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

Moon Miners' Manifesto

& The Moon Society Journal

www.MoonMinersManifesto.com

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In FOCUS "Ice" on the Moon:

Recently, we've heard a lot of "definitive" claims that the case for lunar polar ice has been "debunked." The rattle comes from radar astronomers, particularly a team from the Arecibo observatory in Puerto Rico. But as Dr. Paul Spudis shows*, their claim falls short of compulsion, and instead helps define the challenge that is facing the next round of lunar orbiters, particularly ***Chandrayaan-1*** to be launched by India in early 2008, and NASA's ***Lunar Reconnaissance Orbiter***, set to fly later that year. These two probes will gather complementary sets of data at much higher resolution than any before, and help clarify the picture. At present, all the data, from Clementine in 1994, from Lunar Prospector in 1998-9, from the Lunar Prospector impact splashout in 1999, and from the recent Radar scans admits two or more interpretations.

* http://www.thespacereview.com/article/740/

But, even if Chadrayaan-1's and the LRO's data favor a water ice interpretation, any rejoicing will be premature. There seems to have been a widespread belief in both the media and among many poorly informed space-enthusiasts, that the Lunar Prospector and Clementine evidence meant sheets of solid ice in permanently shaded lunar polar craters. In fact, there has never been any evidence that can be interpreted in that manner.

Any ice of cometary origin, will have accumulated slowly, over billions of years, in a process where the loss rate from cosmic rays and micrometeorite rain, has been somewhat less than the rate of accumulation. During all this time, regolith has been accumulating also, as this blanket of pulverized rock dust continues to this day to be gardened by the meteoritic bombardment. Lunar Prospector's findings were that the upper 10 cm = 4 in. are relatively hydrogen-free. On the one hand, that is a strong indication that whatever hydrogen is present at the poles, is mostly of non-solar wind origin, and therefore probably of cometary origin. On the other hand, radar does not see intact layers of ice. But that is not what we should be expecting in the first place. The Arecibo team is in fact, attacking a "straw man," a position that no one has put forth.

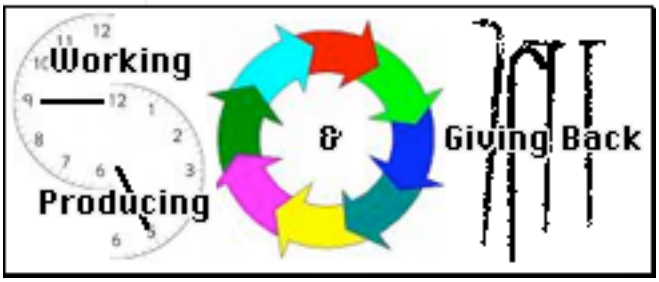
Sorting Sense from Nonsense

In other words, we can expect at best, a mixture of soil particles and ice particles, probably at concentrations below that of what we call "permafrost", the ever-frozen water-logged soils of the subarctic and subantarctic areas. Spudis' figures indicate that the overall concencentration may be on the order of 1.5% moisture, a lot by lunar standards in general, but very dry in terrestrial terms. But, he adds, that is just the indication of the average concentration. There may be pockets here and there where the concentration is significantly higher.

Only lunar lander-rovers equipped to drill and analyze the drill cores, and able to roam widely within a target area, will be able to confirm or rule out concentrations rich enough to be economically recoverable.- PK

"Retiring" on the Moon?

Whoa! you say. "This isn't going to happen! We cannot afford to support people who are not producing. Well, that goes without saying. But that asserted, there may be ways, many in fact, for retired persons to make contributions that improve the gross productivity of the settlement, fully "paying their way." If we are going to have settlements, we must find those ways. Read our article "Retirement on the Space Frontier," page 7.



Moon Miners' Manifesto

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

• **Moon Miners' Manifesto CLASSICS:** Beginning in July 2004, we began an effort to re-edit, reformat, re-illustrate and republish the timeless articles of MMM's first fifteen years, in PDF format only, 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" entrepre-neurial 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 satis-faction with themes and treatment, requires no other litmus test. Any presumption that participating organizations can be labeled by indirect mutual association is unwarranted.

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

• **The Lunar Reclamation Society** is an independently incor-porated non-profit membership organization engaged in public outreach, freely associated with the National Space Society, insofar as LRS goals include those in NSS vision statement. LRS serves as NSS' Milwaukee chapter => www.lunar-reclamation.org

• **The National Space Society** is a grassroots pro-space member-ship organization, with 10,000 members and 50 chapters, dedicated to the creation of a spacefaring civilization.

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

• **The Moon Society** is "dedicated to overcoming the business, financial, and technological challenges 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:
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NASA's Lunar Research Station Design Challenge is just for Kids, grades 5-8

www.moontoday.net/news/viewpr.html?pid=20802

Is NASA disinterested in designs from anyone older?

Zubrin double "tuna-can"

That the sample design chosen for the contest is one that would seem to make shielding difficult, implying that it is not a design goal, is ominous. That this design is floated at all is evidence that the outpost is not meant for extended crew stays, but will require quick crew turnarounds, an expensive option inviting early cancellation of the program by Congress.

NASA halts Biological-life Support Research, Sterilizing the Lunar Outpost in Two Ways

MMM has learned from a reliable source that the **BioPlex** autonomous life support testbed in Houston is now shut down, as is the **NSCORT** program at Purdue. If this is indeed so, then NASA has now dropped the other* shoe, shutting down its various CELSS programs to develop biologically-assisted life support for ISS and the Lunar Outpost. While the excuse is budget shortfalls, the agency has in all things shown a strong preference for continuing to do what it knows how to do, as opposed to learning anything new. And don't we all do that? *We understand. But we had the right to expect more.*

[*The agency had already decided not to use oxygen produced on the Moon as Lunar Ascent Module fuel.]

We will continue to do life support on ISS and on the Moon the way NASA does it on the shuttle, *chemically.* The inescapable result is that at best, a lunar outpost will be a temporary one. Without the "flywheel" of a mini-biosphere to keep it running, the outpost will always be in danger of abandonment if for some reason the chemical system fails and cannot be repaired or resupplied in a timely way. This decision threatens Mars missions as well.

Congress would see any life support failure as reason enough to kill the moonbase project after a short time. The outpost will be a dead end, after all, one more brief shining moment, just as was the Apollo Program.

This was predictable. The agency has spent a considerable amount of money with biological CELSS, but not enough to convince anyone that it was determined to make this approach work. It's quest, however, was for an unrealistic goal: a life support system one could tuck into a closet or at most, an extra module. On Earth, the bio-sphere is immense, dwarfing in size the total volume of human habitations. Life support cannot be supplied as an afterthought. It must be the primary goal, with what we normally think of as an outpost being the annex, the supported inclusion, not the other way around. The whole approach has been totally backwards from the gitgo.

The full burden of developing the technologies, green as well as gray, needed for real settlement on the Moon, now rests on the lunar-enthusiast community. It always had, but now the evidence is clearer. **<PK>**

Technologies Needed to Break Free
Continued from MMM #198 & 199

by Peter Kokh

VIII: Strategies for Organizations self-tasked with helping make it happen

Many have heeded the call

Several organizations have appeared over the years who have taken upon themselves to help advance the day when space settlement, and lunar settlement in particular, might become a reality. Space Studies Institute, the former L5 Society, the Space Frontier Foundation, Artemis Society International, The Mars Society, The Mars Foundation, The Moon Society, and the National Space Society have pursued these goals on the national and international level. NSS, however, has traditionally limited its set of tools to political, public, and media outreach.

On a smaller scale the Lunar Reclamation Society (publishers of Moon Miners' Manifesto), the Oregon L5 Society, and Calgary Space Workers have done, and still continue to do what they could to lay foundations. Other outfits have come tried for a while, only to disappear.

"Nature abhors a vacuum"

The premise on the table is that NASA, most probably with international partners, will establish a *minimal* outpost on the Moon. Several successions of the US Administration and Congress will have to go along with these plans and that makes these plans and announced intentions and commitments highly contingent and "iffy." Further, as individuals and organizations, we will have very limited ability to influence these critical decisions.

But even if all goes as planned, an international lunar outpost will fall far short of establishing a permanent civilian presence on the Moon. Permanence cannot simply be declared. It has to be earned.

Room for the rest of us to rise to the occasion

> What we can do, is t*o work to see that the needed technologies are in place to enable a "breakout"* from any such limited scope outpost, in the direction of resource-using open-ended civilian settlement.

We have looked at several general areas in which a lot of work needs to be done:

I. Pushing the Teleoperations Envelope
II. Shielding Emplacement Systems
III. Warehousing Systems
IV. Modular Biological Life Support Systems
V. Dayspan power storage Systems for Nightspan use
VI. Modular Architecture & Construction Systems
VII. Transportation Systems, to, and on the Moon

Tools at our disposal in seeking to further these goals

- **brainstorming workshops** – We gather those at the forefront of experimentation in a given field, ask each to list (a) what we know, and (b) what we don't know. Combining these surveys, the workshop decides on the most promising areas for collaborative research and experimentation.
- **design contests** – many things are in need of having design options fleshed out: shielding emplacement systems; shielded but unpressurized canopies and hangers; modular architectural languages; *the list is long*
- **engineering competitions** – shielding emplacement systems vie to demonstrate trouble free operation, speed, efficiency, etc.; various options for storing excess dayspan solar power for nightspan usage; interfaces between connected modules, *the list is long*
- **talent recruitment** – our collective memberships do boast some people of real expertise and talent, perhaps lost in an abundance of well-intentioned lay persons. We definitely need to recruit talented people in all areas of science and technology, architecture, systems management, biological life support, lunar agriculture, and in many more areas
- **moonbase analog stations** as equipped settings for demonstrations of candidate technologies. Various types of sites offer advantages for various types of demonstrations: lava sheet areas perhaps with handy lavatubes; any low vegetation pulverized surface area for demonstrations in which the physical attributes of lunar regolith are more relevant than the mineralogical and/or chemical ones: enclosed lighting-controlled environments where dayspan-nightspan operations can be simulated; almost any location where biological life support and food production systems can be demonstrated
- **Lunarpedia** – a dedicated lunar-relevant wikipedia which will attract quality articles about the nature of the Moon, its resources, and the possibilities for integrating the Moon into a Greater Earth-Moon economy, and the possibilities for those involved to make themselves at home.
- **Early astronomical facilities on the Moon** – we can promote design contests, engineering competitions, and the creation of university consortia in support of such a "foot in the door."
- **Citizen Exploration, aka tourism** – Loop-the-Moon tours are closer than most imagine. Beyond that, the first limited land and take off again tourist missions could conceivably occur before the deployment of the first agency outpost. Such a development will create a precedent for a truly permanent civilian presence on the Moon not limited to any one station.
- **Spin-up Enterprise incubation** – draft business plans entrepreneurs could use to develop needed technologies, now, for their profitable terrestrial applications

Marching Orders for whichever organizations choose to step up to the plate

This becomes the strategy for the Moon Society, and its affiliate and partner organizations. It will come to define "who we are" and "what we do." *What we must do!*

In the near future, we hope to announce a "meta-project" that will subsume all of the above and keep everything headed towards our goals. It will have the power to become a catalyst for the needed research and development, a "research & development engine" if you will. Stay tuned. **<MMM/TMS>**

IX: A Lunar Analog Station Program can pave the way, if well-focused

by Peter Kokh, David Dunlop*, Michael Bakk**
* Moon Society Director of Project Development
** Captain of the Calgary Space Workers who are developing the prototype modular analog outpost

[Our 3rd attempt at *unzipping* the L.U.N.A. Acronym]

"Luna Underground Nucleus Analog"

"Lunar Underground" – That's us, an underground movement! Plus we *will* model **shielding**, shielding architectures and shielding emplacement options as well as monitor the thermal equilibrium benefits of an "underground" (under a regolith blanket) facility.

"Nucleus" – we are modeling not a self-contained unitary module good only for extended science picnics but the kind of *modula*r outpost that could become the nucleus of open-end expansion into a settlement

"**Analog"** – we aren't trying to be exact. We need to pick our battles, getting the most bang for the buck.

We had tried twice before to come with an unzipped "Luna" acronym. Most recently, in MMM # 194 April '06 we suggested 'Lunar Underground *Network Accelerator."* In MMM #148 Sept '01, "Lunar *Utilization & Necessities Analog*." We like the new reading best.

Readings this issue and recent issues of MMM

- □ page 10, this issue. **Analog Outpost Options Cont:** When what really matters is "*moondust behavior*", not "*moonscape appearance*" – Looking for a "physical" moonscape analog location
- □ page 12, this issue: **More on the Calgary Space Workers Lunar Habitat Project**
- □ MMM #195, May 2006, p 5, "**Goals of a Lunar Analog Station Program**," Kokh, Dunlop
- □ MMM #198 SEP. 2006, p 7, "**Teleoperating Equipment on the Moon**"
- □ Same issue, p 11. **After Utah, What/Where/How do we follow suite?**
- □ MMM #199, Oct 2006, p 10. **Candidate Lunar Analog Sites**
- □ Same issue, p 12. **Welcome Calgary Space Workers**

A Summary of where we are at in our planning

As stated in the MMM #195 article cited above, an analysis of research & development demonstration needs shows that the Goals of a Lunar Analog Station are quite different than those of the various Mars Analog Stations:

- □ We do not need to demonstrate the usefulness of human exploration of the Moon. Apollo did that well.
- □ We will not be demonstrating microbiological forensic techniques that might prove the Moon once had or might still have living microorganisms – we are all amply convinced by the Apollo and other evidence that the Moon is totally sterile
- □ Nor do we have to demonstrate geological techniques that might reveal the scope of Mars once much "wetter" past – the evidence that the Moon has always been bone dry is overwhelming.
- □ We don't have to model a first visiting crew exploration vehicle. NASA began that with Apollo and will continue that with the lunar outpost program

What's left for us to do?

√ NASA's plan was limited from the outset

√ It is vulnerable to budget cutbacks

NASA's plan is for a small crew outpost with limited capacities for growth and to support demonstrations of production of various elements and of lunar appropriate building materials. The agency's plans are very vulnerable to unrelated budgetary pressures, owing to the black hole of conducting an unforeseen war.

Biological Life Support Research has just been cut

Already NASA has discontinued the BioPlex project in Houston and stopped continued funding for the NSCORT program at Purdue University. Both of these programs were aimed at finding practical ways to deploy closed loop life support systems supported by plant growth and food production and waste treatment systems. There is no question in anyone's mind that a permanent presence, let alone true settlement, can be realistically supported on the Moon without coming very close to "closing the loop."

This means that it is up to efforts outside NASA to make continued progress in this area. Actually, the NASA plan was so limited from the outset, that it has always been up to us.

You can't do biological life support in an add-on closet. Life support can not be approached as an afterthought. It has to be designed into every module and connecting corridor.

We will be studying the modular habitat prototype being designed and built in Calgary, Alberta, and to be deployed in the Drumheller, Alberta badlands, looking for opportunities to integrate biological life support functions. Biospherics must be approached in a modular fashion, so that as the pressurized interconnected habitat complex grows, the biosphere will grow with it, hand in glove, step by step. If you are designing a limited outpost with expansion as an afterthought, such an architecture will seem irrelevant, or not worth the cost.

Shielding cannot be an afterthought

Many NASA illustrations pay homage to Bob Zubrin's double tuna-can design, become so familiar to all of us as the architecture of the Arctic and Desert Mars Research Stations in Canada and Utah. The high vertical profile makes shielding difficult. Zubrin seems to dismiss radiation shielding as unnecessary. But if we are going to move beyond short tours of duty towards real permanence, we have to rely on more than Release Statements that do not hold NASA responsible for radiation damage.

Unaddressed are the major thermal equilibrium benefits of shielding. It pays to design an outpost in a "ranch style" low profile format to make deployment of regolith shielding easier. Shielding can be deployed directly as loose regolith, or as bagged or sintered regolith (blocks) for easy removal should access to the hull or a need for expansion make it necessary. We need to experiment with teleoperated shielding deployment systems, so that a landed but unoccupied outpost can be pre-shielded and ready for occupancy by the first crew. We can demonstrate a variety of such systems.

Modular Architecture, Shielding, and the Media

Granted, the Zubrin double tuna can (DTC) design has been a big hit with the press. It looks like the other-worldly mechanical "visitor" that it is. On the other hand, it does not look like "module one" of a future settlement, and that is the concept that what we want the public and the media to grasp. *We have to sell modularity.* On the surface, that will be an easy task. But if we use reconditioned travel trailers and other adapted but identifiable terrestrial artifacts, that appearance may detract and distract from the lesson we are trying to get across.

However, if we shield the complex with simulated regolith, sand bags, or bags of mulch, whichever is more practical, we'll get our lesson across. A shielded modular complex will look much more serious than the DTC. The idea that we are planning *to stay* on the Moon, not just explore it and go back home, will be clear. We can make show how the shielding blanket on the Moon will perform the same services for us as does our atmosphere blanket. That we can make ourselves at home on what looks like an inhospitable world will begin to sink in. Daydreams of being stationed in a livable lunar outpost will start to look more romantic than being confined to a DTC on Mars.

Resource use should not be an afterthought

The well-advertised NASA In Situ [on location} Resource Use demonstration of oxygen production is still on the Lunar Outpost manifest. But by deciding that lunar oxygen would not be used for the lunar ascent vehicles, NASA effectively put it on the budgetary chopping block.

Lunans will not live, let alone thrive, by oxygen alone!

A lunar analog research station in basaltic terrain could get involved in cast basalt use demonstrations. Cast basalt tiles and abrasion resistant materials handling components are now being produced in several locations. If there is anything that is priority #1 it is to test regolith handling systems, and if we need cast basalt products for that, that fact would but cast basalt demonstrations ahead of everything else, perhaps even ahead of oxygen, as all other ISRU experiments will depend on regolith handling. Cast basalt products can replace many original outfitting items in the habitat module complex: flooring: table, desk, counter, cabinet tops, wall tiles, decorative items and *objets d'art.*

Other building materials to experiment with are glass-glass composites (currently just one ice-cube sized laboratory sample), steamed fiberglass cements, fiber-glass-sulfur composites, sintered regolith products, sintered iron fines products, sintered regolith products. The first goal will be to be able to demonstrate the feasibility of loca (on the Moon) outfitting of inflatable expansion modules. Demonstration of the production of pressurizable modules from simiulated lunar building and manufacturing materials would come next.

Experimentation with lunar sourceable metal alloys, as critical as it is, is best done elsewhere, because of projedct complexity and thermal conditions, and the expertise needed. In all these ISRU experiments, we must keep in mind that laboratory scale experiments, however successful, do not prove that production-scale operations are feasible. Chemical engineers will be much more help-full than chemists, for example. Laboratory scale experiments done elsewhere can possibly be demonstrated on a larger scale at analog facilities.

Power Production & Storage

NASA and many lunar enthusiasts are hellbent on setting up shop at the lunar south pole. To quote lunar planetary scientist Paul Spudis,

> "Although polar ice is important, it is not a requirement to successfully live and work on the Moon. The poles of Moon are primarily attractive due to the near-permanent sunlight found in several areas. Such lighting is significant from two perspectives. First, it provides a constant source of clean power and allows humans to live on the Moon without having to survive the two-week-long lunar night experienced on the equator and at mid-latitudes. Second, because these areas are illuminated by the Sun at grazing angles of incidence, the surface never gets very hot or very cold. Sunlit areas near the poles are a benign thermal environment, with an estimated temperature of about -50° ± 10°C."
> - http://ww.thespacereview.com/article/740/2

Now if you are younger than fifty, the expression "Kilroy was here," may mean nothing. This was a WW II (and perhaps older) way of "tagging" a place to say that a Yankee (an American) had been there. Now if all that you need to die happy is to know that we put up a "Kilroy was here" outpost at the Moon's south pole, than Spudis' vision will thrill you to the core.

But if by "lunar settlement" *you* mean a global presence of humanity on the Moon, then the lunar polar "gesture" (which is all it is) will be but "a tagging event."

Avoiding the Nightspan Power Problem and the Dayspan Heat Problem is *exactly what we must not do!*

As NASA has chosen not to bite this bullet, demonstrating various ways that enough excess lunar solar dayspan power can be stored to get us productively through the nightspan is a priority task for Lunar Analog Stations. That said, simulating the 14 day 18 hour long dayspan and same length nightspan will be much easier to do inside a closable structure such as a large aircraft hanger or high-ceiling warehouse than anywhere outdoors. For this kind of experimentation and demonstration the geological and/or physical characteristics of the host terrain will be irrelevant.

Power storage options include storing waste water at a usable head height, flywheels, fuel cells, magma pools, and other devices. Yes, a nuke would do, but we think it is important to demonstrate any other non-nuclear "backup" options that would do the trick, and which would be easier to scale up or down to the power requirements of a growing lunar beachhead.

The other half of the equation is demonstration of how well various types of lunar outpost operations can be managed sequentially to take care of the bulk of energy-intensive operations during the dayspan, and the bulk of labor-intensive energy-light operations during the nightspan. Such a regular change-of-pace rhythm is bound to become a welcome mainstay of lunar culture.

Ergonomics Demonstrations

The Mars Society missed an obvious opportunity for an ergonomics layout study, by outfitting the interior of its second habitat, the Mars Desert Research Station, with essentially the same floor plans, upper and lower, as in the Arctic station which was built first. Of course, there were time and money benefits to taking a bye on the ergonomics opportunity.

The independent-minded European Mars Society will be designing the interior of the EuroMars with a clean slate. They are happily immune to the expected criticism. This unit will be just a tad taller, by just enough to squeeze in a third floor. They will be incorporating more opportunities for customization of personal quarters, euphemistically called "staterooms" as well as morale boosting perks like a spa tub, and exercise area. The objection that pioneers should feel privileged to "rough it" just doesn't cut it. High morale translates to productivity and safety, and those are far more important considerations than penny pinching economy. One must keep in mind that the Mars explorers will be away from home for two or three years, factoring in the long travel times to and fro.

A modular outpost gives much more opportunity to vary living and working arrangements and their mutual proximity or isolation. A modular outpost, particularly a "practice" one, can have its layout plan "shuffled and reshuffled" until the happiest disposition is found. A consideration, one that does not easily arise in the Mars Hab instances, is finding the best vectors for expansion of the various kinds of facilities: residential, energy generation, workshop, laboratory, fabrication shop, greenhouses, exercise and recreation facilities, and whatever other modular facilities may be needed to "break out of the otupost trap." Developing a site plan with options for expansion must be part of the site selection process.

A mix of hard body and inflatable modules will also yield valuable lessons. The option of adding new modules fabricated out of simulated lunar-processed building materials such as glass composites or fiberglass reinforced concrete is also attractive.

Lunar Analog Outposts will be innovative

It may seem to the casual observer in the public or the media that the exercises at the two operational Mars Habs are getting repetitious. Until you take a close look, all the geology experiments, the biology experiments, the GreenHab experiments, and the human factors studies seem to produce nothing new. Take it from one who has been on two MDRS crews: that is definitely *not* the case. New things are being learned crew after crew, and I remain a staunch supporter of the Mars Analog program. But the illusion or repetition dogs the program.

Next year, there will be a 4-month long exercise by one crew at the Arctic outpost on Devon Island. That will definitely test the reliability of utility systems, at a location that is logistically quite isolated, as well as be a superlative opportunity for human factors studies. Now if the Mars Society would embrace the projects to the Mars Home Foundation which wished to build a demonstrator Martian Village out of materials available on Mars, that would be really helpful.

In contrast, the Lunar Analog Station programs will have no shortage of new things to do and try and test. The clear sign of progress will work to keep the media, and the public interested, as well as to educate them on the possibilities of human settlers making themselves permanently at home on the Moon.

Lunar Analog Outposts and Tourism

When the Moon Society was founded in July 2000, the flagship project announced to celebrate the society's birth was Project LETO [Lunar Exploration & Tourist Organization] conceived of as both a tourist facility and as a research station. On first glance, this would seem to be a marriage made in heaven. But having four weeks of experience at MDRS in Utah, I am convinced that research is best done without the visual or actual interference of curious onlookers. Now in the 2005-2006 field season we experimented with first one web cam then as with as many as six. This works well, and does not disturb research activities.

What does seem most important, even to the point of being sacred, is to preserve the illusion that you are on Mars (or, in our case, on the Moon) as the illusion helps one take the experimentation and/or exercise seriously enough to ensure superior results. In short, it does not disturb research if visitors or tourists can watch *so long as they are out of sight of the researchers.*

One way to keep the required separation is the use of web-cams. What about an analog of a duck-blind? That might work for outdoor activities, but without a great number of such blinds, we couldn't ensure visitors that there would be anything worth observing on a regular basis. Web cams or remote TV cameras would seem to be the better answer. Actual supervised "do not touch anything period!" tours could be conducted when the facility was not occupied.

At MDRS, media visits are allowed, but scheduled by program headquarters to minimize interference with MDRS activities. Nonetheless, interfere they do.

Visitor access is important. We will have our faithful followers and enthusiasts who will want the high of seeing this glimpse of the future for themselves. What we can't do is make the analog outpost a zoo exhibit! or create conditions where the crews feel that they are zoo animals. But growing our constituency is of primary importance as well. So how we can best satisfy the needs of both the various crews and the faithful/curious without shortchanging either is an area that deserves much forethought and should be part of the original site plan.

The commercial connection

Whenever or wherever the brand or supplier of any needed equipment is not crucial, the opportunity to have the equipment donated "by the official refrigeration supplier to the Moon Society Lunar Analog Outpost" etc. (for sake of example) should not be passed over lightly. We will always have less money than we need. And when performance or specifications are crucial, all the more reason, for advertising punch to approach a manufacturer or distributor for product donation or free lease.

We have talked many times about the "spin-up" paradigm, much more powerful than the "spin-off" system in place for decades. In spin-up, an entrepreneur develops a technology or product which happens to be needed on the frontier, precisely for the potential "here and now profits" from any terrestrial applications. As we succeed in encouraging entrepreneurs to take this route, they can test and showcase their products at an analog moonbase location, as an effective advertising ploy. The donation of a model, when it can be integrated into the analog moonbase operations, would be a big plus.

We may be the small guys in town, but we have the bigger dreams, the more powerful dreams, the only dreams that make sense in the long run. There may be several analog lunar station operations. Between us, we can leverage our way to reality. **<MMM>**

RETIREMENT on Space Frontiers

by Peter Kokh, *uniquely qualified to write on this topic!*

A revolution in the way individuals now "do space"

"Retire" on the space frontier? It is a jolting idea considering that no one anticipates the drastic change in the regime of short tours of duty that has been taken for granted since Yuri Gagarin became the first human in space more than 45 years ago.

In last month's issue, "The Outpost Trap, Part VII: Moonbase Personnel," on p. 7, we spoke of the first crack in this regime, the option of "re-upping" or signing up for a voluntary tour of duty extension. We also talked about the need to give serious constructive attention to the matter of crew perks, particularly those which could foster a growing sense of being truly "at home" in one's off-Earth situation. These developments will slowly usher in the revolutionary paradigm shift from simple "staffing" to genuine life-choice "settlement." We see it as a natural and gradual evolution, not as a sudden revolution.

But what do we do with those who reach the traditional age of retirement? Of course, if they still have what it takes to continue being productive in the duties of their current job, they could continue to work. That just postpones our question.

We need everyone to produce, to contribute

The situation will be quite different from that in most societies on Earth. On the space frontier, we will not be in a position to so easily afford the luxury of "carrying" those who stop (or never start) producing. The answer, of course, is to find productive ways for retired persons to continue to contribute at a slower, more relaxed pace, if need be, or simply by shifting gears and focus to another area of productivity and contribution.

We need to see "retirement" as a shift in gears, in pace, and in the many ways of being productively busy. This continues the changes we now see as the WW II Baby Boomers come of retirement age. Actually, ever more people of "retirement age" have been choosing a shifting of gears to productive hobbies over "the rocking chair in front of the TV." These days, retirement need not mean being without a schedule. It can mean a change from being scheduled by others to "scheduling oneself."

In fact, on the frontier, there will be many things deserving attention, for which we will not be able to spare persons in their "most productive years." Until we have retirees to take on such roles, many of those things will just have to remain unaddressed.

Keep in mind, that a development parallel to allowing personnel to stay on duty up to retirement age could well be allowing personnel to enter into stable relationships and have children. But that's a sequel article!" Here, then, is the start of a list of such helpful retirement activities:

✓ **Management assistance:** some management tasks cannot effectively be delegated off-world, but need to be done by those directly involved. But retired persons could assist, freeing others for production tasks.

✓ **General Deskwork:** taking over some of the desk work functions up to then teleconducted by less expensive support personnel on Earth. There will also be office work that cannot be done "efficiently" from a remote location.

✓ **Parenting Relief:** retired persons could relieve new mothers by providing childcare so that the mothers can continue working

✓ **Part time relieving:** as an alternative, retired persons could relieve others in their field of experience, for childrearing sabbaticals.

✓ **Teaching, Tutoring and Mentoring:** much of education can be done remotely, by canned or live video. But retired persons could be on hand to give individual attention and assistance tot young students.

Nothing keeps a society more cultural intact than vigorous and widespread intergenerational contact. With grown children frequently moving away from the home town root-source for employment, the superfamily chain is all too frequently broken. Skip-generation teaching and passing on of values could be the preventative of choice.

Included in this paradigm might be assignment of recycling chores to the young, and helping them appreciate the responsibility which all pioneers must share of maintaining their fragile minibiosphere.

✓ **Continuing Education:** in this area as well, much can be accomplished by canned or live video or internet instruction. But having a qualified real person for occasional or regular tutoring can be essential.

✓ **Art, Craft, Music, Dance Instruction:** Whether for young people or working people in their after hours and weekend spare-time, this service would be of much value. The place of culture and the arts in any society is far from trivial. But we won't be able to spare "working people" to foster this activity.

✓ **Historian:** retired people could compile oral histories of the early pioneers, and do other similar tasks to ensure that the lore of the pioneers is preserved for future generations of Lunans.

✓ **Writers, Playwrights, Choreographers** Retired people who have had little time in their working years to devote to literature and the arts, will have more time to dedicate to creating works for all to enjoy.

✓ **Gardening, Harvest Processing, Cooking, Cuisine Development:** Hopefully, once, thanks to made-on-Luna building materials and habitat modules, we can afford to provide housing with real elbow room, home garden space will be provided as a matter of course. But maintaining a garden may be easier for retired persons than those working full time. They may also have more time to experiment in the development of new recipes and whole cuisines based on what had been and is being grown in lunan gardens and farms.

✓ **Care and Visiting for the injured and ill:** No one would suggest that retired persons play doctor, but they could certainly train to be nurses, orderlies, or simply volunteer visiting care providers.

Summary: a lot of things for which the early pioneers cannot spare anyone of "working age" to take care of, but which are nonetheless sorely needed in a frontier society, can be addressed, at least in part, by "retired persons". Whether the government or the direct beneficiaries take care of adding to their retirement incomes, is a question left to the pioneer societies to address **<MMM>**

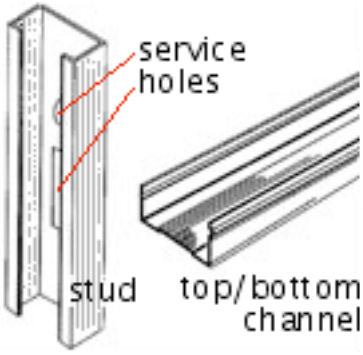
Drywall aka Sheetrock® for the Moon

by Peter Kokh, with Dave Dietzler

Perhaps many of our readers will have had some experience hanging and mudding Sheetrock®, or as they call it in Wisconsin, at least, "drywall." While there are indeed some who do this for a living and are quite proficient at it, in general, it is not rocket science, and many more "home warriers" with some "fixer upper" experience are familiar with this way of cladding home interior walls.

Manufacturing airtight pressurizable habitat modules on the Moon will not be something for amateurs. That is one area where life quite literally depends on high quality performance, after all. But interior wall construction and finishing can perhaps safely be left to homeowners or part-time (afterhours) handymen.

So what will they have to work with? Well, a quick trip to the local Lunar City *The Home Depot* or *Lowes* will show that there is no lumber. No 2x4s? Well, not wood ones. However, some of us, myself included, may have had experience putting up commercial interior walls where steel studs were specified by code.



Steel? We are not talking girders or I-beams here. Steel studs are very thin lightweight somewhat flexible channels, with side slots at intervals for runs of romex or other utilities. You attach the sheet of drywall or sheetrock to the steel studs with special screws. Any and all flexibility and seeming flimsiness disappears once the sheetrock is affixed, holding the assembled section rigid and steady.

Now we should be able to produce some sort of alloy construction studs on the Moon. But what about drywall or sheetrock?

> Drywall {Wikipedia] "is made primarily from **gypsum plaster**, **semi-hydrous** form of **calcium sulphate** ($CaSO_4 \cdot \frac{1}{2} H_2O$). The plaster is mixed with fiber (typically paper and/or **fiberglass**), **foaming agent**, various additives that increase mildew and fire resistance, and water and is then formed by sandwiching a core of wet gypsum between two sheets of heavy paper or fiberglass mats. When the core sets and is dried, the sandwich becomes rigid and strong enough for use as a building material." (bold blue words are links to separate Wikipedia entries.)

By serendipity, a tool of the trade for frequent MMM contributor, Dave Dietzler of Moon Society St. Louis, he was watching a Public Television episode of Bob Villa's "Home Again" in which a fiberglass sheathed drywall was used instead of the usual paper-gypsum-paper sandwich.

www.bobvila.com/BVTV/HomeAgain/Episode-1514.html

In this episode, the team "installs 5/8-inch fiberglass drywall. Replacing the paper-faced drywall with fiberglass on both sides will protect the walls from invasive mold and fungus. Installer Chris McEvoy shows how to handle drywall installation with metal studs ..."

This may be new to most of us, but with all the problems with mold caused by Hurricane Katrina in New Orleans, there is already a big push for fiberglass-faced gypsum board as an improved replacement for the familiar paper sandwich board.

Dave writes: "Instead of plaster on paper, this was made with tightly woven glass fiber cloth. We can make plaster, gypsum, anhydrite, whatever; it's all calcium sulfate mixed with some water and allowed to harden on the Moon by leaching regolith with sulfuric acid as I have described in a previous MMM article [# 159 OCT. 2002, p 5. "Lunar Cement` & Plaster", D. Dietzler] and at www.moonminer.com. Does the glass weave bind to the plaster when they make the drywall or is it bound with a resin? I don't know. If a resin is needed we either use sodium silicate which might not last or good old glass-glass composite. Thus we can make drywall without paper. And it will not be affected by mold or fungus. Now, what if we make 2x4s out of AAC [autoclaved aerated concrete - www.aacpa.org] and hold them together with screws and attach the drywall with screws? We can make interior walls with conventional carpentry techniques. I don't know about nailing things. That could crack the glass-glass cloth on the drywall and I don't know it the AAC studs would take nails either. Screws are better anyway. They hold better and can be removed easily if we want to remodel interiors."

In an answer to Dave's questions, I should think that the fiberglass matt would bond naturally to the wet gypsum which would impregnate the mesh, allowing a skim coat surface. The 8"x8"x24" sample of AAC I have will take both screws and spikes, as well as sawing and drilling. But I question how well AAC "studs" will "hold" them, as AAC has no grain, but instead is a fine granular material. I would prefer lighterweight steel or aluminum studs as I have experience with them.

Prior to hearing about fiberglass faced gypsum board, first from Dave, and then on the News in connection with the mess in New Orleans, I had thought of using Durock® in stead of drywall. Durock® is fiberglass-faced cementboard, commonly used as a base for ceramic tiles in wet locations such as kitchens and bathrooms. I have had experience with that product also. Indeed, producing such a steel stud Durock®-faced lime whitewashed *wall section* as an exhibit for ISDC 1998 as part of the Lunar Homestead Exhibit, was one of the many things that did not get done, simply because time ran out.

It is good to have two options or more, as one may be easier to produce in the early settlement when industrial diversification has not far progressed. As to stuffing such a stud wall, either for thermal insulation or for acoustic deadening, we have choices also: fiberglass batts can be made on the Moon, and AAC slabs could be tucked inside also. But AAC's use is limited where impact resistance is important. An AAC slab or door could be broken in half by a good blow. **<MMM>**

Related Readings:

- MMM # 65 May 1993 p 6. MOONWOOD: Fiberglass-Sulfur Composites - republished in MMM Classics #7
- MMM # 76 June 1994, p 4. INSIDE Mare Manor; Interior WALLS - republished in MMM Classics #8

MMM Classics PDF files are free downloads at either:
www.lunar-reclamation.org/mmm_classics/ or
www.moonsociety.org/publications/mmm_classics/

The Moon Society

JOURNAL

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 utiliza-tion 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 an adopted new human home world. We have work to do!

The National Space Society's 2008 Space Settlement Calendar Art Contest Cosponsored by the Moon Society

NSS Announcement

The National Space Society is sponsoring an art contest in which artists are to create visions of a space faring future - a future of space settlement, be they **on the Moon, on Mars, on asteroids, or orbiting independently in space**.

Twelve winning entries will be chosen to illustrate the NSS 2008 Space Settlement Calendar. Judges include world-renowned space artists David Hardy and Pat Rawlings.

The Grand Prize winner will have their artwork featured on the calendar cover and as one of the monthly images. This winner will receive a Beyond-Earth Enterprises 8 ounce Flight Container for suborbital rocket launch and return (valued at $1,500); a physical copy of Mojoworld 3 Professional 3D software (valued at $480); a $250 cash prize; a 1 year complimentary membership in the National Space Society, which includes a subscription to *Ad Astra* magazine; and a complimentary copy of the calendar.

There will be four First Prize winners in the categories of Best Lunar Settlement, Best Mars Settlement, Best Asteroid Settlement, and Best Orbiting Settlement. In addition to being published in the calendar, each of the four First Prizes winners will receive a physical copy of Mojoworld 3 Professional 3D software (valued at $480); a Beyond-Earth Enterprises Large Photo Kit for suborbital rocket launch and return (valued at $74.95); a $100 cash prize; a 1 year complimentary membership in the National Space Society, which includes a subscription to *Ad Astra* magazine; and a complimentary copy of the calendar.

The remaining seven winning entries will each appear in the calendar and the artists will each receive an electronic download copy of Mojoworld 3 Professional 3D software (valued at $480); a Beyond-Earth Enterprises DNA Flight Kit for suborbital rocket launch and return (valued at $34.95); a 1 year complimentary membership in the National Space Society, which includes a subscription to *Ad Astra* magazine; and a complimentary copy of the calendar.

Deadline for submissions is January 31, 2007. For information on submission formats and other contest details go to http://www.nss.org/settlement/calendar/

The Moon Society Involvement

With the strong support of both the Moon Society Board of Directors and of NSS' Space Settlement contest committee, The Moon Society will contribute a $250 cash prize for the best Lunar Settlement artwork, for which "The Moon Society receives recognition as sponsor of the Moon entry prize, MS is identified as a sponsor in the calendar and on the web site, The Moon Society gets non-exclusive reproduction rights to the winning Moon image. Also Peter Kokh will be one of the 5 judges."

Our involvement was motivated by the desire to secure rights to high quality artwork depicting genuine lunar settlement, not just of a starter outpost. While there is no guarantee that we will find among the submissions a piece that truly meets our expectations, this is perceived by the Leadership Council as a risk worth taking.

Analog Outpost Options Continued

When what really matters
*is "moon**dust** behavior"*
*not "moon**scape** appearance"*

Looking for a "physical" moonscape analog location for a Lunar Analog Research Station

by Peter Kokh

In MMM #198, p. 11, I noted that to demonstrate the teleoperation of equipment needed for moonbase site preparation and for emplacement of regolith shielding over the base, for road construction, mining, etc., it was not a chemically and mineralogically analogous site that we needed. Whether the surface material was basaltic lava flow as in the lunar seas or maria, or similar to highland deposits, would be quite irrelevant. What we need is a pulverized rock and rock powder mix of whatever kind of minerals, so long as the mix of particle sizes was the same as what we find on the Moon, and so long as the handling characteristics are reasonably similar.

Now at first that seems to open the door wide to a long list of potential sites. But alas, no site on Earth has a surface like moondust, either highland or mare. What we have to do, is find a fine gravel or sandy site and then modify it by importing particles in missing sizes and mixing until we have "a mix that works".

This is important, because when push comes to shovel, how the material behaves may affect the degree of confidence we have in the equipment we wish to teleoperate in handling this faux regolith. Now we could just buy a hundred or so truckloads from NASA's source for lunar simulant, but again, we do not need the chemical and mineralogical similarity to moondust, only the physical similarity.

Can we produce this at less expense, economically enough to be able to cover a substantial area with it (an acre or so may do for starters.) I don't know. But it should not be anywhere near as expensive to prepare as the original MLS-1, Minnesota Lunar Simulant 1. In July 1987, I got to see how this handy material was made in a laboratory of the University of Minnesota in Minneapolis, under Dr. Paul Weiblen (still a faculty member but retired). The process began with solid rock quarried from an exposed layer of unusually Titanium rich basalt in a cliff that runs SW to NE in Duluth, Minnesota.

But as the chemical makeup and mineralogy is irrelevant, and we are interested only in the physical properties of the mixture and its behavior in handling, we should be able to start with already pulverized material and then modify it with finer and coarser amendments as needed.

One of the challenges is to get the material to handle similarly. Unlike weathered rock powder on Earth, lunar rock powder retains the angular shapes that come from an origin as impact debris. So the material compacts together to hold its shape and hold a slope much better than sand, for example. As to the electrostatic properties which cause moon dust to so insidiously infiltrate mechanism and lubricants, that is a separate problem that NASA must solve for all exterior equipment. We need concentrate only on teleoperating regolith handling equipment.

Appropriate Reading

Lunar Regolith and Fragmental Breccias
http://epsc.wustl.edu/admin/resources/meteorites/regolith_breccia.html

Lunar Regolith Structural Properties
http://www.asi.org/adb/m/07/particle-structure.html

Another challenge is how inappropriately our transformed stuff acts when wet. The Mars Desert site in Utah becomes slippery mud when wet, and that simply won't do. Thus we may want a very dry desert site. The world's driest desert, the Atacama in northern Chile, however, is logistically out of reach. The driest U.S. desert is the Mojave. It includes the south tip of Nevada (Las Vegas), the NW corner of Arizona (Kingman) and large adjacent large areas of southern California including Death Valley. *Another solution* would be a large covered area under which to experiment in ever-dry conditions.

Starting points - plain sand? - Sand particles range in diameter from 0.0625 mm to 2 mm. The greater portion of the regolith ranges from 0.045 to 0.010 mm, smaller than the largest sand grains. *Add a lot of talcum powder?*

Next we need to simulate the cohesiveness of regolith as demonstrated in its ability to hold both high angle slopes and bootprints. Adding very small size glass and ceramic smithereens may help.

Point of Diminishing returns - a lot of experimentation, tempered by financial practicality, may be needed to produce a close enough match for handling demonstration purposes. There will come a point in trying to assemble a regolith-like mix that the benefits of further amendments are not worth the cost. So our faux regolith will be inaccurate but "good enough."

Cosponsors and/or Clients - Depending on how good a physical analog of moondust we are able to create, NASA may find it useful in ways its regular lunar simulant is not. They may well want to test various kinds of equipment at our "physical analog" moonscape site. Various private companies interested in supplying equipment to NASA may also wish to use such facilities.

So there is some incentive to go ahead on such a front. For now, we need to keep brainstorming the idea, including the kinds of test equipment that will verify or "flunk" our faux moondust process and product.

Mirror Site for Tourists - Kids of all ages like to feel stuff and see how it behaves, physically. The chemical and mineralogical makeup is a moot point that impresses them not. A large play area of our physical simulant would be a great addition to a Lunar Tourist Center especially where there are lots of kids, theme parks over gambling oases. But this is a feature that could be replicated at many locations, licensed to a large chain of theme parks rather than to just one.

An Experiment in process - The Calgary Space Workers have accepted NASA;s Centennial Challenge to produce so much oxygen from so much simulant in such and such a time frame. Before trying their process on the official JSC-1a simulant, they will attempt to make their own simulant expected to be very close to the official one. **<MSJ>**

Welcome to www.TheMoonPeople.org

Lunarpedia.org is only the first of a new family of separately hosted, separately managed Moon Society websites. Go to the address above and you get a common portal to all of these. Just three are listed now, but there are more coming. *Together, we are* "**The Moon People**. The Moon Society banner is a 3 frame animated one, claiming attention as our core, "Alpha Site."

The simple fact is that the Society is branching out in its efforts to work effectively towards its goals. Different major projects may attract different constituencies. If not all these new contributors join the Moon Society proper, that does not matter as long as all are working to achieve our common goals.

Some of our partner organizations may tower over us in sheer size, e.g. the National Space Society, but much of the initiative will ripple out from our efforts and projects. We are now into the second decade of the effort launched by Gregory R. Bennett in 1994 at that year's World Con in Winnipeg, Manitoba, Canada. Greg's dream was to see private enterprise jump start true civilian resource-using industrial settlements on the Moon.

"Happiness is seeing Earth in my rearview mirror" boasts a button seen at a science-fiction convention. Sci-Fi? Our dreams have to start somewhere. Those without dreams, however capable, won't be the ones who deliver. Progress hasn't been smooth. How could it be? We think we are back on track, and the pathways are clear. Look for The Moon People to take on more projects as we take bigger, surer strides. Stay aboard, stay tuned, jump in, get involved. Whatever your talents, experience, or expertise, you can help – and we'll get there! **<PK/MSJ>**

Welcome to www.lunarpedia.org

This is the new address of our **MoonWiki**, our "open source" **lunar** encyclo**pedia**. [*The draft Topic Outline is now up!*] Why is it not part of the Moon Society website? The simple answer is that the kind of software needed to run each are not mutually compatible.

What is a Wiki? – http://wiki.org/wiki.cgi?WhatIsWiki

"Wiki is in Ward's original description:

The simplest online database that could possibly work.

"Wiki is a piece of server software that allows users to freely create and edit Web page content using any Web browser. Wiki supports hyperlinks and has a simple text syntax for creating new pages and crosslinks between internal pages on the fly.

"Wiki is unusual among group communication mechanisms in that it allows the organization of contributions to be edited in addition to the content itself.

"Like many simple concepts, "open editing" has some profound and subtle effects on Wiki usage. Allowing everyday users to create and edit any page in a Web site is exciting in that it encourages democratic use of the Web and promotes content composition by nontechnical users.

""Historical Note. The first ever wiki site was created for the Portland Pattern Repository in 1995. That site now hosts tens of thousands of pages.

http://c2.com/cgi/wiki?WelcomeVisitors
http://c2.com/cgi/wiki?WikiHistory
http://c2.com/cgi/wiki?WikiDesignPrinciples

More on the Calgary Space Workers
Lunar Habitat Project

from Michael Bakk, Project Leader

Airstream Trailer Co. introduced its revolutionary "Clipper" in 1936. Its streamlined monocoque, riveted aluminum body reminds one of an airplane fuselage.

The trailer will house these Command Module functions:

- control hub
- power plant to provide the heating/cooling
- Moon to Earth communication and
- Startup plant for the entire habitat, extension corridor and modules.
- ability to expand the monitoring of life support etc. for the expanded inflatable corridor and modules.

"This module will be a demonstrator of what a Moon habitat interior will need for equipment. It would be the hard shell headquarters or power distribution plant. From the trailer a corridor will be built as an inflatable or sectional with materials from the Moon's surface.

"Our members will assist each other in building their own inflatable or sectional habitats in a series of design possibilities (enablig comparison of ergonomic and other advantages of various designs). All modules will be interconnected for common commute between each other and the hard shell habitat. All connected habitats will access life support, Earth<>Moon communications, power distribution and a hard shell refuge in a crisis.

Lunar vs Mars Analog Programs – Editor's comments

In effect, CSW is modeling an "expandable and modular outpost", not a single structure surface exploration module such as the various Mars Society Mars Habs. In the modular "form follows function" approach, the different activities are each given the space they need. In the "function follows form" approach, needed activities have to fight for cramped slices of a fixed-space pie. But one must remember that the basic goals of the Mars and Lunar Analog Research Station programs are diverse. For Mars, the need to demonstrate the value of human exploration is paramount. For the Moon, that was established by the Apollo program, and as NASA is developing a manned outpost, the Lunar Analog program jumps ahead two steps to demonstrate the architecture of an expandable outpost and the technologies needed for expansion with permanent resident civilian settlements earning their keep through the use of local resources. The L.U.N.A. program is then more comparable to the demonstration needs of the MarsHome project than of the Mars Analog Station program.

<MSJ>

Chapters & Outposts

Bay Area Moon Society

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

Meeting **5th Thurs Nov. 30th** at Henry Cate's in San Jose

From: Henry Cate <hcate2@offshore.ai>

Moon Society St. Louis

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

Contact: Keith Wetzel <kawetzel@swbell.net>

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

Archon 30 Sci- Fi Con Report, Oct. 5-8, '06

www.moonsociety.org/chapters/stlouis/archon30.htm

From Bob Perry <surfer_bob@sbcglobal.net>

"Archon 30 went well. David Heck gave two presentations, both on Saturday, "Design Considerations for Lunar Manufacturing" and "What to Do with Space Station Poo" (send it to the Moon.) Bob also gave two presentations, the first on Saturday, "Ice for the Colonists", and the second on Sunday, "Building Cloud City." There were a fair handfull of people at each of our presentations and quite a few people stopped by our table. We even got thirteen names and addresses on our signup sheet plus a request for attendance at the upcoming ApolloCon in Houston."

Meanwhile, we are starting to plan our annual Christmas Party, probably again at Keith Wetzel's house. Looking further ahead, Chris Nobbe notes that the annual Moon Madness event is set for January 5, 2007.

MSStL goes PowerPoint

One or our members, Rufus Anderson, has a laptop, DLP projector, and six foot screen so that we are now able to do PowerPoint presentations at our meetings.

Chapter Photo taken at ShowmeCon – April 22, 2006

http://www.moonsociety.org/chapters/stlouis/Buttons/ShowMeCon4_moon_society.jpg

L>R Top Row: Bob Perry, Dave Dietzler, Rufus Anderson, Keith Wetzel. L>R front row: Dave Heck, Chris Nobbe

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

NASA Lists Long-Term ISRU Needs & Goals
http://ares.jsc.nasa.gov/HumanExplore/Exploration/EXLibrary/docs/ISRU/00toc.htm

Exploring the social frontiers of spaceflight
http://www.thespacereview.com/article/713/1

Kistler, Rising from the Ashes
http://www.thespacereview.com/article/711/1

Bigelow keeps surprising
http://www.thespacereview.com/article/710/1

Apollo 13: "successful failure" or "failed succes"
http://www.thespacereview.com/article/708/1

A sneak peek inside SpaceShipTwo
http://www.thespacereview.com/article/717/1

A coming Suborbital traffic jam?
http://www.thespacereview.com/article/715/1

Space sports and space power
http://www.thespacereview.com/article/721/1

Individual, corporate, and government space risks
http://www.thespacereview.com/article/720/1

Can the private sector opern Mars?
http://www.thespacereview.com/article/718/1

The Moon People
http://www.TheMoonPeople.org

Moonbase Analog/Simulations Links Page
http://www.moonbaseanalogs.net/

Jim Benson's new endeavor
http://www.thespacereview.com/article/726/1

Opening the Space Frontier with Space Sports
http://www.thespacereview.com/article/724/1

Cosmology: what's in it for humanity?
http://www.thespacereview.com/article/722/1

Cydonia's 'Face on Mars' 3D animation
www.esa.int/SPECIALS/Mars_Express/SEMINCO7BTE_0.html

Lunar Research Station Design Challenge for kids
www.moontoday.net/news/viewpr.html?pid=20802

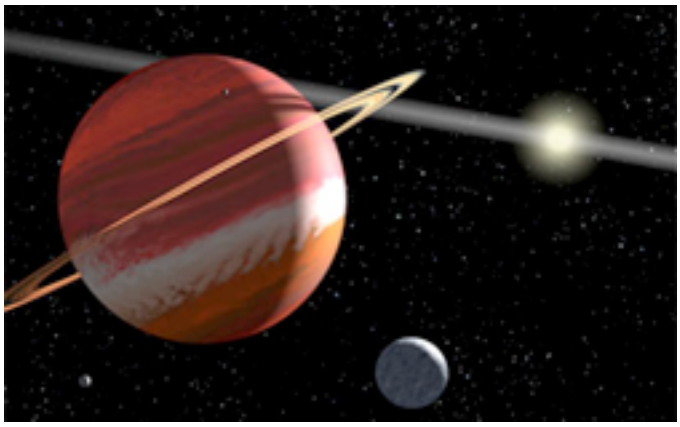
Sweden to put first "house on the Moon" by 2011
www.staff.city.ac.uk/~ra826/group5/mg/mgindex.html
http://www.lunaresort.com/eng.html

"Mars Underground" now on DVD
htto://www.themarsunderground.com

China's Moon Rover Model pictures
http://english.people.com.cn//200610/31/eng20061031_316866.html

Closest Solar System – Epsilon Eridani

10.5 light years away (Alpha Centauri is 4.3)



Artist Conception
www.spaceflightnow.com/news/n0610/09hubbleplanet/

Avid readers, or watchers, of science fiction will have heard of Epsilon [ε] Eridani. More than twice as far from Earth and the Sun as Proxima and Alpha Centauri, it is the closest "single" "sun-like" star.

Alpha Centauri is actually a double star or binary system with one sun slightly more massive, hotter, and brighter than our own, the other a bit lighter, cooler and dimmer than ours. In theory, there are stable orbits around both suns, close in, and further out about the two suns together. See MMM #43 March, 1991, p. 8 "Alpha Centauri" – republished in MMM Classic #5, a free download pdf file from either of these locations:

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

But to date no extra solar planets have been found in that complex system. Most stars further than Alpha Centauri but not as distant as Epsilon Eridani, are dim white or red dwarf stars, many of them binaries also.

At the speed of light, the time delay in getting an answer to a phone call to Epsilon Eridani would be 21 yrs. Yet, on a cosmic, even on a galactic scale, that's right in our backyard. So here at last is a solar system we can relate to. But not quite. It turns out that Epsilon Eridani is only 800,000 years old: we can tell from the abundance of metals in its spectrum, the more, the younger, as the interstellar gas and dust keep getting enriched with the heavier elements as more and more stars go nova. To put that age in perspective, our solar system is 4.6 billion years old. So "εE" formed when ours was already 3.8 billion years old, but still before the evolution of the multi-cellular large naked eye plants and animals we are familiar with. Back then, there where only microbes and other very small organisms in the sea, and probably little if anything on land. When Earth and the Moon were as old as εE is now, the nearside basins were undergoing the process of being filled with lava sheets.

So it is not surprising that we still find a substantial ring of dust and other debris also circling εE, as apparently, any other planets in formation have yet to sweep most of it up. The planet we found is 1.5 times as massive as Jupiter and orbits its sun in 6.9 years. It may well have siblings closer in, and rocky!

In the painting above, a Jupiter-like planet is shown at left with a conjectured moon below. **</MMM>**

MMM PHOTO GALLERY

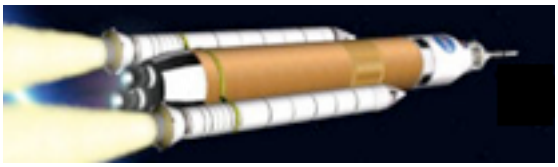
Michelin Tests moonbuggy like airless tires

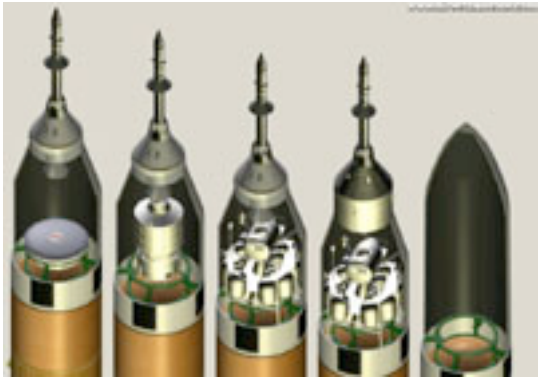
Michelin's "Tweek" Tire

Question: could this serve as a prototype for new lunar rover tire, or did the flex-steel moonbuggy tires serve as the inspiration for thesenew airless rubber tires? Last thing we need on the Moon or Mars is flat tires!

http://www.michelinman.com/difference/releases/pressrelease01102005a.html

NASA's Proposed DIRECT Launcher > p. 15, col A





Various DIRECT payload options, including a Crew Capsule.

The launch area at Woomera, Australia as seen from above

Yet another type of Mars Analog Site: high altitude lakes in the Andes

www.spaceref.com/news/viewpr.html?pid=21145

The summit lakes of three giant volcanoes in the Andes are the target of a team of 15 scientists who are curious about what kind of life can be supported in such cold, thin air environments. The volanoes are Licancabur at 19,813 ft (6004 m), Poquentica at 19,192 ft (5850 m), Aguas Calientes at 19,635 ft (5950 m), in Bolivia and Chile. The "High Lakes Project" is funded by the NASA Astrobiology Institute to study to study how life can adapt to such extreme conditions. **<MMM>**

NASA dumps *Ares* in favor of *DIRECT*

Thanks to Gerry Williams <FILMIST@Mac.com>
http://www.directlauncher.com/

Rightly or wrongly, NASA has concluded that using one launch vehicle, derived from the present Space Transportation Shuttle System architecture, and using shuttle launch systems will save the agency money both up front and down the road in operations. "DIRECT" – billed as "The Universal Launch Solution" would be one launch vehicle, lofting various types of payloads in the same general weight classification.

At the website above, you can peruse the many illustrations, showing different payloads and payload farings, including a crew capsule option, and various stages of a typical launch.

From the Website: Last Update: 26th October 2006

"DIRECT is an alternative approach to launching missions planned under NASA's new mandate: The Vision for Space Exploration (VSE). DIRECT would replace the separate Ares-I Crew Launch Vehicle (CLV) and Ares-V Cargo Launch Vehicle (CaLV) with one single "Universal Launcher", capable of performing both roles.

"This architecture completely removes the costs & risks associated with developing and operating a second launcher system, saving NASA $19 Billion in development costs, and a further $16 Billion in operational costs over the next 20 years.

"DIRECT's single launcher would use existing Space Shuttle's facilities / hardware to lift over 70mT (basic configuration) up to over 98mT (with an Upper Stage).

DIRECT CLV + EDS

"This approach would introduce many key benefits (optimum use of existing NASA and contractor workers know-how, equipment, development costs, upgrade paths, early return to the Moon) over the current Ares Launch Vehicles. To know more about this concept please browse the menu for DIRECT's Proposal (pdf), images, video and related links."

Comment:

So long as none of the elements of the SST system that contributed to the 10,000 average man hours needed to turn each Shuttle around, saving the rest of the architecture and its in-place infrastructure, makes sense.

In our opinion that means saying goodbye to the following high maintenance items:

- the shuttle tile system – in all likelihood, a one piece replaceable ablative shield, a la Mercury, Gemini, and Apollo will be used instead at an enormous savings in cost and man-hours.
- the SSMEs – as marvelous as the Shuttle Main Engines are, the cost-benefit ratio of maintenance vs. performance, in our opinion, was a definite negative
- The External Tank foam system – now as long as the payload, including crew vehicles, ride on top of the stack, they would not be endangered by chunks of insulation foam coming loose from the EDT's during the high vibration incurred during launch.

So, "go for it!" **<Editor>**

[mural on corrugated side of Woomera Village Store]

from off the beaten track to space to a busy bright future in South Australia

From desert rocket test range to radio astronomy observatory to dreaded and much maligned detention center for illegal aliens to a "desert basin" on asteroid Itokawa named in its honor to a spaceport with a big future. The saga of Woomera is still in its overture.

In the "red heart" of Australia, it lies 367 km = 228 miles SE of another legendary town, the other worldly underground settlement of Goober Pedy. Nor is it far from the site of MarsOz where Mars Society Australia hopes to erect the fourth Mars Analog Research Station.

Starting in 2008, Rocketplane Kistler hopes to begin launching its spacecraft to the International Space Station (ISS) from a Woomera launch facility in the state of South Australia. NASA awarded the company $207 million to pursue its design for a vehicle to fill in for the retiring shuttle, in ferrying crew & supplies to the Space Station.

Meanwhile, support has been building in Australia for the nation to join the spacefaring community in other ways. Andy Thomas, a NASA astronaut from Australia, believes his homeland could play a bigger role in satellite launch services and space tourism.

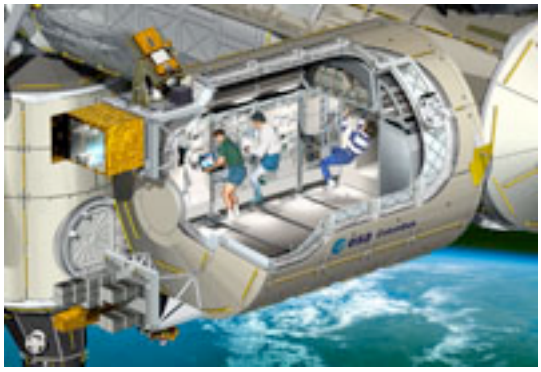
Woomera is well placed to launch in almost any direction. It has infrastructure to build upon and some are already calling it "Spaceport Australia," in hopes it will be a real rival to New Mexico's "Spaceport America." **<MMM>**

ESA's Columbus ISS Module

Fresh off the highly successful *SMART-1* Moon Missioin, the European Space Agency is near ready to take its place on the Space Station with its complex laboratory module

www.esa.int/esaHS/ESAAYI0VMOC_iss_0.html

www.nasa.gov/mission_pages/station/structure/iss_manifest.html



At left, a cutaway of the Columbus module showing lab scientists at work at 3 of the payload racks. The unit is 4.5 m (15 ft) in diameter.

Biolab – one of ten payload racks designed for a snug fit inside Columbus. It supports experiments on microorganisms, cells and tissue cultures, and even small plants and small insects. Over the years that follows, Columbus is expected to support thousands of experiments in life sciences, materials science, fluid physics and a many other disciplines, in the weightlessness of low Earth orbit. On its outer hull, exposed to vacuum, are four mounting points for external payloads.

Working virtually alongside the researchers aboard Columbus will be many Earthbound scientists in the Columbus control center, Oberpfaffenhofen, Germany. Together, they will form one team as they pursue the many kinds of experiments that the facility can support.

Can Columbus reach its full planned potential?

However, the Columbus module's success may be dampened by understaffing. With the U.S. Crew module now scuttled by the Bush Administration, there are no firm plans to increase the ISS crew capacity from the present three to the original design complement of seven. A Bigelow Aerospace Nautilus inflatable module to the rescue? Not for some time. Another option may be to use sleeping room aboard a docked Soyuz or Progress Freighter.

Early in the planning and design of the International Space Station, in an effort to be ready for the unexpected, planners attempted to identify various kinds of **"Off-Nominal Situations" – "ONS."**

http://www.spaceref.com/iss/ops/ISS.Off.Nominal.doc

An ONS is defined as an unplanned event causing a disruption of planned operations that impact the ISS and/or crew safety or the successful completion of the ISS mission /flight plan. ONS are events not prevented by planned design measures or operational controls, and which require an integrated multisegment response. An ONS can range from the loss of a major ISS hardware element to the failure of an electronics component, depending on the severity of the consequence. For the purposes of this document, the ONS identified herein are subdivided into the following main categories:

- Disruption of the planned assembly sequence
- Disruption of planned logistics flights,
- Loss of a critical system function or capability
- An event requiring an emergency response (Depress, Fire, Toxic, Release).

And in fact, we have had two ONS events. The Bush Administration decision to cancel the US Crew Habitat module, forced a manning cut from seven to three and fits the first situation type described. The loss of Columbia in its reentry from orbit disrupted planned logistics. Fortunately, we have not yet had instances of the third and fourth described ONS events.

But every unplanned crisis is the stuff of which opportunities are made. Instead of cursing the darkness, we need to be mentally prepared to take advantage of the situation. It is not inconceivable that the International ISS partners will come up with a plan to provide housing and support for additional ISS crew members.

This could come from ESA's European aerospace contractors. Or it a solution could come from commercial enterprises in Europe, or even in the US, from Bigelow Aerospace, for example. The situation has a parallel in nearly every attempt to design a new city from scratch, be it Washington DC, Brasilia, or Chandigarh in the Punjab. There comes a time when residents are ready to abandon preconceived masterplans in favor of sponta-neous and opportunistic growth. Thus the Bush decision may turn out to have opened the door to genuine natural growth of what the Space Frontier Foundation calls "Alpha Town."

This is a development we watch with expectation and great interest. Centralized or socialist planning can only go so far. We will be in Earth orbit to stay only when enterprise and individuals are pushing the envelope of the frontier. If ISS may does not become the breakout point. an orbiting tourist complex might. The Columbus module will soon set up the situation! **<MMM>**

The National Space Society's 26th Annual International Space Development Conf.

Memorial Day Weekend - May 24-27, 2007

DALLAS, Texas

http://isdc.nss.org/2007/index.html

Intercontinental Hotel

15201 Dallas Pkwy, Addison, TX 75001

$99/night (Group "NSS")

http://www.ichotelsgroup.com /h/d/ic/1/en/hotel/dfwha?_requestid=1101691

1-888 424 6835 - 1-972-386-6000

(map) http://www.ichotelsgroup.com /h/d/ic/1/en/hotel/dfwha/transportation

Conference Registration

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

- **Early Bird Ends Dec. 31:** member $85, joining NSS $100, non-member $120, Student $25
- **Pre-Registration Ends Feb. 28:** member $100, joining NSS $120, non-member $140, Student $25

Conference Program (Draft November, 2006)

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

PREMIER TRACKS:

- **Space Transport:** to space - in space - from space
  - Suborbital, Earth to orbit (Fr), TransLeo, Cislunar, Fuel Depots (Sa), Other Destinations (Su)
- **Moon & Cislunar Space Development** (with Moon Society)
  - Cislunar (Fr), Return to the Moon (Sa), Spacefaring (Su)
- **Mars** (with Dallas Mars Society)
  - Getting there (Fr), Being there (Sa), Staying there (Su)

SECOND TIER TRACKS:

- **ISS Science** (Fr/Sa)
- **Space Medicine** (Sa/Su)
- **Space Law** (Fr/Sa)
- **Space Business** (Fr/Sa)
- **Space Education/Outreach/Activism** (Sa/Su)
- **Space 100 Basics** (Sa/Su)
- **Space Humanities** (Fr/Sa/Su)
- **The Beyond** (Sa/Su)
- **Kids Program** (Fr/Sa/Su)

Moon Society Special Events

(open to friends and visitors)

- **Moon Society Reception & Mixer** (Fri)
- **Moon Society Town Meeting** (Sat or Sun, TBA)
- *Possible Moon Society Suite* (all days) with Exhibits, Literature, Project Sign-up sheets, etc.
- *Possible Moon Society Workshop*

National Space Society Issues

Call for Papers

for 2007 International Space Development Conference in Dallas, TX:

"From Old Frontiers to New"

Texas has stood at many frontiers in history, and is proud to be in the forefront of our efforts in the space frontier. Many agendas are being pursued in this new frontier, and efforts are accelerating to establish a presence there. Our knowledge of both the risks and benefits of living in the Solar system are increasing at a dizzying pace. New launch systems are springing up all around. The competition for space skills and technology is increasing, providing new opportunities at every turn.

The National Space Society is

seeking papers and speakers to discuss the latest issues in space technology, science, policy, commerce, medicine, exploration, settlement and more

at the 26th International Space Development Conference (ISDC) in Dallas, Texas over the Memorial Day weekend, May 24-28, 2007.

This year's conference, "From Old Frontiers to New" is themed on the settlement and development of this new frontier.

Individuals wishing to speak ***must submit an abstract of 300 and 500 words by Thursday, March 1st, 2007.*** For more details about submission guidelines, interested individuals are encouraged to review the Call for Papers onlinet [http://isdc.nss.org/2007/____ address to be posted soon] or email their questions and comments to CallForPapers@nss.org .

In the spirit of the near frontier, the International Space Development Conference will feature three primary tracks running the length of the conference:

Frontier Transport: to, through, and from space - Explores the principles and practice of transport in the new frontier. From suborbital to interstellar, this track is about the means of travelling to and from the many destinations in space.

Moon & Cislunar Space Development - Explores the varied destinations between here and the Moon, the many things to be done, and the infrastructure we'll need to become a space-faring, and not just space-visting civilization. TOPICS: √ Unfinished science: √ Base siting, √ Resources of use, √ Habitat & infrastructure, √ Access techniques, √ Health & medicine, √ Tools we'll need, √ Law on the Frontier, √ What we need to study - technolog y, √ Tourism, sports, & public access. - *Presented in association with the Moon Society.*

The Martian Frontier - Explores the ways and means of going to Mars, and what is needed to stay there. Presented in association with the Dallas Mars Society.

Additionally, the conference will feature a number of one and two day tracks on a variety of important topics, including:

The Solar System Frontier -ISS Science -Space Medicine -Space Law -Space Business -Space Humanities

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!

2006 LRS OFFICERS / Contact Information

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Newsletter Mailing – Carol Nelson 414-466-2081
(*Board Members & Ken Paul <kenpaul@cape-mac.org>)

LRS News

• **20th Anniversary Celebration**: 115 invitations have been mailed to members, former members, NSS members in the area, Wisconsin Mars Society members, members of other collaborating groups, and most important of all, those who were present at our birth, including those on the "colonizing teams" from the L5 Society chapters in the Twin Cities and Chicago.

LRS Upcoming Events – November, December

Saturday, November 11th, 1-4 pm

LRS Meeting, Mayfair Mall, Garden Suites Room G110
AGENDA: www. lunar-reclamation.org/page4.htm
Reports on Summer events, Updates on space and space mission news, conferences etc. A look at the calendar ahead.

Saturday, December 9th, 1-4 pm

LRS & MMM 20th Anniversary Celebration
Mayfair Mall, Garden Suites Room G110

Over 100 Invitations have been sent out for this event.
Buffet luncheon: Turkey, Beef, Oven-browned Potatoes,Corn O'Brien, Cole slaw, Dinner roles
Vegie & Dip platter, desert, beverages
(soda, non-alcoholic sparkling cider)

$5 for members, $8 non-members & guests
If you want to come, but not share in the buffet, or prefer to bring your own food, there is no cost.
This year, we will not be showing our usual classic science fiction movie. We want people to mix and mingle
Exhibits – Door Prizes

RSVP requested for those wanting the buffet.
Please respond to LRS, PO Box 2102, Milwaukee WI 53201
by Saturday November 25, (postmark deadline)
or to kokhmmm@aol.com
so that we can order the proper quantities.

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
Nov. 18, Dec. 16, Jan. 20

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

New MN SFS Officers: at a Saturday, November 4th Meeting, the following were elected for the coming year:

- Executive Director; Dave Buth
- Secretary: Becky Huset
- Treasurer: Lynn Heffernan
- Councillor: Scott Shjefte

Ben Huset returns to Mars Desert Research Station for a 4th crew assignment. (must be in his blood!)

1. Crew 34: February 6-19, 2005
2. Crew 42: Janurary 15-28, 2006
3. Crew 45: March 6-12, 2006
4. Crew 51: November 11-26, 2006

WISCONSIN

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

NOV 16th: UW-Sheboygan, Room 6101, **Sheboygan**
DEC 21st The Stoelting House, **Kiel**
JAN 18th: UW-Sheboygan, Room 6101, **Sheboygan**

SSS Rockets for Schools Display from 2004

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: Nov. 18, Dec. 16, Jan. 20**

CALIFORNIA

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

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

Events Hotline/Answering Machine:(310) 364-2290
Odyssey Ed: Kat Tanaka - odyssey_editor@yahoo.com

[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.
• June18 th - July 16th - August 20th

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

Upcoming Events

- **Sat. November 18th, 3:00 pm** at the home of Steve Bartlett & Tina Beychok, 7108 East Peabody Street Long Beach. The annual election of officers will be completed at the meeting. Plans for the upcoming Loscon event will be finalized. After the meeting, at 5 o'clock, we will have a Potluck Party. Call the *OASIS Hotline,* 310/364-2290, for more inform
- **Fri.-Sun. Nov 24-26, 2006 -- Loscon,** the annual regional science fiction convention of the Los Angeles Science Fantasy Society. OASIS will again be providing science programming and doing public outreach at this event. We also throw a great party!
- **Sat. December 9th, 3:00 p.m.** -- OASIS Monthly Business Meeting, location TBD. Annual Holiday Party follows meeting. Call the *OASIS Hotline,* 310/364-2290, for more information. *NOTE: This the **second** Saturday in December!*

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/.

Is the Moon a wasteland?
There is no such thing as waste.
There are only resources we are too stupid to know how to use.

Arthur C. Clarke – to Walter Cronkite
during launch of Apollo 13

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PHONE#S _____

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

Moon Society dues include *Moon Miners'Manifesto*

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

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

INDEX to #200 November 2006

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

=> *for those outside participating chapter areas* <=
○ **$12 USA** MMM Subscriptions; ○ USD **$20** Canada;
○ USD **$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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