its own costly weight.

Now here is the point where many will balk. Yes, there are grandiose plans to use lunar resources to build giant solar power satellites in geosynchronous orbit about the Earth, or to build giant solar farms on both the east

and west limbs of the Moon to beam power directly to Earth, and/or to harvest precious Helium-3 from the lunar topsoil or regolith blanket, a gift of the solar wind buffeting the Moon incessantly for billions of years, the ideal fuel for nuclear fusion plants. But none of these schemes will materialize right away. Meanwhile what do we do? Cannot anything the Moon might manufacture to ship to Earth be made less expensively here at home? No!

But that does not matter. Earth itself is not the market. Developing alongside of an upstart settlement on the Moon will be tourist facilities in Earth orbit. And that is something the lunar settlement effort can support. Anything future Lunan pioneers can make for themselves, no matter how unsophisticated in comparison with the vast variety of terrestrially produced alternatives, can ge shipped to low Earth orbit at a fraction of the cost that functionally similar products made on Earth can be shipped up to orbit. It is not the distance that matters, but the depth of the gravity well that must be climbed. It will take one twentieth of the fuel cost to ship a set of table and chairs, a bed frame, interior wall components, floor tiles, *even water and food,* from the Moon, 240,000 miles away, than from Earth's surface, 150 miles below.

Thus, in the near term, the future of Lunar Settlement will be closely tied to the development of tourist facilities, hotels, casinos, gyms, etc. in orbit. This sort of development will start to bloom about the same time as a lunar settlement effort starts to break out of an initial limited moonbase egg. But the linkage will become visible much earlier: it is very likely, that the first space tourist will loop-the-Moon, without landing, before the first astronaut since Apollo 17 in 1972 sets foot on the Moon. The Russians say that they can provide such a tourist experience, skimming low over the Moon's mysterious farside, in just two years after someone plunks down $100 million. That will indeed happen, and it will create a benchmark that others will want to follow, inevitably brining the price down for a ride to an orbiting resort.

The Moon from a Settler's Point of View

Magnificent Desolation? Yes. Harsh and unforgiving? That too. Alien and hostile? Of course! It has always been so from the time our ancestors on the plains of East Africa started pushing ever further into unfamiliar lands: the lush, dense jungles, the hot dry deserts, waters too wide to swim, high mountain ranges, and eventually, the arctic tundra. Judged by the pool of past experience, each new frontier was hostile, unforgiving, and fraught with mortal dangers ... until we settled it anyway.

Once we learned how to use unfamiliar resources in place of those left behind, once we learned how to cope with any new dangers, as if by "second nature," then the new frontier becomes as much home as places we left behind. Anyone raised in a tropical rain forest, suddenly transported to Alaska's north slopes, might soon perish, unable to cope. The Eskimo never gives it a second thought. How to cope with ice, cold, the arctic wildlife, the absence of lush plant life, has become second nature.

And future Lunans will reach that point as well. Yes there is sure suffocation outside the airlock. Yes the sun shines hot and relentlessly with no relief from clouds for two weeks on end. Yes the Sun stays "set" for two weeks at a time while surface temperatures plunge. Yes the moon dust insinuates itself everywhere. The litany goes on and on. Lunans will learn to take it all in stride. How to take due precautions for each of these potential fatal conditions will have become culturally ingrained 2nd nature.The Moon will become a promised land to Lunans.

Making ourselves at Home

Even in the first lunar outpost, crew members could bring rock inside the habitat as adornment in itself, or perhaps carve one into an artifact. An early cast basalt industry, early metal alloys industries, early lunar farming, will all supply materials out of which to create things to personalize private and common spaces alike. Learning to do arts and crafts on the Moon may seem useless and irrelevant to some, but it will be the first humble start of learning to make the Moon "home." And so it has been on every frontier humans have settled.

We will also learn to schedule our activities and recreation in tune with the Moon's own rhythms. We'll do the more energy-intensive things during dayspan, the more energy-light, manpower-intensive things saved for nightspan. With no real seasons, the monthly dayspan-nightspan rhythm will dominate. The pioneers may bring some holidays with them, but will originate other festivities and both monthly and annual celebrations.

Getting used to lunar gravity will also help the pioneers settle in. They will quickly abandon trying to adapt familiar terrestrial sports, which can only be caricatures of the games of Earth. Instead, they will invent new sports that play to the 1/6th gravity and traction, while momentum and impact remain universally standard. Alongside the development of lunar sports will be forms of dance. Can you imagine how ethereal a performance of Swan Lake would be on the Moon? How many loops could an ice-skater do before finally landing on the ice?

But they have to live underground, for heaven's sake!

On Earth, our atmosphere serves as a blanket which protects us from the vagaries of cosmic weather: cosmic rays, solar flares, micrometeorite storms. If our atmosphere were to "freeze out" it would cover the Earth with a blanket of nitrogen and oxygen snow about 15 feet thick, *and still provide the same protections.*

On the Moon, eons of micrometeorite bombardment have pulverized the surface and continue to garden it into a blanket of dust and rock bits 10-50 feet thick. Tucking our pressurized outpost under such a blanket, will provide the same protection, along with insulation from the thermal extremes of dayspan and nightspan.

Will our outposts look like somewhat orderly mazes of molehills? To some extent, perhaps; but the important thing is that we do not have to live as moles. We have ways to bring the sunshine and the views down under the blanket with us. In the spring of 1985, I had the opportunity to tour a very unique Earth-sheltered home 20-some miles northwest of Milwaukee where I live. Unlike typical earth-sheltered homes of the period, TerraLux (EarthLight) did not have a glass wall southern exposure. Instead, large mirror faceted cowls followed the sun across the sky and poured sunlight inside via mirror-tiled yard wide tubes through an eight-foot thick soil overburden. Periscopic picture windows provided beautiful views of the Kettle Moraine countryside all around. I had never been in a house so open to the outdoors, so filled with sunlight, as this underground one. At once I thought of lunar pioneers, and how they could make themselves quite cozy amidst their forbidding, unforgiving magnificent desolation. The point: yes, the Moon is

a place very alien to our everyday experience. Nonetheless, human ingenuity will find a way to make it "home."

What about us outdoorsmen?

While Lunans will find plenty do do within their pressurized homes, workplaces, and commons areas, many will miss the pleasures of outdoors life on Earth. Fishing, swimming, hunting, boating, flying, hiking and mountain climbing and caving. The list goes on and on.

Yet some of these pleasures we may be able to recreate indoors,fishing in trout streams, for example. We will want an abundant supply of water, and waste water in the process of being purified can provide small waterfalls and fountains, even trout streams for fishing and boating. In large high ceiling enclosures, humans may finally be able to fly with artificial wings, as Icarus tried to do.

Out-vac, out on the vacuum washed surface, it will be more of a challenge. Present space suits are too cumbersome, too clumsy. We need suits that offer more freedom of motion, that tire us less easily. Then out-vac hiking, motor-biking, mountain climbing, and caving in lavatubes will become practical. Out-vac sporting events, rallies, races, and games will follow. As we learn to take the Moon's conditions for granted, and to "play to them," we'll invent sporting activities that suit the environment.

Agriculture and minibiospheres

The idea of going to the Moon with sterile tin cans and a life-support system tucked in a closet with a few token house plants thrown in for good luck is absurd. As it happens, NASA has abandoned "Advanced Life Support." Instead we have to approach creation of living space on the Moon as a mating of modular architecture with "modular biospherics." Every pressurized module should have a biosphere component, so the two, living space, and life in that space, grow a pace, hand in hand. The clues are not in the organic chemistry labs but in the many down to earth "back to earth" experiments thriving on Earth as we speak. Earth life must host us on the Moon even as it does on Earth, not vice versa. Lunar settlements will be "green" to the core. And we will feel at home.

One settlement, a world "doth not make"

The Moon's resources are not homogeneously situated. A site handy to polar ice reserves will not be near mare basalts, nor iron and titanium rich ilmenite, nor vast underground caves formed long ago bu running lava. As the lunar economy expands, we will need to establish settlements in a number of differently advantaged areas. And that will make the Moon a real "world." Lunans will be able to travel elsewhere, get away from it all, experience cultural, artistic, archeological, and climate variations. Even as an outpost cannot be "declared" permanent, neither can a solitary settlement. No matter where we choose to set up shop first, we need a global vision. The authors have this vision, and their brilliant concept of a lunar railroad network illustrates that well.

Getting through the Nightspan

To many people spoiled by abundant energy "on demand," the need to store up enough energy during the two week long dayspan to allow the outpost to not just survive the nightspan, but to remain productive is daunting. Yet all of human progress is built on utilizing various forms of power storage, starting with firewood. Even in nature, the spread and survival of species has turned on this point, from bear fat to squirreling away nuts. The problem is one of attitude. Those with the right attitude will find a way, many ways in fact. The same goes for managing the thermal differences between lunar high noon and predawn. Since we first began to move out of our African homeworld to settle the planets of Eurasia and the Americas, we have tackled harder problems. Those not intimidated by the challenge will lead the way.

The pattern emerges

Lunan pioneers will make progress in all these areas together: providing the bulk of their material needs by mastering lunar resources; becoming ever more at home through lunar-appropriate arts, crafts, sports, and hobbies; creating a uniquely lunan culture. this process must start immediately. The first outpost should be designed to encourage, not discourage experimentation by those with the urge to create and fabricate with local materials. Things shipped from Earth should be designed and manufactured in MUS/CLE fashion, so that their simpler and more massive components, made on Earth can be replaced with parts made on the Moon, freeing up the original parts for reuse. Parts made here of elements hard to produce on the Moon, like copper or thermoplastics, will help spur infant lunar industry at a quicker pace.

The Necessary Gamble

It is predictable that NASA, however free the life styles of its individual employes, will continue to take a conservative stance on fraternization between outpost personnel. It is predictable that there will be an absolute ban on pregnancies. Yet, this is something that cannot be conveniently postponed. The only way to know for sure if infants born on the Moon will turn out to be healthy, is to see how the second native born generation turns out. Will they be fertile? Experiments with animals with much shorter life cycles will give us debatable clues. There is but one way to find out for sure. Do it! Take the plunge.

Official policy may be quite strict and allow no exceptions. But then individuals will take matters into their own hands. Confidence in this outcome will grow, if there are for-profit commercial outposts on the Moon.

As long as we play the "outpost game," and that is what it is, of rotating crews with short tours of duty, as long as we avoid allowing people to choose to live out their lives on the Moon, raising families, as nature dictates, we will not see the rise of a lunar civilization, nor real use of lunar resources to help solve Earth's stubborn energy and environmental needs in sustainable fashion. Human choices must be taken out of the hands of politicians and administrators afraid of conservative opinion. Nations may build outposts, but only people pursuing personal and economic goals can give us settlement. If history is any guide, that is exactly what will happen.

Antarctic outposts are a dead-end paradigms no real use of local resources, no economic activity, no real society. For the Moon, we see instead, a real human frontier in which an initial small outpost will seed a self-supporting frontier of hundreds of thousands of pioneers in a number of settlements. Many of these Lunans will be native born, others fresh recruits from Earth seeking the promise of starting over, starting fresh, getting in on the bottom floor. Throughout history, those doing well stayed put. Frontiers have always been pioneered by the talented but "second best" seeking a more open future.

The Moon will become a human world. **<MMM>**

Making Ourselves
AT HOME ON THE MOON

An Index to MMM Articles on this theme:
www.lunar-reclamation.org/at_home_on_Moon.htm

Articles from issues #1-140 have been reprinted in pdf file volumes of Moon Miners' Manifesto Classics, one per year, ten issues each. The MMM Classics volumes are freely download-able from either of these directories:
www.lunar-reclamation.org/mmm_classics/
www.moonsociety.org/publications/mmm_classics/

Articles from issues #141-150 will be included in MMMC #15 which we hope to complete in January 2007, if not sooner, and this volume will be posted for download at the above locations.

Articles from issues #151-200 are individually available online for download by current Moon Society members at"
www.moonsociety.org/members/mmm/

Free Sample issues, the editor's pick contain some of the above, for free access at:
www.lunar-reclamation.org/mmm_samples/

Whether or not to extend the MMM Classics program to cover more recent issues, say up to 2 or 3 years behind the current issue year, is a topic for consi-dertation by the Moon Society, for whom these pdf files (#s 151-200) have been created.

Unfinished & Unfulfilled Dreams
Of the MMM Editor
by Peter Kokh

It has been a conundrum of sorts, how to do one thing when your time is totally taken up doing another. We have at times successfully, at times not, resorted to the proverbial trick of killing 2 birds with one stone. For example, we'll undertake a project, then write up a report on the project for the next issue of MMM.

We've found time to do a number of workshops in this manner, and when we've been asked to give a talk to some group, we'll often pick a topic on which we have not yet written. Nonetheless, after twenty years, too many of our dream projects remain unfinished or not yet begun.

MMM Archiives Project
- □ The MMM Classics project, *now almost finished*
- □ Hyperlinked Subject index of MMM articles
- □ Glossary of MMM-speak, new words, new meanings

Book Projects:
- □ "MMM the Book" It goes without saying, that I cannot write this book until I have finished writing MMM the newsletter. Yet
- □ "A Travellers Guide to the Moon"
- □ "The Moon's Hidden Valleys: the Lavatubes"

Web Projects
- □ A dedicated Moon Wiki (***lunapedia.org*** *is started*)
- □ Lunar Economic Geography
- □ ***The University of Luna Project*** (will soon debut)

Conference Projests
- □ Ground breaking and breakthrouhg workshops ###

An Unfulfilled MMM Dream

The Lunar Homestead Show
by Peter Kokh

This idea came out of the initial brainstorming of a comprehensive program for a Milwaukee-hosted International Space Development Conference. David A. Dunlop and myself started putting together ideas for our ISDC bid for the 1997 slot on our way home from the 1993 ISDC in Huntsville, Alabama. Our bid lost by a tie-breaking vote to Orlando. We rebid and won the 1998 slot but not without a penalty of bashed enthusiasm on our team. We would never go through a rebid process again.

The Lunar Homestead Show was to be a grand exhibit of technology that could make a pioneer home comfortable and inviting.

It would be a concrete illustration of many of the ideas we have talked about in the pages of Moon Miners' Manifesto through the years.

We had a long list of exhibit items, but only four were actually produced.

- The prototype of the now famous "gravity bricks"
- A table top modular pioneer homestead on an 80" by 36" hollow core door (pictured on page 1 bottom RT)
- a demonstration model of a ""Z-view" periscopic picture window.
- exhibits of lunar paintings done with metal oxides in sodium silicate on the reverse side of a glass pane.

The other items on our list were casualties of money, available labor, and time, but mostly the latter. Among the ones not realized were practical items such as how pioneers could build interior walls, and decorative items made of cast basalt, raw glass made from fused regolith, sintered iron fines, etc.

It was our hope to add to our initial offerings as time went on. The exhibit had been conceived as a traveling show that we hoped could be included in every other ISDC. But this did not materialize either, and for one simple reason: no place to store any additional items! But then, if we solved that problem somehow, we'd still have the problem of mobility: getting items out of storage and to exhibit places.

The dream is still alive

But the dream is still alive. If we find the funds to begin erecting an analog moonbase research station, with a modular architecture, build-as-you-go fashion, and if we built alongside of it a growing integrated tourist facility, lunar "homestead items" could provide some of the furnishings and much of the atmosphere.

The tourist facility would have a one-way mirror connection to the research facility. They could observe what is going on in common areas of the facility, but would be invisible to the research crews, and thus not a distraction. Infrequent invasions of Mars Desert Station surroundings by the curious are very disruptive.

Now the dream of the Lunar Homestead Show is hitched to the dream of an ever-growing modular (architecture and biosphere) Lunar Outpost Analog, tasked with demonstrating the technologies needed to "break out" of an initial small science outpost, towards resource-using, import-defraying, export-producing lunar settlements.

Everything fits together! **<MMM>**

MODULAR BIOSPHERICS

Making the most of pressurized pedestrian & vehicular corridors:

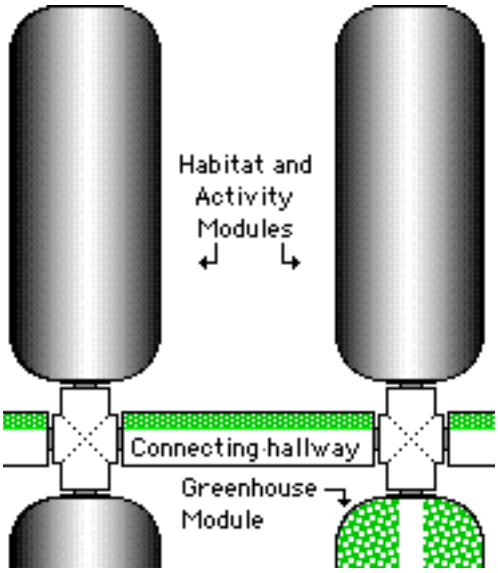
"*Living* Wall Systems"

by Peter Kokh

> "A **living wall** is a vertical garden. Plants are rooted in compartments between two sheets of fibrous material anchored to a wall. Water trickles down between the sheets and feeds moss, vines and other plants. Bacteria on the roots of the plants metabolize air impurities such as volatile organic compounds."
>
> http://en.wikipedia.org/wiki/Living_wall

While this is the definition in the most technical sense, experimenters have made living walls in which plants are in pots anchored to a wall in a staggered pattern. They have also found other ways to keep them properly watered, fertilized, and to recycle the drainage water. The illustration top right is an example of the first approach, the illustration bottom right of the latter.

In a modular outpost, there will be connecting tubular passageways for pedestrians and small carts. Their curved walls offer an opportunity to increase the overall biosphere mass of a lunar outpost (real or analog) by integrating a living wall feature along one side, for the whole length of (each) hallway. This will be in addition to the biomass contributed in any Greenhouse modules and any in the habitat and activity modules themselves.

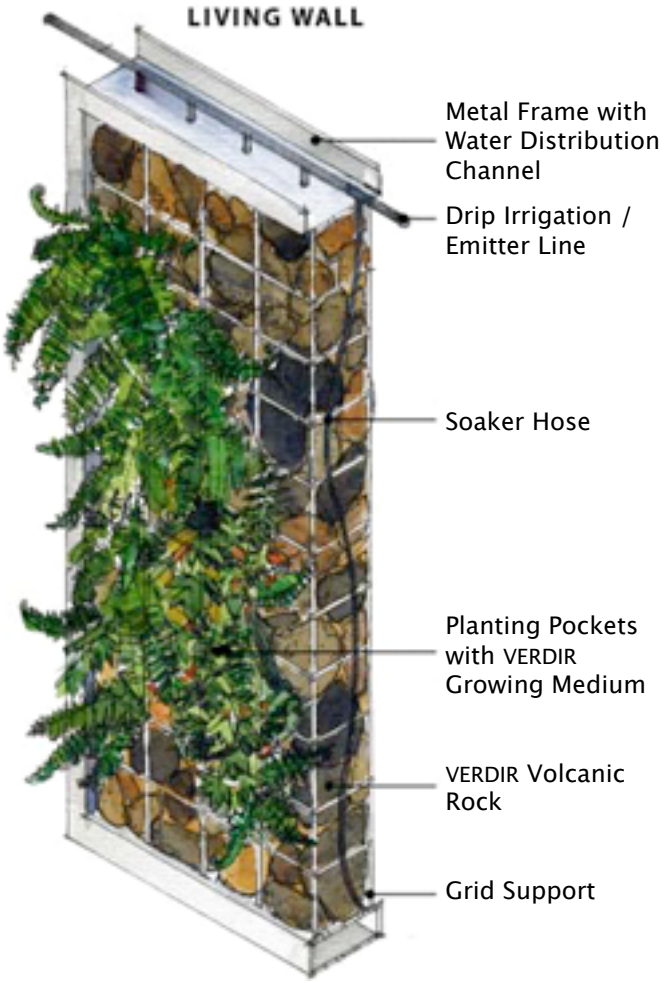


In a larger settlement, pressurized roads could have living walls to each side, and, down the middle, to separate traffic flowing in opposite directions, boulevard style.

If we continue to think in terms of floor space, then we will be put in competition with the plants we depend on – not a prescription for success. But plant areas can make use of otherwise empty wall space.

"Waste no opportunity to include more plant life, want not for your next breath" to paraphrase an old saying.

If we are talking about an open-ended installation (again, either on the Moon or at an analog research site) by adopting a policy that no wall should be idle, we guarantee that the modular outpost grows, a modular biosphere grows with it, neither outstripping the other. Now can there possibly be a better arrangement? Yet so far all biosphere experiments seem to be of set size, not designed to grow in modular fashion. The non-modular set-size approach tends to be an effective predictor that the installation will have no future.



from
www.verdirsystems.com/ html/living-walls.html
The above shows a technical approach.

Many Living Wall installations use a system of staggered planters and integrated water features to accomplish the same ends in a more natural and beautiful fashion.

Plants to choose from

There is a wide variety of plants that provide lush green foliage while cleansing the air of toxins (to prevent "sick-building syndrome") and increase the amount of oxygen, maintaining a fresh, clean atmosphere inside.

Dr. B. C. Wolverton, doing the research for NASA, identified a dozen common house plants easily available

that cleansed the air, including: *gerberra daisy, bamboo palm, spider plant, marginata, mass cane, spathiphyllum, Janet Craig,* and *English Ivy* – published in the pamphlet "Plants for Life: Living Plants Vital In Filtering Contaminated Air – a NASA pamphlet published more than fifteen years ago.

Now Dr. Wolverton has published a much more comprehensive treatment in the book, "**How to Grow Fresh Air: 50 Houseplants that Purify Your Home or Office**" – Penguin Books ISBN 0.14.02.6242.1.

Living Wall installation, Baltimore, MD. This 110 sq ft (10 sq m) wall filters all the air for its 7,500 sf office building.

Notice the ornamental character of some plants chosen

Living Walls as Graywater Purifiers

www.holon.se/folke/projects/openliw/openlev_en.shtml

"By growing plants in a porpos wall [a special adaptation of the Living Wall concept, *read on*], you get both an efficient space use by vertical plant growing and purification of the percolating water, which can be grey-water." (Greywater is water from sinks, tubs, and showers, and previously treated blackwater from toilets.)

"The hollow parts of the stones are filled with inert material, like gravel, LECA-pebbles, perlite or vermi-culite. The stones are placed so the water will percolate in zigzag through the wall. Bacterials in the porous material break down organic pollutants. The water trickling down through the wall will nourish the plants at the same time as it will be purified The plant roots will grow into the inert material and extract nutrients from the water. Over the pebbles, a film of bacterials will grow. After comsuming organic material they release the nutrients in the percolating water. The plants will take up the nutrients and subsidize the bacteria with sugar from their photosynthesis.

"By this, you get both vertical growing & grey-water purification. Therefore, the efficiency of the purifi-cation is *dependent on the amount of solar radiation reaching the plants in the wall."* [web source cited above.]

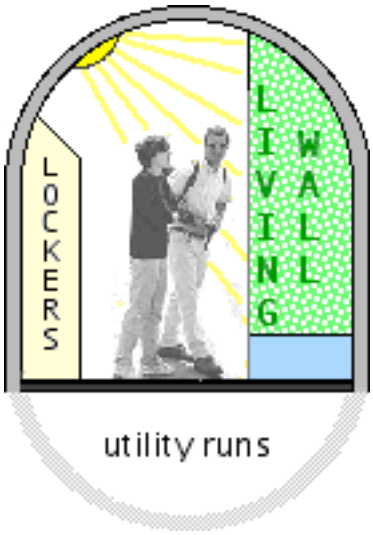
Air Circulation Systems

"Active walls'" are also integrated into a building's air circulation system. Fans blow air through the wall and then recirculate the refreshed air throughout a building. These indoor living walls help prevent and/or cure what is known as "*sick building syndrome "by increasing air oxygen levels .*

Integrating Water Features and Fish

Some Living Walls integrate fish ponds at the foot of the wall as part of the system where trickling water collects before it is pumped back up to the top of the wall.*' The foliage purifies the graeywater, digesting the dissolved nutrients.*

Thus a living wall can be an integral part of water purification and reuse, not just fresh air.



At right: Cross-section of a hallway corridor in a modular Lunar Analog Research Station – or in an actual Moon Outpost.

Decorative Options

It is easy to work in rocks and/or decorative planters, sculptures and other objects into a living wall system. These can be design accessories or fully functional parts of the plant holding and water irrigation systems. A living Wall is something to be designed to suit taste as well as to serve function.

In a modular (analog or real) lunar outpost, each hallway could boast its own design, creating a more interesting working an living environment as well as a fresher, cleaner, healthier one.

You can go high-tech, but this is not necessary, and the cost-benefit ratios of a high-tech approach are probably not great. Low tech is always better *if it works.*

Using all Opportunities to increase biomass

We tend to make the mistake of describing living space volume in terms of square footage of floor space only, neglecting the opportunity walls provide. Counting *all surfaces* is the secret of packing a bigger biosphere into a smaller space: using walls, and even ceilings!

It is important, if we are going to bring the biosphere truly inside, to build our environment with mold-resistant surfaces. This means giving careful consideration to materials and surface coatings, as well as due humidity control and ventilation.

Sunshine, or its equivalent

Proper light must be brought in by light pipes, clerestories, or grow lamps. A separate, related topic.

Purposes of a System of Living Walls in an Outpost

- □ purify and freshen air; purify greywater
- □ provide lush greenery, color, interest
- □ provide herbs, spices, berries, etc.

and last, but not least,

to psychologically "reencradle" crews in a minibiosphere

<MMM>

The Moon Society

J O U R N A L

http://www.moonsociety.org

http://www.moonsociety.org/blog/

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/

Moonbase Simulations - Lunarpedia wiki

Moon Society DUES with ***Moon Miners' Manifesto***

- **Electronic MMM** (pdf) **$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: the Moon in its natural beauty, empty and deceptively barren, waiting for human settlers to shelter and to mother, as their adopted second home world. We have work to do!

Moon Society President Peter Kokh Elected to NSS Board of Advisors

Larry Ahearn, a longtime National Space Society Board member from Chicago, directly responsible for recruiting Peter Kokh to help start an L5 Society chapter in Milwaukee twenty years ago on August 23, 1986 (and now you know the rest of the story ...) was the first to call Peter and let him know that "someone" had put his name in nomination for the NSS Board of Advisors.

Apparently, two points were stressed in pushing this nomination, twenty years of producing MMM, and his position as President of the National Space Society's new affiliate organization: The Moon Society. Larry and another longtime friend on the NSS Board encouraged Peter to signal that he would accept. He did so.

Whereupon, there was a quick return email from NSS Executive Vice President, Mark Hopkins, saying

> "Great! There will be an actual election by the Board of Directors on Saturday, October 21st, but in your case, that's just a formality."

There was one "nay" vote.

This appointment will work to further strengthen collaboration between our two organizations. A few months after the affiliation agreement was signed in May 2005, NSS wholeheartedly backed our Moonbase Exercise in Utah, contributing a 20% share of the rent due on the facility, matching the contributions of the Moon Society and the Lunar Reclamation Society. Meanwhile, NSS will add a Publications page to its website, www.nss.org, on which there will be a link to Moon Miners' Manifesto, the oldest continually produced NSS chapter newsletter.

We will be advertising our new Lunarpedia wiki project to NSS members also, seeking their contributions. We hope to contribute a thick information folder to the ISDC 2007 registration packs. **<MSJ>**

NSS members to get MMM "teaser" copies

Report by Peter Kokh

The Moon Society Board, voting at the November 18th meeting, agreed to a proposal worked out by the Leadership Council aimed at attracting the high percentage of lunar enthusiasts in the NSS membership.

NSS members get the glossy quarterly ***Ad Astra.*** But NSS leaders have been looking for something to fill the time gap between ***AA*** issues every 3 months. We will email, at a schedule to be set by NSS in between ***AA*** mailings, the current issue of MMM in pdf file format, that is 4 out of the 10 issues each year, plus a volume of MMM Classics, currently 14 in number, again in pdf format.

Our hope is twofold:

1. They will want to get all the issues each year and thus subscribe.
2. They will be motivated to pitch in on Moon Society projects, our new Lunarpedia.org for example

The offer is for one year. If the Moon Society Board is pleased with the results, it will be extended. There is one NSS Board member who feels the affiliation agreement between NSS and the Moon Society is too one sided in our favor. We will show them that we intend to contribute more than our fair share. **<MSJ>**

Calgary Space Workers Moon Habitat Progress Report

From Michael Bakk

After the Airstream Command Module, The start of a Corridor System

We are discussing what modules we should build first. The corridor is a definite necessity so we can leave the headquarters and even run electrical conduit and pipe to supply the needs of the extended modules, but what then?

A Workshop Module

The plan is to build our shop first so as to have the additives, resins and equipment to mix with the Moon's soil and build the rest of the habitat. The plan is to have this module as a hard shell as well.

It seems to us that in order to bootstrap our way along, a couple of things will be a need to ensure a strong start. The plan is to use a cargo trailer that is much like ones you see used to carry race cars to the races. This trailer can be partitioned into additional rooms if needed to house an assortment of tools/materials etc. to use in building and repairing the rest of the habitat. A large simulated airlock can also provide the ability to repair a rover inside the shop and be large enough to remove some module sections prefabricated inside.

Wetlands Biosphere Dome Project

Next will be the wetlands biosphere project. This will likely be a dome building out of a similar material as the corridor and be the first inflatable module other than the corridor.

Dorm Module

The last structure planned at this time would be a dorm module and then maybe a lab or common area. It is important that we experiment with other designs and we are encouraging our members to design their own living quarters. We will however, join as a collective group for manufacturing them.

Underground Modules

The plan is to look at underground modules also, to extend the radiation shielding, thermal protection and thermal flux of a habitat otherwise exposed to direct sun, small meteors, solar winds etc.

The MexLunarHab Project

Report by Peter Kokh

Jesus Raygoza, who founded the National Space Society chapter in Guadalajara, Jalisco, Mexico in the 1980s and who more recently has been the principal proponent of the "MexLunarHab" project (**MLH)** has been a recent house guest of Moon Society President, Peter Kokh.

Naturally, the topic of Analog Moonbase Stations and simulations has been a dominant one. However, Jesus [pronounced hayZOOS] is also a key figure in the shaping the future of the recently created Mexican Space Agency, **Agencia Espacial Mexicana** (**AEXA**), with an initial budget of only $2 million. To put that small amount to best use, leveraging it to grow and have the greatest effect in bringing Mexico, somewhat belatedly in comparison with a number of other, smaller developing nations, is something taking a lot of Raygoza's time. He is in constant contact with involved associates in Mexico. Getting off on the right foot is very critical.

Meanwhile, we have spent some common free time discussing lunar analog options, and in particular, what he foresees as a possible future of the MexLunarHab project.

Jesus has already secured 200 hectares, 494 acres, 0.77 square mile in a plot some 200 kilometers SE of Ciudad Juarez (the growing industrial metropolis across the Rio Grande from El Paso, Texas.) The road to the site follows the south bank of the Rio Grande and the mountains on the Texas side dominate the view. As with the land across the river, this is very dry desert area. I've been along I-10 between El paso and Van Horn and in comparison, the deserts of New Mexico are lush oases.

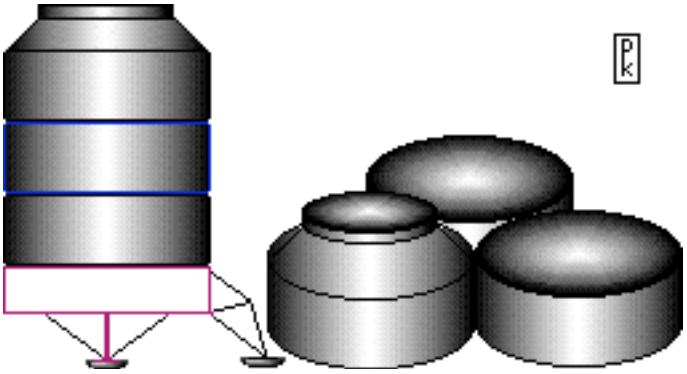
Hise plan is to put up a mockup Lunar Lander and a nearby research station and a "recreational area" for robotic rover contests. Elsewhere on the site would be a domed greenhouse for biological research. A visitor center would be part of the project, and a major source of income for continuing research.

The Lunar Lander is reminiscent of the Zubrin design, except Raygoza's current sketch shows three floors (3 stacked tuna cans, if you will) with a different interior layout from the current Zubrin design as exemplified by the mockups on Devon island, in Utah, and the one being outfitted currently for Iceland. From bottom up:

1st level: sleeping, leisure activities, kitchen, bath
2nd level: operations, communications, infirmary
3rd level: laboratory, workshop

This arrangement is, of course, a proposal that can be modified later as various considerations come into play. The stack would sit twice as tall as the Apollo LEM. The landing platforms are similar.

We discussed the possibility of the Lander being open to tourists, while duplicate "tuna-can" stacked but separable floors could be arranged side by side in a triangle on the desert floor -- an arrangement that would not only be shielding friendly, but eliminate the constant negotiation of ladders between levels, an open flirtation with accidents and physical, muscular stress.



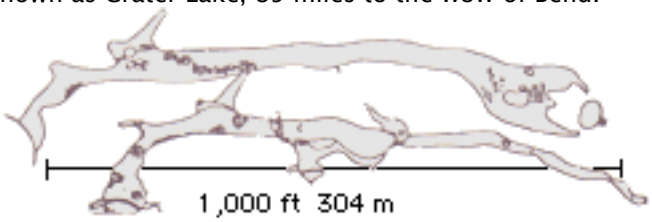
We have many more notes to compare. It is in our interest to have a number of Lunar Analog Research Stations, all trying different things. That way, we all stand to learn the most, and that bodes well for a future civilian lunar settlement effort. **<MSJ>**

Usefulness of Terrestrial Lavatubes in a Lunar Analog Research Station Program

by Peter Kokh

In August 1992, I had the wonderful experience of a personal guided tour of the pair of lava tube caves outside Bend, Oregon that the Oregon L5 Society was using for outpost simulation purposes. My guides were Bryce Walden and Cheryl Lynn York of Oregon L5.

Oregon Moonbase Photo taken during a simulation. The PVC tube frame would be covered with a tarp to serve as a makeshift base for students. The cave floor is flat due to the invasion of volcanic ash from the explosive eruption of Mt. Mazama 4,800 BC that formed the jewel known as Crater Lake, 85 miles to the WSW of Bend.



Above: Young's Cave complex outside Bend, OR.

Lavatubes on Earth are much smaller in scale than those on the Moon, probably in some inverse relationship to gravity. The widest portion of the Young's Cave complex is 79 ft., the greatest ceiling clearance 26 ft. but these dimensions are uncommon. Because of their much smaller scale, they are hardly simulation stand-ins for those on the Moon. But we can put them to some use. And on July 20, 1989, NASA granted the Oregon chapter $25,000 to do a thorough site characterization.

The Geological survey was done by Stephen L. Gillett, a consulting geologist now in Carson City, Nevada with U-NV-Reno. Century West Engineering of Bend did the engineering analysis. A series of 5 borings, in roomy locations specified by Oregon L5, showed the roof to be generally from 10 to 20 feet thick with 7-19 ft of hard basalt overlain by 0-3 ft of loose soil. Except for a few transverse cooling cracks, the ceiling is relatively intact and rock quality analysis shows the roof could support from 2-60 tons suspended weight per linear foot, depending on varying roof thickness and the presence presence or absence of fractures. For this, a system of rock bolts will do. In weak areas, roof-shoring supports are advised. Some 6000-7500 cubic yards of sand forms a floor 0-6 ft thick. This could be removed, if desired, by vacuuming. Rock debris could also be removed, if desired, by backhoe or by hoists through openings made in the roof, thereafter available for installation of equipment. But creating such openings whether by blasting, jackhammer, or rocksaw would be a major undertaking. The variations of surface terrain was also surveyed.

The estimated cost of preparing the site as a major lunar analog facility as outlined by the Oregon Moonbase team was over $6 million 1990 dollars. The Phase II grant never came. Eventually, the chapter decided to let the renewable 5-year lease on the facility expire.

But on the basis of what we learned about this pair of lavatubes during the study, we think that this facility, if we could regain access, or a similar tube elsewhere, could support unique simulation exercises. If the main moonbase facility was up on the surface nearby and only limited simulations done in the lavatube, the cost could be significantly lower, with a very modest initial presence expanded on a pay-as-you-go basis.

The five 60 mm (2 3/8") bore holes through the tube roof-ceiling could be used to drop in miniaturized survey equipment designed to demonstrate how we can robotically map the interior of lunar lava tubes, profiling their complex shapes and cross-sections. These tests finished, the bore holes could be filled with fiber optic bundles to let in sunlight concentrated up to thirty times. One bore hole could be used for communications access.

A small Habitat complex could be put together out of small inflatable units or of EZ assemble-disassemble semi-prefab structures. At such a facility, where, within the lavatube, lighting would be totally controllable, we could more easily simulate the lunar dayspan/nightspan cycle. We could examine ways of dealing with the two week long nightspan that would let a crew remain productive throughout. We would try to determine how little power we could get by on and still be productive, concentrating on repairs, maintenance, inventory, and other power-light, manpower-intensive tasks, so as to better use the 15 days of dayspan solar power available to store up power to tap after lunar sundown.

Meanwhile, a nearby surface conventional outpost complex would investigate and demonstrate other things: teleoperations; in situ resource utilization; shielding options; and many more lines of investigation. While it would be ideal for the companion analog surface outpost to be very close to the lavatube entrance, a separation of a few miles should not hinder operations. Crew would go from one to the other in a "pressurized vehicle." This allows room for latitude if it is not possible to have both outpost components closely collocated.

If the access to the Bend, Oregon site can't be recovered, we might do something similar at lavatube locations at Craters of the Moon National Park, ID; El Mapais National Monument, NM; or Snow Canyon State Park, UT. The advantage of Bend is that the lavatube complex there is well known and studied, and familiar to a number of Moon Society members. **<MSJ>**

Space Settlements 2008 Calendar Artwork Contest Prizes Grow

As more potential sponsors of the NSS Space Settlements 2008 Calendar Art Contest hear of the contest, the pool of prizes has grown to a total of 58 with a total value of $9424.00. The contest is cosponsored by the Moon Society which is offering a prize of $250 for the best piece of artwork rendering a civilian settlement (not just a small crew space agency outpost) on the Moon.

For more information, check out the Contest website at

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

Art work may be in any form: digital or more traditional media, but must be submitted digitally. The posted deadline, set by the publishers of the 2008 calendar in which the winning entries will be featured, is January 31, 2007.

Artwork is sought in four categories:

- space settlements (as in O'Neill colonies)
- settlements on the Moon
- settlements on Mars
- settlements out among the asteroids

If you are an artist, now is the time to jump in. If you are not, but know someone who is, please tell them about it. **<MSJ>**

Chapters & Outposts

Moon Society Phoenix Outpost

Contact: Craig Porter <portercd@msn.com>

I set up an outreach table on October 21stat the Riparian Water Ranch in Gilbert, Arizona for the Grand Opening for their Observatory and Telescope. I recruited a young assistant for the night, a friends daughter that is curious about what's going on. We were outside with no electricity.

www.azcentral.com/news/articles/1020observatory1020.html

The Gilbert Rotary Centennial Observatory, a $100,000 facility equipped with a $20,000 16" tele-scope. It is sittuated 6 miles SE of Mesa, AZ on 2757 E. Guadalupe Road, 15 mi ESE of downtown Phoenix. It's an educational facility, more than a research one.

My wife is seated to the right. *continued next column*

I am working on a video for introducing the Moon Society to the general Public. You (chapters coordinator) will get the 1st copy for your comments and suggestions. Also, I have purchased a PowerPoint Software Package and will put together a Power Point presentation.

I plan on setting up a regular meeting site, date and time and posting them on several local Campuses, Junior Colleges and Universities. *Craig Porter*

What Craig Porter has been doing in Phoenix is a model for what other local outpost contacts could do.

1) gather materials into the start of a display
2) Create flyers and other outreach materials
3) set up a place and time & date to meet
4) publicize the above.

There are many tools and guides to help you at http://nsschapters.org/hub/ This is a site created to help chapters of the Moon Society, National Space Society, and the Mars Society. *You can do it!*

Bay Area Moon Society

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

Meeting 4th Thurs. montlhly at Henry Cate's in San Jose

Contact: Henry Cates <hcate2@offshore.ai>

Moon Society St. Louis

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

Meeting the 3rd Wed. monthly at Buder Branch Library 4401 S. Hampton, in the basement conference room

Contact: Keith Wetzel <kawetzel@swbell.net>

November 15th Meeting Report – Bob Perry

This was our first meeting on the 3rd Wednesday instead of the second, with Chris Nobbe, Dave Dietzer, Mark Rode, and Bob Perry attending. We had a lively meeting with these highlights:

- Cylindrical Moon habitat requirements & construction. What atmospheric pressure and gas mix would be maintained? The diameter of the cylinder and the wall materials proposed.
- Regolith shielding – heat flow, cosmic rays, etc.
- Magnum Launch Vehicle (Mark, thanks for the URL), heavy lift capability
- Reprise of "what to do with space station poo" (a Dave Heck Archon30 presentation)
- Dave Dietzer brought a new moon miner page draft along with many new erpages – www.moonminer.com

Earlier in the day I left the St. Louis Science Center Science Cafe handouts with the librarians and they dropped them off at the start of the meeting – Chris took 150 for her school, students, and students' parents. I took the remaining 50 and will go to area libraries (public and collegiate and even high school) libraries and try to get them posted. We hope to attend the January 18th event, "Can the Moon Save the Earth?" by Gregg Maryniak.

Bob gave Dave a folder of HTML and JPG files and briefly discussed the proposed "silent jet" passenger air craft that uses the NASA Blended Wing Body concept, with the engines inside the craft and the inlets and exhausts especially designed for drastic reduction in noise. I'll post the files on the chapter website. *Bob Perry*

GREAT BROWSING !

NASA offers a $250,000 prize for a better glove:
http://www.courant.com/technology/hc-space0425.artapr25,0,666931.story?track=rss

Daily News on Pluto, Charon, KBOs
http:www.plutotoday.com

Deep Impact Extended Mission to Comet Boethin?
www.plutotoday.com/news/viewpr.html?pid=21191

Images of Dwarf Planet Ceres
www.plutotoday.com/news/viewpr.html?pid=21080

"Competition, Cooperation and Conflict: Space Tourism on the Rise"
www.space.com/adastra/061117_adastra_xprizecup.html

Astronomy and Spaceflight Discussion
http://www.spacebuffs.com/discussion/

Arecibo and VLBA telescopes face budget axe
http://www.newscientistspace.com/article/dn10449-worldclass-radio-telescopes-face-closure.html

"Space Religion" and the Infidels
http://space.com/adastra/adastra_infidels_061102.html

Fly your name to Mars on Phoenix
http://planetary.org/special/fromearth/phoenix

Details on SpaceX and Rocketplane Kistler plans
http://www.thespacereview.com/article/733/1

Ice on the Moon debate: Paul Spudis
http://www.thespacereview.com/article/740/1

Misconceptions on Space Commercialization
http://www.thespacereview.com/article/743/1

Philosophical, Cultural, Political Astrobiology issues
http://www.thespacereview.com/article/741/1

Safety Regulations push could kill Space Tourism
http://www.thespacereview.com/article/749/1

Air Force, NRO Needs shapped Shuttle Program
http://www.thespacereview.com/article/748/1

4Frontiers Corporation Mars Settlement Video
www.4frontierscorp.com/video/MainSite720x480.html

Mars Frontier Site for Kids
http://www.crazy4mars.com/

Bigelow Aerospace well ahead of bold schedule
http://news.yahoo.com/s/space/20061122/sc_space/bigeloworbitalmodulesacceleratedspaceplans

The Stardust Probe's amazing Aerogel stuff
http://planetary.org/programs/projects/stardustathome/aerogel.html

Ten-minute Russian video of the planned Phobos-Grunt mission to land on the Martian moon and return a sample of it to Earth (in Russian)
http://www.youtube.com/watch?v=W0cUvK0Dgy8

National Space Society announces new SPACE SETTLEMENT NEXUS

WASHINGTON, Dec. 4, 2006 -- The National Space Society (NSS) today announced the launch of the NSS Space Settlement Nexus, **a public Internet portal** that offers unlimited access to the most comprehensive collection of documents, studies and other resources concerning Space Settlement and related issues.

Timed to coincide with NASA's release earlier today of the agency's Global Exploration Strategy and Lunar Architecture, the unveiling of the NSS Space Settlement Nexus (www.NSS.org/settlement) underscores the National Space Society's continued strong support for NASA's Vision for Space Exploration and the placement of Space Settlement at the center of NASA's long-term plans.

"At a time when the country and the world are calling for a positive direction, NASA's space exploration program offers a path of growth, discovery and hope," said George Whitesides, Executive Director of the National Space Society. "The global exploration strategy makes a bold statement that we are going back to the Moon to stay."

The National Space Society traces its founding principles to the innovative concepts of Dr. Gerard K. O'Neill, the Princeton professor who advanced the field of Space Settlement in the 1970s and 1980s. The NSS Space Settlement Nexus includes comprehensive coverage of Dr. O'Neill's work, as well as related resources on the settlement of the Moon, Mars and asteroids.

"Today's announcement places the expansion of humanity at the center of NASA's exploration program," said Mark Hopkins, Senior Vice President of NSS.

"This decision validates the belief of Dr. O'Neill – and thousands of NSS members worldwide – that Space Settlement can deliver nearly unlimited resources, growth and prosperity."

The NSS Space Settlement Nexus can be found at:

http://www.nss.org/settlement

[MMM Editor:}

The left hand menu is the key to all the linked pages, over 8,000 of them. The links are:

- SPACE SETTLEMENT LIBRARY
- NASA SPACE SETTLEMENT MIRROR SITE
- NASA/NSS STUDENT DESIGN CONTEST (grades 6-12)
- INTERNATIONAL STUDENT DESIGN CONTEST (grades 9-12)
- CALENDAR (2008) SPACE SETTLEMENT ART CONTEST
- ORBITAL SETTLEMENTS
- MOON
- MARS
- ASTEROIDS
- SPACE SOLAR POWER
- L5 NEWS (pdf archives)
- NSS ROADMAP

There is a lot here to explore. Some of this, like the L5 News archives in PDF format, courtesy of David Brandt-Erichsen, have been online for a while.

Personally, I am going to check out the Moon section first. Perhaps we can add to it, and certainly we will link to it. **<MMM>**

http://www.nss.org/settlement/moon/index.html

THE 7 WONDERS OF THE MOON

Starting Thursday, November 8, 2006 and for the following 6 weekday mornings, ABC's *Good Morning America* news program unveiled the new "Seven (human and natural) Wonders of the Modern World:"

- the Potala palace/lamasery in Lhasa, Tibet
- the Old City of Jerusalem
- Polar Ice Caps
- NW Hawaian Islands Reef
- The Internet
- Chichen Itza Pyramid
- Serengetti Migration

Thirteen years earlier, in MMM #69, October '93, page 7, we gave our pick of the "7 Wonders of the Moon:"

Five Nearside Wonders

- The ever changing spectacle of Earth in the sky
- The Crater Copernicus
- The Straight Wall
- The Alpine Valley
- The Lavatubes

Two Farside Wonders

- The splendor of the Milky Way in the sky
- The crater Tsiolkovsky

This article has been republished in MMM Classic #7, in pdf format, freely downloadable at either of these locations:

www.lunar-reclamation.org/mmm_classics/
www.moonsociety.org/publications/mmm_classics/

Our list included only natural wonders. Two of them were not on the surface of the Moon but in its sky, splendors that no one on Earth could imagine.

What might we include as human wonders on the Moon? Our pick includes:

- Luna 9 (USSR) in Oceanus Procellarum (Ocean of Storms), the fist soft landed artifact from Earth, February 3, 1966
- the Apollo 11 site, Mare Tranquilitatis (Sea of Tranquility) with man's first footprints, July 20, 1969
- Lunakhod 1 (USSR), in Mare Imbrium (Sea of Rains), the first rover from Earth, carried by Luna 17, November 15, 1970
- the Apollo 15 site, Apennine Mountains: July 31, 1971, not only does this site include the first moonbuggy, left behind by the crew, but it is near the Hadley Rille, which we have come to realize was once a giant lavatube. Lavatubes will be very prominent in many future human settlements

Destined to join this list will be the first human habitat module left on the lunar surface, the first fully functioning outpost, etc. But we believe any and all of these items should be listed as Historic Wonders, the start of an totally different list form the natural wonders above.

The Seven Wonders of the Ancient World and those on the new list, are creations of mankind and nature. It will be a long time before we can create such a list for the Moon. In both lists, "standing the test of time" has been essential. All 7 ancient wonders and 4 of the new wonders are significant architectural achievements.

It is important to realize, moreover, that there will be no future human wonders of the Moon, unless w make it happen, we being people with foresight that can look way beyond the limited horizons of the NASA lunar outpost mandate **<MMM>**

4Frontiers Corporation Begins
Generation II Mars Settlement Study
Launches New Websites and Product Lines
www.4FrontiersCorp.com

Nov. 20, 2006: Tampa, FL – The 4Frontiers Corporation today announces the beginning of a new round of intensive Mars settlement design. 4Frontiers has contracted thirty researchers, scientists and engineers in a broad array of technical and social science disciplines to further the company's understanding of Mars settlement.

The eight month project, called the Generation II Programming Study, will further refine and expand upon concepts established in an initial study completed in 2005. This work will investigate many aspects of an initial home for a dozen settlers on the Martian frontier. The Gen II study will also examine the broader issues related to a the growth of a branch of human civilization on the red planet to more than 1000 people.

A key aspect of 4Frontiers business strategy is to engage the public, sharing much of the vision, the new technologies, and innovations which it develops, and translating public fascination into revenue-based support of the company's space development research and business operations. A completely new corporate website is now available which provides the interested public with access to the company and its Mars experts. This newly expanded site will include periodic updates of company research and discoveries from its Mars settlement studies as well as in other business activities.

4Frontiers is also proud to today announce the launch of a new children's site (www.Crazy4Mars.com). This site will be continuously expanded and enhanced with new features,and provides a fun and interactive destination where children can learn about a family living in the early Mars settlement. The site features an exciting, real science based series of illustrated short stories which allow children to experience some of the excitement, hardship, and triumph of a family of settlers and their companions living in the Mars frontier. A resident robot helper, EMMA, both teaches the children about their new home and protects them from the dangers of their exciting but untamed world.

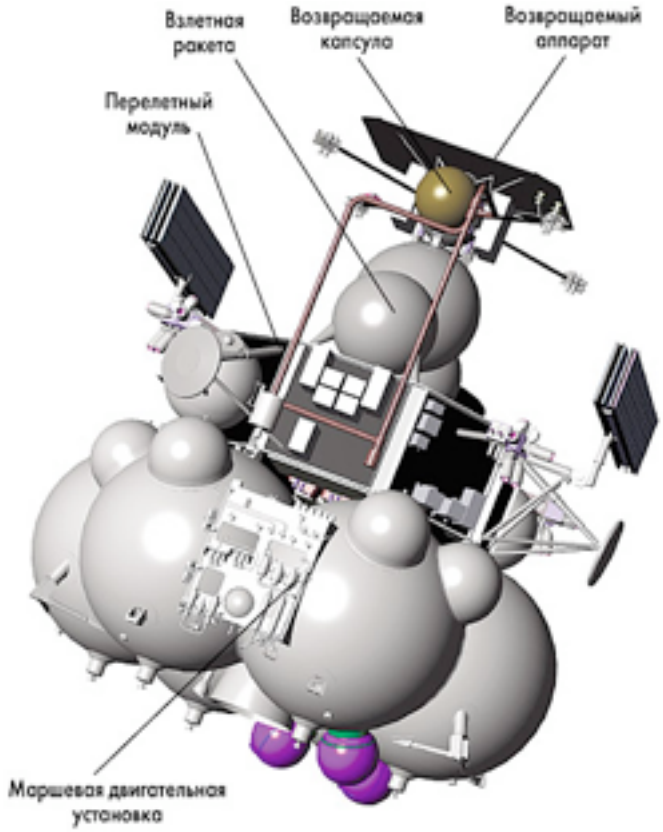
The new 4Frontiers website includes a webstore featuring both fun and educational products related to Mars and outer space. The online store is linked through both the corporate and children's websites. 4Frontiers intends to expand upon and further develop current product lines on a continuing basis.

4Frontiers derives its name from the four current and upcoming space-based economic frontiers – Earth orbit, Mars, Moon and asteroids. The company is positioning to be a leader in emerging space commerce and that includes conveying related development and economic information to the public. In addition to the aforementioned activities, the company has completed a technical paper establishing an economic model describing the emerging space frontier economy. This paper will be published in an upcoming edition of the peer reviewed journal Futures Research Quarterly. **<4FF>**

MEDIA CONTACT: Barbara Preslock – 4Frontiers Marketing Manager Phone: 727-845-4011 Fax: 727-845-4113 Email: Media@4FrontiersCorp.com

MMM PHOTO GALLERY

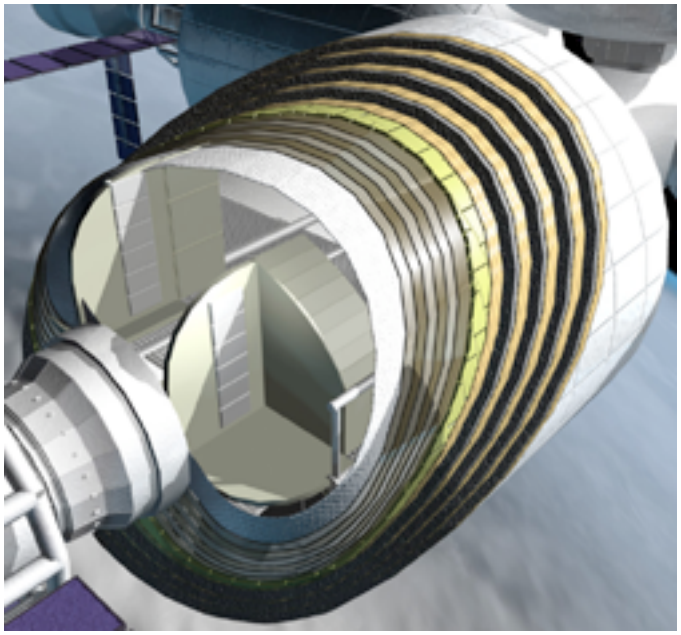
Russia's Planned "**Phobos Grunt**" ["soil"] Lander / Sample Return Mission



The lower part brakes into Mars orbit; the upper part (photo below) lands on Phobos and takes core samples which go into the red return capsule (both photos) eventually returns to Earth

Do watch the 10 minute YouTube video, even though the narration is in Russian:
http://www.youtube.com/watch?v=W0cUvK0Dgy8

Bigelow Aerospace licensed the TransHab Technology & Plans from NASA: Bigelow will not necessarily keep the vertical, three-floor layout.



Cuttaway shows the foot-thick layered structure of the inflatable envelope designed to resist puncture by micrometeorites and space debris

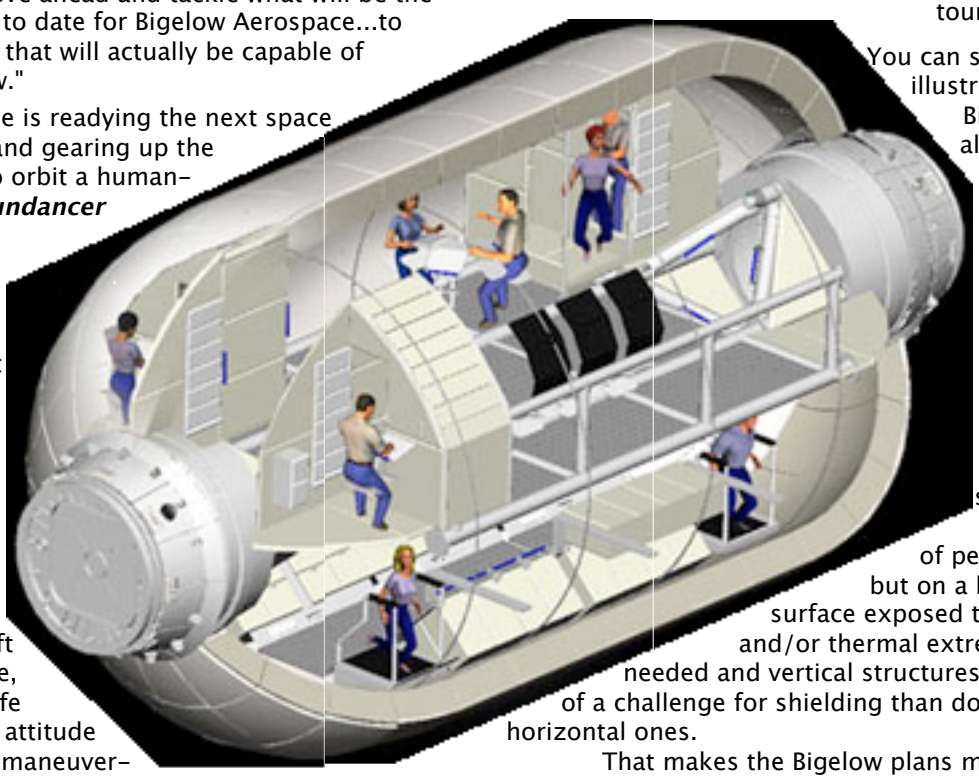
"Go, Bob!, Go!" - Burt Rutan
(of Robert Bigelow)

Success with Genisis I inflatable module now in orbit, advances next step plans of Bigelow Aerospace

http://news.yahoo.com/s/space/20061122/sc_space/bigeloworbitalmodulesacceleratedspaceplans

Mike Gold of **Bigelow Aerospac**e, "At this point, we feel we're ready to move ahead and tackle what will be the largest challenge to date for Bigelow Aerospace...to develop a habitat that will actually be capable of supporting a crew."

Bigelow Aerospace is readying the next space module mission and gearing up the company plans to orbit a human-rated habitat--***Sundancer***



Genesis 2's flight could come as early as March, 2007. It would new and different payloads and experiments, with enhanced systems.

Looking ahead, ***Sundancer*** (see artist sketch =>) will boast 180 cu meters (6400 cu ft of habitable space, fully-equipped: life support systems, attitude control, on-orbit maneuverability, as well as reboost and deorbit capability. The Sundancer would boast three windows and could support a crew of three. How soon? "in a late 2009-2010 time frame," Robert Bigelow says.

Sundancer would not be the final product, but a definite step towards the goal of a 330 cubic meter habitat which could be added to the existing International Space Station or combined with other "BA-330" modules, form the first private enterprise space station in orbit above the Earth.

330 cubic meters or 11,725 cu ft would be the size of a 45 ft long cylinder with a diameter of 18 ft. That is considerably more spacious than the scuttled US Hab module once planned for the International Space Station before the administration minimized the ISS final stage.

Bigelow's Launch Providers

Bigelow Aerospace is in the inflatable module business, along with the systems needed to outfit it. The company has to purchase launch services from other providers to get its modules into space.

A Russian Dnepr, a converted surplus intercontinental missile, provided this service for Genesis on July 13, 2006, earlier this year, and a similar launch vehicle will probably boost Genesis II to orbit next March.

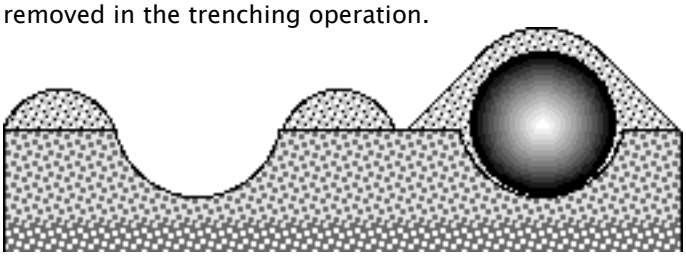
Meanwhile, Bigelow Aerospace has entered into an agreement with Lockheed Martin to explore the use of its venerable Atlas V 401 launch vehicles in the future. Other options could be the untested SpaceX Falcon 9 or the Ukrainian Zenit.

Editor's Commentary:

It is unclear (to the MMM editor) whether a Sundancer crew would be boosted into orbit aboard that habitat, or separately. But reaching the capacity and level of man-rated systems is an essential goal for Bigelow Aerospace, because that is what it's all about - designing, testing, flying inflatable modules for human occupation, whether in commercial space stations or future space tourist orbital hotels.

You can see from the artist illustration at right that Bigelow is thinking along the lines of a horizontally configured layout, not a vertically configured one as in the Zubrin double (or triple) "tuna can" design also featured in current NASA lunar outpost illustrations. In space, orientation may be a matter of personal preference but on a lunar or planetary surface exposed to cosmic weather and/or thermal extremes, shielding is needed and vertical structures pose much more of a challenge for shielding than do ground-hugging horizontal ones.

That makes the Bigelow plans most interesting to potential private enterprise moonbase developers. A site could be trenched, the module set in and backfilled, and the protruding top half easily shielded with the regolith removed in the trenching operation.



"Less expEnsive, More expAnsive" modules will allow for a larger outpost and a larger crew for the same amount of money. Of course, more than modules will be needed to make a functioning outpost. But the same commercial contractors that would supply NASA with all these other systems, could, minus the cost-escalating paperwork, provide the same for a commercial outpost contractor for much less money.

There's a long road ahead, but a Bigelow Aerospace inflatable module-based lunar outpost could just become a functioning reality before a budget-retarded downscaled NASA one could see the light of day.<**MMM**>

Also read:
www.space.com/news/060721_genesis-1_impact.html
"Bigelow's Big Gamble: Building a Space Station"
By Leonard David

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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(* LRS Board Members for 2007)

LRS News

• **Peter has a visitor**: *Jesus Raygoza*, founder of the NSS Guadalajara Mexico chapter and chief protagonist of the MexLunarHab (MLH), now living in southern Colorado, has been in Wisconsin for a few weeks, alternating visits with Peter Kokh in Milwaukee and Dave Dunlop in Green Bay. We are comparing notes on or respective Analog Moon Research Station ideas, and coming up with some interesting ideas. Raygoza has secured 200 hectares (c. 800 acres) of land about 120 km (75 mi) SE of Ciudad Juarez, the major industrial city across the Rio Grande from El Paso, TX. But like ourselves (Moon Society-LRS-NSS partnership) looking for funding. Of course, we are comparing notes on that also. Jesus [pronounced hayZOOS], in his mid-50s, is a cool character, and Peter and his three dogs have been enjoying his visit.

• **James Schroeter joins the LRS Board.** As Ken Paul's constantly shifting work schedule results in his more often than not being unable to attend regular meetings, we have asked James to step up the plate, joining Peter Kokh and Robert Bialecki as the three LRS Board Members as of January 1, 2007. Other positions remain unchanged. Meanwhile, we thank Ken for his service!

LRS Upcoming Events – Janurary, February

Saturday, January 13th, 1-4 pm

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

Peter will be out of town, January 12-22nd,
visiting siblings in Washington State.

Saturday, February 10th, 1-4 pm

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

MMM 7 NSS Chapters Strong

NSS Chapter Events

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

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 16, January 20, February 17

Chicago Space Frontier L5

610 West 47th Place, Chicago, IL 60609

INFORMATION: Larry Ahearn: 773/373-0349

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

December 7th Meeting: Ben Heset will be speaking on the Mars Desert Research Station, and his most recent experiences there on Crew #51, November 12-26, 2006.

Nov Minnesota Astronomical Society meeting pics
http://freemars.org/mnfan/MAS/2006-Nov-Meeting/

Ben Huset's 4th tour of duty at MDRS ends Nov. 26th
Pictures taken by Ben on MDRS Crew 51:
http://www.freemars.org/mnfan/MarsSociety/2006/MDRS/Crew51/

WISCONSIN

Sheboygan Space Society

728 Center St., Kiel WI 54042-1034

c/o Will Foerster 920-894-2376 (h) <willf@tcei.com>
SSS Sec. Harald Schenk <hschenk@charter.net>
>>> **DUES:** "SSS" c/o B. P. Knier
22608 County Line Rd, Elkhart Lake WI 53020

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

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

DEC 21st The Stoelting House, **Kiel**
JAN 18th: UW-Sheboygan, Room 6101, **Sheboygan**
FEB 15th The Stoelting House, **Kiel**

PENNSYLVANIA

Philadelphia Area Space Alliance

PO Box 1715, Philadelphia, PA 19105

c/o Earl Bennett, EarlBennett@erols.com
215/633-0878 (H), 610/640-2345(W)

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

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

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

Next Meetings: Dec. 16, Jan. 20, Feb. 17

October/November Meetings Report: No formal meeting in November but, as has been done in the past, we will meet for lunch or dinner at the event noted below.

By the time this is published we will have participated in the Philcon Science Fiction Convention in center city Philadelphia at the Sheraton. Since we have no formal meeting for November I have decided to add some technical material to our delayed October report. First, though, our Space Day event report: on October first. we exhibited at The Franklin Institute where U.N. Space Day was held. Stand up guys Mitch Gordon and Alex Howerton where our presenters to the public. We had Peter Kokh's Gravity Bricks for the youngsters and the potential of space for inspiration and exploration from Mitch and Alex.

One of the purposes of our group going to the event was to promote contact between Alex and the Institute's Planetologist Derrick Pitts who also works on bringing in exhibits that will attract the worlds public. Alex, whose title is Business Development Manager, Space Training, works for Nastar Center, a part of Environmental Tectonics. This happened and we hope that this results in exciting space related exhibits and work for our area. Material for Nastar Center and our exploration and science groups where given out. I made a cameo appearance late in the day but brought a new element for our "Bricks" exhibit: a new "Jupiter Brick". This brought a number of weight lifting demos of course! However: I had to restrict access to this element due to children wanting to "try it". If you bring it" you are responsible for "it". On a more pleasant note, Derrick came over and thanked us for coming and stayed with us for some time. We are happy to be chosen for this event.

Earl Bennett brought a few space related articles and am adding some post meeting material. *Nuts and Volts* for November had a Near Space piece that had an interesting side bar: there are directions to youtube.com for videos of Near Space explorations. L Paul Verhage has made his flights available on the site by looking for Near Space there.

Analog, Science Fiction and Fact for December had an article by Stephen L. Gillett, PhD on Floatworlds, planets where most habitation is, or at least at the beginning, not on large land masses but in floating aerial communities. Several Life in the Shallows concepts are described, including some fundamentals of where life's necessary chemicals come from (and an interesting concept for terraforming the "float world" of Venus!).

In addition to this *Analog* edition, the January/February issue came as a "double issue" with Shielding a Polar Lunar Base by Franklin Cocks on what it may take to be "out in the open" on the Moon. the author describes the level of shielding we might need and describes the electrical currents, with an equation or two. To show what could be done. This is a neat alternative to building up large piles of regolith but does require a superconducting coil of some size. This mass would be in lieu of "earth movers" that could be reused but for large bases it might be more economic. See the article.

And last: The September/October *Amsat Journal* has a continuation of Satellite Signals and Reception (part two) by Gould Smith, WA4SXM. This part is on orbital passes and software. There is also an article on "Reinventing the Cube" by Paul Shuch Phd., N6TX. This is a continuing consideration of the small satellite family called, appropriately, Cubesats. Paul discusses the background of the craft and some new applications for these small transponders in the sky. Read these and other pieces, which include the early history of amateur satellites and the upcoming Eagle.

Michelle Baker gave our treasury report and pointed out that we are solvent but that renewals are still needed from some members. We send our report to many former members but stop supporting their Moon Miners mailing after several months. This great resource is the primary reason for dues and is an asset worth paying for (my editorial).

In a post meeting report Larry the Webmaster

said that he is upgrading the website. We had a response from a potential member who also later contacted me. I will forward our report to Larry for posting both on the website , as an update, and the blogsite.

Dorothy Kurtz brought material from the October *Smithsonian* on the search for extra solar (outsystem?) planets. "The Planet Hunters" is by Robert Irion. The piece features several explorers looking for "exoplanets" including Chris McCarthy working at the Lick Observatory and Berkley's Geoff Marcy. There is even mention of one of our wish list items: sending cameras out to look at two solar systems (Tau Ceti and Epsilon Eridani). Using what we have now the article says we have found over two hundred planets now. Neat!

Dennis Pearson stopped in, from the Allentown area, to tell us of traveling to last springs ISDC, visiting the Mojave Desert Space Port and got to visit the JPL site running *Spirit* and *Opportunity's* explorations. Beyond that he and Michelle brought out a lively topic of "what is the edge of the Solar System?". This is something that came up as a result of talk about whether the Voyager craft had left the system. If we start including the Kuiper Belt then its going to be a while, and if its the Oort Cloud (or as Michelle later related: The Opik Oort Cloud) it will really be a long wait: the Cloud goes out to a Light Year. The Heliopause or magneto pause are more reasonable definitions. Dennis also talked of research on aerospace vehicles and the problem of "the wings falling off". And lastly: Dennis, who gives tours of Bethlehem Steel's old plants suggests using these massive sites as rocket test locations. Excellent conversation.

Hank Smith talked of his lost opportunity to be at a convention, rather than our meeting, due to storm damage at the convention location (Capclave) He also talked of Philcon and our place as participants and future event. Balticon will be in May on Memorial Day weekend. This is good for our public outreach as this several weeks after a favorite event here: Super Science Weekend. This means that Hank, and members not going to the ISDC in Dallas, will be able to support this fine event.

Mitch Gordon reprised the great time we had talking to the public at "a prime traffic area:" for U.N. Space Day at the Franklin Institute. He thought it was our best event in five years. This was the event Mitch worked for and resulted in Alex meeting Derrick with our help so, in that sense, I have to agree. Mitch is currently working on a broader field for a public speaking event. Go, Mitch!

I should mention a bit of humor from the *Smithsonian:* A humor piece called "Moonstruck" includes some priceless conversation bits including the misnaming of "The Van Allen Belt" as "The Van Halen Belt!" A funny thought piece by Melody Von Smith.

Submitted by Earl Bennett

SOLAR SYSTEM AMBASSADORS
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CALIFORNIA

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.
- **January 20, February 17, March 17**

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

Upcoming Events

- **Dec 9, 3:00 p.m. -** OASIS Monthly Business Meeting, at the home of Paula and Bob Gounley, 1738 La Paz Road in Altadena. The Annual Holiday Party follows meeting at about 5:00 p.m. Call the *OASIS Hotline,* 310/364-2290, for more information. *NOTE: This the **second** Saturday in December!*
- **Sat Jan 20th, 3:00 pm --** OASIS Monthly Business Meeting, location TBD. Call the *OASIS Hotline,* 310/364-2290, for more information.

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/.

Looking Ahead

- **Dec 21, 4:22 p.m.** -- Winter Solstice (Dec 22, 00:22 UT)

"CLARKE'S LAW"

New ideas pass through three stages:

Stage 1: *"It **can't** be done."*

Stage 2: *"It **probably** can be done, **but** it's not worth doing."*

Stage 3: *"I **knew** it was a good idea all along!"*

"The excellent engineer knows when better is worse than good enough"

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○ **$20** NSS dues **if under 22 / over 64.** *State age* ___
600 Pennsylvania Ave SE #201, Washington DC 20003

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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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Send proper dues to address in chapter news section

=> *for those outside participating chapter areas* <=
○ **$12 USA** MMM Subscriptions; ○ US**$22** Canada;
○ US**$50** Surface Mail Outside North America
Payable to "LRS", PO Box 2102, Milwaukee WI 53201

CHICAGO SPACE FRONTIER L5
○ $15 annual dues

LUNAR RECLAMATION SOC. (NSS-Milwaukee)
○ $12 low "one rate"

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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PO Box 2102, Milwaukee WI 53201-2102

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