"Expanding the Human Economy through Off-Planet Resources"

Moon Miners' Manifesto

& Moon Society Journal

#150 November 2001

Published monthly except January and July., by the **Lunar Reclamation Soc., Inc.** (NSS-Milwaukee) for its members, members of **participating chapters** of the **National Space Society**, the **members** of the **Moons Society**, and for individuals worldwide. EDITOR: Peter Kokh, c/o LRS, PO Box 2102, Milwaukee WI 53201. Ph: (414) 342-0705.

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In Focus ▣ Dan Goldin: His Legacy & His Recommendations for NASA

On November 17th, Dan Goldin will retire as NASA Administrator, a job he has held for a decade and in which he has done a truly remarkable job. More so than any Administrator before him, he has changed the way NASA operates and profoundly affected the agency's philosophy. Despite the still recent notorious failures of *Mars Climate Orbiter* and *Mars Polar Lander*, his "*Faster, Better, Cheaper*" approach to planetary missions has yielded a wealth of knowledge and insight into the other planets and moons with which we share the Sun.

While most of these new fast cheap missions are aimed at Mars and venues beyond, his Discovery Mission Opportunity series provided a chance for industry and academia designed "extramural" missions to fly and that meant the difference for the grass-roots conceived ***Lunar Prospector***, the little lunar polar orbiter that could, which went on to revolutionize our understanding of the Moon as something more than a dry, barren rubble pile.

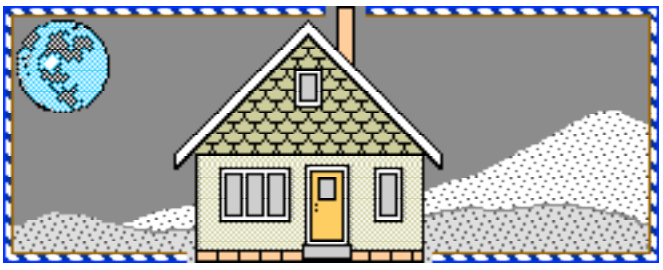
To be sure Dan had his own personal horse-blinders. Along with a lot of other prestigious and renowned company, he was a victim of the "Been there, Done that!" attitude towards the Moon, and *Lunar Prospector* made it on the merits of its superior design and low cost. But that is okay. In our personal philosophy, every apparent disadvantage has an equal and opposite advantage waiting for discovery. That NASA, the Administration, and Congress are all bored to death with the Moon and do not want to hear the word is a good thing. Official hands off leaves the door wide open for private and/or corporate, for-profit initiatives. A government or multi-government lunar outpost would dampen that climate big time.

Goldin saw a number of reinventions of the Space Station design in his time, and discouragingly now faces another period of second guessing. To blame him and NASA for budget overruns seems to us absurd. Building the ISS is something we have never done before and guesstimates of its final cost cannot really be anything more than that. To demand hard and fast numbers only discredits the intelligence of those who demand them.

We give Dan Goldin an A. He did far better than anyone before him, far better than anyone had a right to expect. Despite our plaintiff litany of things undone and missions not undertaken, he has a right to be proud, and we should have the integrity to be grateful. We wish him Godspeed in his future endeavors and/or retirement. [=> p. 2, col. 2]

Will we ever feel "at home" on the Moon?

We won't succeed in establishing truly permanent settlements on the Moon until we've learned to quit seeing it as an "alien" place. When we return, "job one" will be to engage the Moon on its own terms. We won't have come "to go back home", we *will be home!* We'll have to learn to perceive, feel, handle our new home as natives. More >> pp. 3-8



Moon Miners' Manifesto

MOON MINERS' MANIFESTO / Moon Society Journal is published every month except in January and July, by the Lunar Reclamation Society. In January and August, chapter members, ASI members, and subscribers receive Moon Miners' REVIEW.

® MMM is being reedited for the World Wide Web by members of the Artemis Society International. => www.asi.org/mmm

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

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® MMM's desktop publication has received ongoing support (computer hardware and software) from the Space Frontier Foundation, 16 First Ave., Nyack NY 10960; 800-78-SPACE - SFF seeks to open the space frontier to human exploration and settlement as rapidly as possible.

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See contact information on page 9.

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

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1630 N. 32nd Street, Milwaukee WI 53208-2040

fi IN FOCUS Editorial continued from p. 1.

Dan Goldin's Departing Recommendations

While it is clear that Goldin senses that the time is right for him to retire, it is also clear that he senses his work to change NASA's way of doing business is not finished. This is hardly surprising. Dan inherited a cumbersome bureaucracy with a considerable amount of inertia and attachment to the status quo way of doing things. If he had had his way, the changes he brought to NASA would have been considerably more extensive. So it is no surprise that in his departing remarks, he saw one more chance to plug the changes he had no personal chance to make.

It would seem that Goldin senses that NASA is out-of-step with the American way of private enterprise. He would commercialize the Space Station, and indeed the entire Manned Space Program. By picking his time of departure to make these recommendations, he is using the well-deserved reserve of good will he has earned to call the government's and the nation's attention to changes that the NASA establishment of which he was never a part is sure to go on resisting.

That said, we're not sure how much weight should be given to these recommendations. It would seem unclear (and that is my charitable best) that Goldin and his lieutenant in charge of identifying opportunities for "commercialization", Dan Tam, have even the foggiest idea of what private enterprise and commercial competition really are all about.

Perhaps by "commercializing manned space operations" he means something akin to the so-called commercialization of the Post Office. If so, no thanks! You can't have both true commercialization and a monopoly. That said, we are not sure that under the present circumstances of unavailablef "cheap access" man-rated launcher options, that there is any real way to commercialize manned space -- yet! *But it is a road we must find ways to travel, and we owe him for calling our attention to it.* It is our torch now! - PK.

[Readers' Service Announcement:]

Knollwood Books is no more

Lee Price, the owner of Knollwood Books in Oregon, Wisconsin has died of pancreatic cancer. Lee had had a vendor's table at a number of past space conferences. His extensive library contained many classic lunar and planetary books, space exploration, astronomy, and meteorology. The list is found at:

http://www.waverlyauctions.com/waverly2.htm

We were sent this **auction notice** too late for our readers to take advantage ot this opportunity as the auction was set for November 15th.

Knowllwood's website (still up) was/is:

http://www.abebooks.com/home/KNOLLWOOD/.

"At Home" on the Moon:
No Longer *Treating* the Moon *as* "Alien"

by Peter Kokh

Our First Encounters with the Moon

While our Apollo astronauts were on their scientific picnics on the Moon, back in what's getting to be ancient history, "job one" was to protect them from "the hostile and alien conditions" of their temporary surroundings - "*returning them to Earth safe and sound."* Their moonwalker space suits and their Lunar Excursion Module tent were designed to keep the Moon out, and Earth atmosphere and other "necessities" in. These precautions were totally understandable. We did not know *for sure* how benign or insidiously life-quenching the lunar environment might be. We were there to do science, *not to make ourselves at home.*

Lessons Learned

Thanks to these six excursions, we know that while the cosmic weather to which the lunar surface is exposed has potentially life-threatening hazards, there is nothing per se poisonous to us or plant life in the lunar regolith, however troublesome the fine powder fraction can be to housekeeping etc. The next humans to go to the Moon will have to take the cosmic ray and solar flare dangers of the lunar environment just as seriously as did their scouts. But armed with what they have learned, those returning to establish a beachhead will be there to learn

how to engage the Moon
and deal with it -- on its own terms.

They will be there to test and verify equipment and strategies that will enable them to remain on the Moon throughout the dayspan *and into and through the nightspan.* Our previous explorers had been on the Moon in "mid-morning" conditions only.

They will be there to test equipment that will allow them to explore the regolith as a reservoir of potential resources: oxygen and various materials for fabricating useful products. "Pure" science will continue to be a mission goal, but *from now on* pure science will become secondary to practical applied science as the main goal. We will have returned to the Moon with *the ultimate goal of becoming Lunans.*

Becoming Lunans -- that's a status that has to be earned. We will have to achieve a respectful intimacy with the Moon, combining a "second nature" awareness and responsiveness to the dangers our chosen new homeland poses with engagement at every opportunity. We're sure some will be offended by the analogy but it is appropriate - we'll have to learn to enjoy "safe sex" with the Moon. How?

First we must become at home with the Moon's pulverized surface blanket - the "regolith"

- We have to practice "dust control" *by 2nd nature*
- We have to learn to do arts and crafts with regolith-derived media
- We have to learn to build living space out of regolith-derived materials

Not only must our engagement with the Moon show in our homesteads and how they are constructed and furnished, but we need reinvented "moonsuits" that will help our senses truly *engage* the Moon when we are out and about. And, we need Out-Vac sports and hobbies which allow us to enjoy being out on the "alien life-hostile" surface as well as in our comfortable homestead retreats.

In short, we must get past our defensiveness, not by ignoring the dangers and risks, but by learning how to deal with them as if by second nature, the way we in Wisconsin deal with the winter dangers that give sun-coddled southerners the dreads. it is only by such a degree of comfortable familiarity that we can go on to enjoy such a bogeyman climate: enjoying the beauty of fresh-fallen snow, the crunchy sound and feel of cold snow underfoot, the cold kiss of winter air on the cheeks, skiing, tobogganing, ice-skating and other winter sport pleasures. Knowledge and skill must replace paralyzing fear before we can truly enjoy. And the path that northerners and others who have settled in niches once deemed hostile by those in "more benign" homelands, is a cultural and psychological journey that Lunan pioneers and settlers will take as well.

For sure, Earthlubbers will always think of the Moon as a hostile, alien, impossible place. Their loss, our gain. The Moon is a frontier, no more, no less. Perhaps the most challenging yet. But who of us would be ready to change places with a polar Eskimo? The accommodation can be done. The acculturation will be made. And those who succeed in this process will learn to love their new adopted homeworld and pine not to return to Mother Earth.

This is a prediction we make based on some idea of the tremendous range of possibilities, of the potential of the Moon to serve our needs. But the conviction we have is based even more solidly on the nature of being human - adaptation is something we are extremely good at. We will do it because we can!

Cosmic rays, solar flares, intense raw ultra-violet, extreme heat and extreme cold, two week long dayspans and two week long nightspans, insidious moondust, dryness beyond that of baked concrete, the ever black sky, isolation from the immense diversity of Earth's consumer goods shopping heavens and the general unavailability of so much that those left behind take for granted, having to do without or make do with "inferior" substitutes, isolation in general, no nature-given biosphere to take for granted and to enjoy in shirt-sleeves without breathing assists -- the sad litany goes on and on. Oh yes, one thing, the Lunan settlers will be anything but sad. They will have learned to love the Moon. It's a bet. **<MMM>**

Learning to Not Fear the Night

by Peter Kokh

My first response to a bloke who dismisses the Moon with "been there, done that" is to point out that we haven't been to the Moon "at night", much less for "a single full night." Like I've been to the middle of Siberia (Bratsk) -- but it was at the end of July and the beginning of August (1981) -- big deal!

You haven't been to a place, not really, until you've been through a whole cycle of seasons. On the Moon, the cycle of seasons and the cycle of day and night are pretty much one and the same, the 29.5 day long sunrise to sunrise or sunset to sunset cycle. When the sun comes up, it stays up for almost 15 days. When it sinks below the horizon, it stays out of sight for almost another 15 days. "Dayspan" and "Nightspan" are the terms we've been accustomed to using in MMM. Put them together and you have a Sunth, not a month -- the interval from Sun up to Sun up, not from new moon to new moon. It's a matter of perspective: we're looking at it from the Moon's vantage point, not the Earth's.

The Apollo crews visited the Moon in the "mid morning" periods only. Not only did they not dare stay for the night, they fled before High Noon. If you are afraid to stay and experience the Moon full cycle, how dare you say, "been there, done that!"

Fear of the nightspan is rooted in two factors. It gets quite cold and solar power is unavailable. If all we are doing is pitching a tent - a Lunar Lander - the bitter cold may well be a problem. If we put up an outpost *and shield it with regolith* to protect from radiation, then we will also have buffered ourselves from both the extreme high noon heat and the post sunset extreme cold.

If we rely solely on direct solar, then power is a problem. But we can easily generate excess solar *while the sun shines,* storing reserves for nightspan use, as well as including backup nuclear power.

If we take the first "enhanced solar" route, we can meet any power deficit half way by planning our operations to concentrate on energy intensive tasks during the dayspan, reserving labor-intensive ones for the nightspan. In approaching the problem this way, we will set up a rhythm of life and operations that is one with the Moon's own rhythm. We will no longer fear the Nightspan, because we will have faced it on the Moon's own terms. Nothing "alien" about it!

Relevant articles from MMM issues past:

#43 MAR '91 p. 4 "Dayspan"; "Nightspan" p. 5 The "Sunth"

#90 NOV. '95, pp. 7-9 "Overnighting on the Moon"

#126 JUN '99, pp. 3-8 "Potentiation: a Strategy for Getting Through the Nightspan on the Moon's own Terms"

#115 MAY. '98, p 8. High Noon: Coping with Dayspan Heat <MMM>

Learning to Love Moondust: Domesticating the Regolith

by Peter Kokh

Effective Regolith Symbolism - Early Days

Be they on short-term tours of duty or the first prospective settlers, if everything around the pioneers has come from Earth, the Moon will remain cast as alien, as something from which we must keep ourselves safely apart. One way to break this psychological "quarantine" is to begin as early as possible to start making useful items or even merely decorative "accessories" from raw regolith.

Humble crude starter industries that should be in reach of early pioneers include:

- sintered metal products made out of pure unoxidized iron powder fines harvested from the regolith with a magnet
- sinter-cast regolith items using microwaves or a crude solar furnace
- glass and cast basalt products made with a solar furnace
- crude ceramics

Additionally, larger moon rocks or "breccias", surface dust removed, can come inside, as is, or cut and polished to reveal hidden beauty inside. Regolith particles, sorted for color, would allow "Moonscape" "sand paintings" as are familiar in our Southwest.

Sculptures for wall or tabletop, useful items such as glass or ceramic tableware, planters and flower pots, napkin holders, and cast basalt table top slabs will all serve to "bring the regolith inside" in a safe way. This kind of simple, relatively easy blending of raw native lunar and made-on-Luna objects into a habitat setting made-on-Earth, pierces the veil of quarantine by showing that the stuff of the Moon is just as much a medium for human creativity and artistry as is the more familiar "earth" of Earth.

As such "made of moondust" artifacts become more sophisticated, they will find an export market both in other space locations such as LEO orbital Resort Hotels and space liners and on Earth itself.

Bringing the Outside In & the Inside Out

Especially and effectively symbolic would be indoor Japanese style gardens of "raked" moondust dotted with carefully placed moon boulders. First the fine and troublesome powder fraction can be sifted out of the regolith. Then any pure iron fines must be removed by a magnet, less the regolith "rust" in contact with indoor humidity. These modifications are relatively easy to accomplish and leave the "domesticated" regolith looking very much as it did "out-vac" on the exposed surface.

Of course, it would be equally legitimate to let the unpurged regolith rust naturally. This would

be a Moon-appropriate way of bringing in a range of familiar "earthtone" hues as relief from the gray monochromatic scheme of regolith au naturelle, and another way of "domesticating" it.

Another way to merge inside and outside is through the use of cast basalt pavers inside, and again outside on the approach to an airlock, for example. cast basalt floor tiles can sport the full range of regolith hues and variation and possibly even smoothed breccia inclusions as highlights (casting temperatures permitting) in random patterns. Cast basalt tiles are a known technology on which we reported in MMM # 135.

Other "interior" furnishings such as tables, benches, chairs made of lunar iron, cast basalt, lunar concrete, etc. could also adorn Out-Vac "patios" and walkways. Regolith domesticated for indoor uses could thus return transformed to the surface, reinforcing the mutual accommodation of Moon and Man.

On all new and strange frontiers past, people have first begun to make themselves at home by using local resources to meet *some* of their needs - indeed, as many of their needs as possible to an insistently resourceful spirit. This kind of artistic accommodation is a toe-in-the-water first step towards a much greater commitment to learn how to "live off the land" as thoroughly as possible. The artists, crafters and collectors will be the first pioneers to say with their proud achievements, "hey, we're here! Might as well make ourselves at home for the duration!"

Longer term, Lunan artists, craftsmen, architects, furniture makers, and interior designers will be able to do much more by way of integrating lunar materials into their new homesteads so that the our settlements "grow out of the moonscape" so to speak. The Moon will have ceased to seem alien, because we will have learned enough of its secrets and ways to rely upon it for shelter and even our livelihood. Our point is rather that we can, *and must*, take humble but real steps in this direction from the very outset.

Food from Regolith?

Post Apollo agricultural experiments with returned moonrock samples showed not only that regolith is not toxic to plants, but that it contains useful nutrients and can be transformed into a superior rooting and growth medium. First the fine powder must be sifted out lest it clog the drainage systems. Then, as an improving option, the soil can be heated to 150°C which results in an appreciable fraction being transformed into zeolites that hold water-born nutrients well. Treated human wastes and kitchen compost can be added. Nothing will exonerate the reputation of regolith more than using it in household flower and vegetable gardens that provide food, fiber, freshened air, and color. Hydroponic gardens might be easier to set up and maintain but they will require greater import of nutrients and be less "reassuring." But to each, his own.

From Regolith, Lunar Architecture

The next stage will be to build expansion habitat space itself from regolith derived materials: lunar steel or other alloy, lunar concrete, glass-glass composites, etc. Each of these materials, each characteristically different from Made on Earth analogs, will bring a uniquely lunar quality and feel to the inside spaces they frame. In the process, homestead structures will in a very real sense "grow out of the moondust," further rooting their occupants to their new home world.

Even on the outside, the marriage of Moon and Man will be evident. Thee will be the tell-tale pattern of shielding mounds, lavatube entrances, and outside storage ramadas. Some homesteaders may choose optional "'lithscaping" of their shielding mounds, with boulders and breccias, with ceramic and cast basalt shards, with coatings of lunar lime (calcium oxide), glass, etc. As the settlement ages, we can expect to see such attempts at refined sophistication, Moon-style.

We have also talked about lunar architectures that "take back the surface" in MMM #137. And in issues #55 and 111 we described lunar-appropriate "skyscrapers" which sprout out of the surface, breaking the horizons as if they belong, because they will. Unlike the first "outposts" which will be made on Earth and "dropped on the Moon," future human settlements will be *home*-grown.

In short, the Moon is more than a location where we will settle. It is a location *out of which* settlements will grow. In such a mutually involving process, Lunans will hardly feel like "Strangers in a Strange Land." They will feel at home, because they will be at home.

Relevant articles from MMM issues past:

#3 MAR '87, "MOON MALL"
#5 MAY '87, "LUNAR ARCHITECTURE"
#16 JUN '88 "GLASS GLASS COMPOSITES"
#55 MAY '92, p 5. "SKYSCRAPERS ON THE MOON?"
p. 7 "MOON ROOFS"
#63 MAR '93 p. 5 "Sintered Iron from Powder"
p. 8 "GLAX: glass-glass composites; GLASS"
p. 9 "Ceramics"
p. 10 "Color the Moon Anything but Gray"
#74 APR '94, p. 5 "Lunan Homes; Shielding & Shelter"
#77 JUL '94, p 4 INSIDE Mare Manor: "Cinderella Style"; "FURNITURE"; p. 6 "SCULPTURE"
#89 OCT. '95, pp. 5-6. "Dust Control"*
#91 DEC. '95, p. 4 "Startup Lunar Industries"*
#111 DEC. '97, p. 4 "Lunar Skyscrapers: Shattering Low Expectations"
#135 MAY '00, p. 7. "Cast Basalt: Industry Perfect for a Startup Outpost"
#137 JUL '00, p. 5. "Take-Back-the-Surface Architectures" **<MMM>**

Embracing the Moon's Rhythms: Adopting a Moon Calendar

by Peter Kokh

Living and working by the "Sunth"

The slow two-week long crawl of the Sun across the black lunar skies would surely seem to merit the term "alien" along with the equally interminable wait for the Sun to rise again. Meanwhile, in all our activities, we will be in constant scrutinizing communications with Earth. At the beginning, the clock and calendar of our sponsor nation(s) will govern all activity schedules. *Not so!*

Many activities from field work to mining to energy production will necessarily be timed to the rhythm of local sunrise and sunset -- to the "sunth." Now surely personnel on the Moon can observe such schedule constraints while continuing to use Earth's international calendar for all other purposes.

TERMS: the 29.5306 day long period from sunrise to sunrise *at any spot* on the Moon is called a **lunation**. By **sunth** is meant the *equivalent* length of time *as reckoned from a set location*, and as used as a calender division of time.

But as temporary personnel on limited tours of duty are gradually phased out to be replaced by a growing number of volunteers willing to stay much longer, even indefinitely, the sense of adopting a truly lunar calendar will begin to become appealing. Most people prefer a predictable routine over the long term, however welcome occasional breaks may be. The plain fact is that the pace of the Sun, and whether or not it is currently dayspan or nightspan, will greatly affect the agenda for the (calendar) day for most everyone, in most every occupation. If we had a calendar which enshrined this natural lunar rhythm cycle, it would regularize everything.

Reconciling the 24 hour day with the 708 hour long sunth will be the easy part. Lunans would simply alternate sunths of 29 and 30 days, adding a leap hour every 7 weeks or so for a longer night's sleep -- never a shorter one! Of course, that would mean a gradual drift off of whatever terrestrial time zone they had started with -- Houston's Central Time or London's Greenwich Mean Time (Universal Time, Zulu time.) That way they would just be "democratic," sharing clock time with one time zone after another.

The benefit of this observance of sunth time would be considerable. Local sunrise and sunset would occur on the same dates every sunth, give or take a half day depending on whether it is a 29-day or 30-day sunth. This means that work scheduling that depends entirely on the local day/night situation can be regularized from sunth to sunth. Life would take on a certain predictable rhythm. And most people do strongly prefer predictable rhythms.

Factoring in the "week"

One could go further if -- (shrieks of horror from Jewish, Christian and Islamic fundamentalists) settlers adopted a variable length week. Five 7-day weeks with three interspersed 8-day weeks makes 59 days or two calendar sunths exactly. That would put local sunrise and sunset regularly not only on the same date, but also on the same day of the week.

Would people accept this? Historically, *the seven-day week has been the single most change-resistant time-keeping interval.* But there are ways to compromise. The seven named days could remain, with the occasional intercalary eighth day occurring on the weekend, say between "Saturday" and "Sunday." There would be little resistance to nineteen 3-day weekends a year -- three 3-day weekends every two sunths! -- except by the business sector, of course. The extra day could even be adopted by religious leaders for scheduling seasonal feasts and other religious observances. This presumes some good will on the part of religious leaders and some willingness to adapt their schedule of religious feasts to the lunar calendar. Freedom means that some will simply govern everything by Earth calendars. So be it.

The Weekend

On Earth, many businesses must operate around-the-clock day in, day out -- "24/7." That means that work schedules are staggered or even put on a rotation of 6 or 8 days ("not 7") so that everyone takes his or her turn working weekends. On the Moon it will be even more important to keep expensive capital equipment and expensive shared facilities such as schools and parks *open and running all the time*. So what is a true "weekend" for the largest number will surely not be so for all. How the settlers decide to "be fair" or "flexible" will be up to them.

The Weekdays

Now I put "Saturday" and "Sunday" in quotation marks for a reason. You see, the sticking point will be that in a system with periodic eight-day weeks, the named day of the week on the Moon cannot long remain the same as the universally named day of the week on Earth. With the very first 8-day week, the next lunar "Sunday" would fall on the next terrestrial Monday. In a little over two months, the days of the week would coincide again -- temporarily. There can be only one way to avoid confusion: adopt a totally new set of names for the lunar days of the week, seven constant and one periodic.

Now there is nothing very religious about the names of the days of the week in most modern languages. The days are named after the seven celestial bodies known to the ancients: Sun, Moon, Mars (Tiw), Mercury (Woden), Jupiter (Thor), Venus (Fria), and Saturn (in English using the Scandinavian equivalents given in parentheses.) So there should be nothing either sacrilegious or antireligious about

adopting a totally new set, to avoid any confusion.

Fundamentalists, of course, believe that when it is Sunday on Earth it must be Sunday everywhere in the Universe. In fact it can be Sunday one side of our International Date Line and either Saturday or Monday on the other side, and no one looses sleep over that. Avoiding confusion with Earth's calendar will be essential, just as is avoiding confusion between Metric and English units of measurement. Some suggestions for day name sets of 7(8) names are given in the MMM #7 article cited below.

Sunths and Years do not neatly mix

So far so good. The real sticker comes if we attempt to assign a year number in a lunar calendar. One Earth year, and the Moon does share this once-around-the-Sun pacing, works out to twelve lunar months (sunths from a Lunan's perspective) of 354 days plus eleven and a fraction days left over. That's quite inconvenient, it would seem. In the Hebrew calendar, an adjustment is made by inserting a thirteenth month from time to time. In the Islamic calendar, there is no attempt to keep pace with the solar year count -- the year is counted as 354 days and so shifts constantly with respect to the seasons.

The Metonic Cycle to the rescue

However, there will only be a problem if the Lunans adopt an annually rotating set of sunth names. Happily, there is a way to avoid this. Just by chance, the lineup of sunth and month repeats every nineteen years in a pattern known as the Metonic cycle. In short, 235 "sunths" is very nearly 228 calendar months (a total deviation of only 2 hours!). Now if the Lunans simply numbered the sunths from 1-235 they could still observe the shared terrestrial year count.

There really is no other "elegant mathematical" solution. We've tried to brainstorm the problem in various directions for the past 15 years. Such a solution has been sought in vain by lunar calendar partisans for millennia.

Numbering the sunths from 1-235 with a repeat every nineteen years will work just fine. We could assign them short, *easy to remember* compound names, using the first syllable roots of the Latin names for the numbers 0-9: ni, un, du, tri, qua, qui, si, sep, oc, nov -- or some euphonic variation thereof.

Quioct = #58, Septri = #73, Novni = #90,
Unquasi = #146, Dutriqui = #235 -- etc.

Starting Points

So where or when would we start counting? The answer is simple, on any nineteenth year in which our January first happened to coincide with a "new moon" or "full moon" -- whichever standard we wanted to adopt. When we see a full Moon, observers on the Moon would see a new Earth (the night hemisphere of Earth would face the Moon.) When the Moon is "new," the side facing Earth is totally dark and observers on the Moon would see a full Earth.

What would be the logical place to start a sunth from a lunar viewpoint? That depends on the chauvinism that comes with where on the Moon you happen to have settled. For Farsiders, any consideration of the "phase" of Earth would be moot -- Earth will never be above their horizons. Perhaps most settlers will live on Nearside where most of the mare plains are located.

Sunrise on the eastern limb (Mare Smythii - Mare Marginis - Mare Australe) at 90 °E would seem as good a starting point as any. That would coincide with "new moon" on Earth. If you wanted to mark the sunth from sunset at that point, the start of the sunth would coincide with what we experience as Full Moon. The settlers must make the decision, and pick up the sunth count reckoned back to the last new Moon or full Moon (whichever stan-dard they pick) that occurred on a January 1st.

To follow or avoid Jewish or Islamic Practice?

Now in both lunar calendars in wide usage on Earth, the Jewish and the Muslim, the start of the month is reckoned from the first observable crescent moon, i.e. a couple of days after the new moon. The settlers can opt either to go with that precedent or break with it (by using the lunar standard suggested above) to avoid any confusion or appearance of religious considerations.

However, if they want a lunar calendar that is ready to go, has a fixed tradition of calculation, and still tries to keep apace with the year count, they could simply adopt the Jewish Calendar with or without its month names, and with or without its feasts and festivals. The one advantage of such a choice would be that calculators to translate Jewish and Gregorian dates into one another already exist, both on paper, and online. But similar calculators could easily be devised for any calendar setup the settlers choose to adopt. It's only a software matter.

Calendars on the Wall

In plain practice, physical Lunan calendars would give the equivalent standard Earth date and day of the week (and/or day count #s 1-365) in fine print alongside the lunar sunth day number and day of the week name. It's simply a layout problem, with a number of good solutions. One great advantage of the Sunth Calendar is that it won't change every year. Lunar Calendars can be made of durable materials.

Relevant articles from MMM issues past:

#7 JUL '87, "M" is for Month or "Sunth"
"Moon Calendar"
#43 MAR '91 p. 4 "Dayspan"; "Nightspan"
p. 5 The "Sunth"
#92 FEB '96, p. 6 "Pioneer Holidays"
#95 MAY '96, p. 8 "Moon Calendar Revisited"<MMM>

The "LCCJC"

Luna City Cyc lers & Jogg ers Club

by Peter Kokh

Cycling and Jogging in Middoor Spaces

"MIDDOORS": In Lunar & Martian Settlements, the Middoors are public commons spaces, including paths and roads as well as parks and squares, *within the pressurized envelope* of the community, *fully shielded* from the Out-Vac (outside surface vacuum) beyond the air-locks, but distinct from private "indoor" spaces.

For many people, exercise in a necessary fountainhead of their sense of well-being -- vital for physical and mental health alike. To avid joggers and cyclists, in-place exercise in fitness centers, or at home with compact fitness equipment is "not the same thing." Thus it is important for the general well being and morale level of the settlement to attempt to provide for this form of recreational exercise. That means providing fully shielded and pressurized safe pathways reserved for joggers and cyclists.

Cycling & Jogging Paths

In laying out our settlements, it should be easy enough to provide for dedicated pathways, time-shared between cyclists and joggers if too narrow for both. There could be time set aside for walkers as well. Given the need for an abundant area for growing plants which could border such pathways, this set aside should not be difficult to justify.

There could also be special reserved lanes on city pressurized arterial streets and open use on residential lanes - again with abundant landscape vegetation to increase the total biomass, spread, and diversity of the settlement biosphere.

Middoor Cycles

Will cycles for use in pressurized areas be recumbents, bicycles, tricycles, leaners? We have to design for lower gravity and lower traction for maneuvering and braking as well as for unreduced momentum and impact vulnerability. An ideal challenge for a Design Competition!

Protective Equipment: Helmets & Knee Pads

Even in low lunar "sixthweight", a cyclist's (and his cycle's) inertia and momentum are the same as they would be on Earth. Inertia and momentum are cosmically constant. If you are catapulted *forward* into some obstacle, you will hit it *as hard as* you would on Earth. The lighter lunar gravity one-sixth that of Earth's will save you only in a downward fall in which no forward velocity is involved. This lesson is one that each fresh settler will quickly, and probably painfully, learn for him/herself.

On the other hand, while imported terrestrial cycling head gear will work quite well on the Moon, cyclists will be up against the prohibitive cost of importing it. It will be a priority to try to invent a home-grown "lunar-sourceable" alternative. Given that there are no "soft" materials easily made from the elements common in the lunar regolith, we may have to do with metal helmets with fabric inserts that suspend them outwards from the cranium. Ideas from readers are welcome!

Jogging Shoes:

On the Moon, one might expect that "impact" injuries from running and jogging would be much less of a problem, in proportion to the lower gravity. Unfortunately, that will be true only if we learn by practice to bound no higher than we do on Earth. If each running step takes us six times higher than on Earth because we have not learned to restrain the bounding energy we put into it, the impact on footfall will be just as great on the Moon as here. But I predict that new arrivals will quickly learn to adjust their strides. If so, the incidence of impact injuries to the feet and spine could be reduced. But until we have a chance to practice jogging on the Moon in a pressurized environment without spacesuits, we can't be positive about that.

People say "The Moon? Been there, done that!" When you stop to think that no human has walked or ran on the Moon except in a space suit, or within the sardine can confines of the Lunar Lander, you see the absurdity of that dismissal. There is much that we would consider ordinary activity (sleeping in a bed, for heavens' sake, staying overnight, etc. etc. etc.) that no one has had the chance to do on on the Moon. "Been there, done that? - *NOT!"*

The LCCJC

While jogging and cycling are activities that individuals can do each on his/her own, we can expect that jogging and cycling clubs will arise and appeal to many if not all. Social sports are more fun and self-discipline in a social context is easier. By joining clubs, one gets social as well as physical exercise, to the benefit of the whole person. Health is a mental as well as physical state. Club activities could include dances and dinners etc. It is important for people to socialize in non-work-related contexts and social hobby and sport outlets will be valuable.

Conclusion

In the process of getting to feel "at Home" on the Moon, satisfying perks will be very important. The physiological-psychological highs that come from good hard exercise will certainly help those who take part. So many of the "outdoor" activities we have been used to on Earth will be hard to duplicate on the Moon for some time to come. Those that we can accommodate fairly easily deserve to be high on the list of things to provide for in settlement design and growth. All work and no play makes ... **<MMM>**

http://www.moonsociety.org

Please make NEWS submissions to
David Wetnight at newsmonger@asi.org
Other submissions: 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 the further exploration and utilization of the Moon in cooperation with other like-focused organizations and groups.

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

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The Lunar Flag Contest
http://www.moonsociety.org/flag/

Please send all mail related to Memberships to:

The Moon Society Membership Services
PO Box 940825, Plano, TX 75094-0825, USA

How to fix MMM Subscription Errors:
www.asi.org/adb/06/09/04/1999/09/news-19990915.html

Moon Society to Host Moon Track at ISDC 2002 in Denver, CO.

by Gregory R. Bennett and Peter Kokh
http://www.moonsociety.org/conference/2002/isdc/

The Moon Society has been asked by the ISDC 2002 Committee to organize and host its Moon Track at the 2002 International Space Development Conf. to be held over the Memorial Day Weekend, May 23-27, 2002 in Denver, CO at the Tech Center Marriott Hotel.

ISDC website -- http://www.isdc2002.org

The ISDC is the annual conference of the National Space Society, but has traditionally been organized with a "Big Tent" philosophy, inviting key speakers from other space interest organizations. Previous ISDCs have been at Albuquerque (2001), Tucson (2000), Houston (1999), Milwaukee (1998), Orlando (1997), New York (1996). Next Spring's event will be the 21st in the series originated by the former L5 Society (merged into NSS in 1987).

If you can do a presentation or are willing to participate on a panel discussion about the Moon at this conference, please contact Greg Bennett via email to grb@asi.org. Send plain-text email only; *no HTML!*

In your note, please include:

- Your name
- Brief Bio
- Email address and other contact information
- Title of talk (or subjects you can speak about)
- Brief abstract of your talk
- URL for related material on the web, especially if you would like us to publicize it in the on-line plans for the conference

The Moon Society is one of the sponsors of the conference, so Moon Society members can register for the ISDC at the special $50 rate. For non-members, the current rate is $75, going to $90 on Jan. 1, 2002.

The theme for the conference is "Settling the Solar System." Presentations related to the development and settlement of Luna would be most appropriate. Suggestions for topics we need to address:

- Architecture and design of lunar settlements
- Economics of lunar settlements
- Mining: equipment, technical details, markets
- Lunar tourism
- Lunar power systems
- Transportation systems on the moon
- Cislunar transportation systems
- How Luna can support outbound missions
- Property issues
- Political motives to develop lunar settlements
- Life styles on the lunar settlers
- Public interest in lunar settlement and tourism
- What we can do to prepare for and bring about lunar settlement
- Projects for the Moon Society, and how to make them happen

The Moon program session is scheduled for Saturday, May 25, 2002, from 9 AM to 5:30 PM.

Outreach via Moon Sims

http://moonsims.asi.org

6 Nov 2001 from: Gregory Bennett <grb@asi.org

On each of the past two days [11/4-5/01], we have had more than one million hits on asi.org, due to the popular appeal of a web site for The Sims game hosted on Moon Sims.

Every visitor to the hosted site gets to see a link to Moon Sims, and we can safely assume that a fan of the game will eventually follow that link. On every page of the site (http://moonsims.asi.org) visitors will see a nice, big badge for the Moon Society. There are currently 104 pages on the Moon Sims site.

So there's a good chance that in the next few days or weeks, we will have at least exposed the name of the Society to 4,000,000 people, all of whom own computers, have a net connection, and play at least one computer game.

Here's where I need help. We can attract the traffic; now we have to deliver some neat stuff.

Moon Sims needs to be developed to present the story of what it will be like to live in the Luna City Cavern 100 years from now. To do this, we need:

- people to write the stories and essays
- people to create artwork depicting household objects that fit into a "Livin' Luna" environment
- people to convert that artwork objects for The Sims (Currently you must have a Windows machine to run the utilities.)
- people to design fashions for denizens of the moon to wear
- people to convert those fashions into clothing the Sims characters can wear
- people to help maintain the increasingly massive and totally out of control Moon Sims Links
- people to develop illustrations and web pages for ASI MOO's web interface (I want ASI MOO to be consistent with Moon Sims. Same characters, same settings, same stories.)

So here's a really fun way you can do a lot to help the Moon Society grow into an effective organization, right in the comfort of your own computer. This project couples serious lunar development work -- designing concepts for household objects for people living in the moon -- with just plain fun. Really, can it get any better than this?

What the Heck is The Sims?

Unfamiliar with The Sims? Here's a primer.

The Game

The Sims is a game from Electronic Arts, written by Maxis. Those are the guys who created Sim City, Sim Earth, Sim Tower, and all those other sim games. It is the best-selling computer game of all time, with about 4 million copies sold. It's available for both Windows and MacOS. The Mac sales account for about 40% of the total.

Web page -- http://thesims.ea.com/us/
(Click on "About the Sims" for an introduction.)

In the Sims the player creates characters and builds houses for them to live in. These little 3D animated people running around inside the houses, living their lives. They get jobs, develop their skills, get promoted, earn money, buy stuff, develop relationships, get married, have babies, fool around with the neighbors, have parties, redecorate their houses, cook meals, get into arguments, and basically do all that mundane stuff that people do. Sometimes they electrocute themselves, drown in the swimming pool, and even set themselves on fire -- not all good stuff.

The greatest challenge of the game is learning to manage the characters' time so they can do all the stuff they want to do. Figuring out strategies can be entertaining. I'd guess you could play the game for a couple of hours a day for about two months before you had tried everything and it became tedious. The basic logic is very similar to Sim City, though of course the little characters have a lot more personality than a city.

The Sims on the Web

But there's a little more to it. It's possible for users to create new objects to add to the game, and to create new clothing for the little people to wear. You can in fact, create a whole new character, for whatever reason. And it's easy to share these things with other folks, via the web.

Sidebar

- Home
- Livin' Luna
- Men
- Women
- Boys
- Art
- Walls
- Floors
- Tech
- Mesh List
- Tour Guides
- Links

My most significant contribution to the Sims community to date will be found on this page, which is not linked from the main Moon Sims site at all:

http://moonsims.asi.org/skins/m/sociopaths.html

Thousands of people have downloaded that character and installed him in their games. Keep in mind that the player has the ability to do lots of horribly humiliating things to a character, many of which end in the character's death.

There are at least 1200 web sites dedicated to The Sims. Most of these web sites offer downloadable characters ("skins") and objects for the game. Among

these are about a dozen very large, very popular sites that nearly every Sims player learns about rather quickly once they start surfing the Sims sites.

If you look at the Moon Sims web site, you'll see a box with a list of "Hosted Sites" in alphabetical order. Sim Goddesses, which came on line on Moon Sims last Saturday, is the cause of the sudden jump in traffic on our server. They are (obviously) one of the most popular Sims sites on the net. So popular, in fact, that every time they updated their site they cratered The Sims Resource; which explains why they really needed to be Powered by CyberTeams. :)

It strikes me as very appropriate that the featured goodies on Sim Goddesses as this moment are the "Moonstruck" designer line by Byline. (Byline is a pseudonym for Bibi Beliffe. She lives in Sweden.)

The Bottom Line

The ability create custom objects, walls, and furniture was what lead me to think that

> *we could use this as a way to portray life in the Luna City Cavern to a very large audience who would be interested in what we have to say*

at least from the standpoint of providing goodies they can incorporate into their games. And that's what lead to Moon Sims.

• Ideas in MMM for Luna City Sims Features

- From Peter Kokh <kokhmmm@aol.com>
- For those of you who want to participate in the **MoonSims** Game and help flesh out the setting, homes, furnishings, clothing, transportation, etc. There is a lot of speculative raw material in pages of MMM issues past.

• Online MMM Articles that might be of help:

NOTE: all URLs below start with
http://www.asi.org/adb//06/09/03/02/

[Sequence is from earliest to more recent articles]

- 001/special-forward.html "M is for Mole" *We can underground and still enjoy sunshine and views*
- 002/moongarden.html "Moon Garden" *Gardening on the Moon as essential for pioneers*
- 003/mare-essay.html "M is for Maria, Multiple Sites, and Mounds"
- 003/moonmall.html "Moon Mall" *Providing diversified goods for a small market will create a lot of incentive for pioneers with arts and crafts talents to get busy off hours*
- 003/moonmusic.html "Moon Music" *What will early pioneers use for musical instruments in a world where wood, plastic, brass, a*nd copper are hard to come by?
- 004/paperchase2.html "Paper Chase II" *How to cope in a world where paper is very scarce*
- 005/airlockessay.html "M is for the 'Middoors' and 'Matchports'" T*he concept of public pressurized spaces and traveling about the Moon without spacesuits*
- 007/powerco.html "Powerco" *Providing power on the Moon, especially during Nightspan*
- 007/sunthessay.html "M is for Month - or 'Sunth'" *The concept of "the Sunth" as the core feature of lunar time and any lunar calendar*
- 008/animal-life.html "Animal Life in Settlement Biospheres" *Will there be a place for animals on the frontier?*
- 008/parkway.html "Parkway" *If we are serious about creating a biosphere, even our pressurized streets and alleys have to play a part as serious green spaces*
- 008/mooncalendar.html "Moon Calendar" *Lunans will end up marking time with their own calendar for very practical reasons*
- 021/lunar_overflight.html "Lunar Overflight Tours" *Even before the first Lunar Outpost is established, tourists could be looping the Moon without landing for unforgettable up front views*
- 022/hair.html "Hair as a Resource" *With wood, paper, and plastics hard to come by, shorn hair could be a valued art medium*
- 023/gas.html "Gas Scavenging" *With few good ores to start with, pioneers will do well to religiously scavenge trapped solar wind gases whenever they have to move regolith*
- 023/tailings.html "Tailings" *Whenever you extract something from the lunar soil, what's left in the residue or tailings becomes enriched and thus worth mining*
- 025/lavatubes.html "Lavatubes" *MMM's first article on the subject*
- 034/recycle.html "Recycling" *For Lunan pioneers, recycling will be a matter of do or die*
- 034/educ_at_luna.html "The 4th 'R' (Recycling) and Lunar Education" *In Lunan schools, recycling sense will be stressed so that proper recycling becomes second nature*
- 052/firesides.html "Firesides" *Gathering around the fire has always been at the heart of human socializing, but can we do that on the Moon?*
- 089/shelter.html "Shelter on the Moon" *Why we need a protective blanket over our habitat spaces*

- 089/dust-control.html "Dust Control" *The ever mischievous moondust will get the best of us unless proper dust control measures become instinctive*
- 089/shelter-on-the-moon.html "Digging in for Longer Stays" *various options for shelter*
- 090/warehouse.html "Warehousing on the Moon" *Avoiding chaos requires strategy*
- 090/overnight.html "Overnighting" *The Apollo astronauts fled for home long before high noon. The first rite of passage for a would-be outpost crew will be successfully overnighting*
- 090/site-management.html "Site Management" *Good surface housekeeping will be essential if we don't want to spoil our moonscapes*
- 091/expanding-outpost.html "Expanding the Outpost" *Considerations as it becomes time to expand the initial outpost*
- 091/personnel.html "Personnel Requirements" *How do we gradually progress from crews on short tours of duty towards permanent settlers?*
- 092/lunar-holidays.html "Pioneer Holidays" *The early pioneers are likely to establish traditions that involve special holiday observances*
- 092/permanent-outpost.html "Permanent Outpost" *Permanence has to be earned, not proclaimed*
- 095/lunar-desert.html "The Global Lunar Desert" *How the Moon's hostile arid surface will forge the character of settlers and settlements*
- 095/tale-two-moons.html "Tale of Two Moons" *The differences between Nearside and Farside will have a role in shaping our future on the Moon*
- 095/moon-calender.html "Lunar Calendar Revisited" *After nearly 9 years, we take a fresh look at considerations for a Lunar Calendar*
- 096/security-blanket.html "A Green Security Blanket" *The more massive our settle-ment biospheres, the more secure our settlements*
- 096/suit-aversion.html "Spacesuit Aversion" *Pioneers will find ways to do without spacesuits wherever and whenever possible*
- 096/elbow-room.html "The Quest for Elbow Room" *Astronauts may put up with sardine can living, but those who volunteer to pioneer the Moon will not and the powerful need for elbow room will make its mark on the lunar economy*
- 097/market-syndrome.html" "The Small Market Syndrome" *We are used to an endless variety of consumer goods but this will be hard to provide in the small lunar domestic market*
- 097/spirituality-pt1.html "Spirituality on the Moon" *The Moon's character will have a profound effect on the spiritual sensibilities of the pioneers* -- online in three parts
- 097/spirituality-pt2.html Part II (see above)
- 097/spirituality-pt3.html Part III (see above)
- 097/lunar-frontier.html "The Lunar Frontier" *How long will the Moon be a frontier? -- Forever!*
- 098/space-olympics-pt2.html "The Space Olympics of 2046: Part II: Olympic Events on the Moon" *It's just a matter of time!*
- 099/to-from-lunar-surface.html "to and From the Lunar Surface" *using lunar resources to make transport to and from easier and cheaper*
- 100/12-questions.html "!2 Questions about Lavatubes" *What are they anyway?*
- 100/remote-mapping.htm "Remote mapping of Lavatubes"
- 100/lavatube-exploration.html "Robotic on site exploration of lavatubes"
- 100/lava-tube-settling.html "Settling into a Lavatube"
- 100/lavatubes.html "Subterraforming" *Making Lavatubes more Livable*
- 100/culture-civilization.html "Down Inside Culture & Civilization" *Life in Lavatubes*
- 101/lavatube-culture.html "Lavatube Culture Continued" C*ontinuation of above*
- 102/luna-museum.html "The Luna City Museum's Visitor Guide 2097" *What will visitors go to see?*
- 102/archive-luna.html "Archive Luna" *Lunar lavatubes will be the safest possible place to archive all of mankind's records and treasures*
- 110/moon-civ-authority.html "Roots of Civil Authority on the Moon" *It has to start somewhere* Please go to the following address to find the rest of this discussion www.lunar-reclamation.org/homerule_paper.htm
- 110/xity-n-reclamation.html "The Lunar City and the Concept of Reclamation" *Essential!*

• Find additional online material at:

- http://www.lunar-reclamation.org/page12wp.htm

• Ideas from MMM Articles not yet online:

- As to articles not yet online, if you want ideas on any MoonSim related item, please email me at the address above, and IF there is an MMM article that could be helpful to you, I will simply email you the text. - PK

Meandering Through The Universe

A Column on the Cooperative Movement on the Space Frontier © 2001 by Richard Richardson

Security on the Frontier Means Many Things

Recent events bring to mind the question of security for space settlements. But don't think that security lies only in preventing intentional attack. The word "security" can be, and usually is, used in that sense. However, what security is there in dying from Legionnaire's Disease that springs from poorly designed ventilation ducting? Or how secure should a population feel when they are dying of a virulent strain of flu? Should space settlers feel secure if they know that rogue criminals have virtually no opportunity to touch their lives in any way, but at any moment any one of them could be dragged off by government officials never to be seen again? Ultimately, "security" is a much broader topic than just the protection of humans from other humans who are acting independent from their victims' government.

On Earth there is always at least a slim hope of escaping danger from human malice by slipping into the midst of huge crowds of people or slipping out into some very remote area (there still are a few left even today). Similar escapes also apply to other threats to an individual's security. That hope of escaping danger can be pretty dim and infeasible. But it exists. Such hopes are sure to be far dimmer in a space community where there will be so few places to successfully hide, so few exits which will be so easily monitored, and nothing beyond the exits which will provide any more obscurity or anonymity.

A prime lesson of history is that there is no security without freedoms for the individual members of a society. There also is very little security without well enforced, appropriate consequences imposed against those who violate the legitimate security expectations of their fellow citizens, whether anti-social rogues or entire governments or segments of the society itself. Various other rules, regulations, customs and precautions can also increase personal security significantly.

As noted above, just as humans can be a threat to the security of humans, so can nature (with or without help from humans or human technology) threaten the security of humans. The flu epidemic of 1918 took millions of lives, which in turn led to hundreds of thousands, even millions, of additional deaths by starvation, violence, and accidents as the survivors suffered the consequences of losing a provider, a mediator, and/or an emotional/psychological foundation. Most damaging of all, perhaps, was the loss of a *sense* of security both from the actual loss of loved ones or family members and from the traumatic events which ensued in so many cases.

Because a space settlement (for any foreseeable future) is a tiny, tightly enclosed, self-dependent world (not just in the bio-environmental sense, but also in a societal sense) we have to have not only a heightened sense of the consequences of living downstream of ourselves with regard to pollution, but we must also have an equally heightened sense of living downstream of ourselves socially. Our societal behavior will have an enormous bearing on our security with regards to human victimization of humans as well as the presence and spread of diseases, the occurrences of accidents, and so forth.

As with issues of pollution, technology will and must play an important role in meeting sociological and epidemiological needs. Yet the single most important factor in providing security has always been (and in space colonies will be more so) societal and individual behavior. In a space settlement, reducing, reusing, and recycling physical resources will have to be a 100% way of life. In exactly the same way, if space colonies are to have a reasonable chance to survive (much less, flourish), individual, family, and community patterns of living will have to be oriented toward reducing *all avoidable* traumatizations for *all* citizens to the lowest possible level. Because we will so directly live just downstream of ourselves socially, this too must be a 100% way of life.

Unfortunately, just as with the other dangers of living downstream of ourselves, naive or wrong minded efforts to address social issues can create more problems than they solve and end up causing (or at least, allowing) the very harm they are meant to prevent or alleviate. For instance, there is no case in history where restricting core civil liberties in order to protect civil liberties has ever made a society stronger or more secure in the long run. And there are many examples where the wrong social policy has sooner or later led to the collapse of the society's economy which then soon led to drastic reductions in security. Even more threatening to our goal of the permanent human expansion to space is the danger that poor administration in one space community could spread disaster to most or all other space communities (even back to Earth) as people flee the turmoil of their home community.

Trying to find all of the answers ahead of time would likely only result in deep political polarizations among us who want the space frontier opened to human settlement and development. But we don't have to find *all* of the answers now, we merely must seek to find and familiarize ourselves with the problems we are likely to come up against in the next couple of major steps along the path toward our goals and then *begin* to discover where the answers may lie.

There are inevitable negative consequences we will face if we insist on fully solving every future problem before we take each new step. Ultimately, no new steps would ever be taken.

But the [lack of any] progress toward space settlement since the end of the Apollo program

clearly illustrates the negative consequences of *not* developing a reasonably clear understanding, ahead of time, of all foreseeable pitfalls which might potentially be encountered in the succeeding couple of major steps. It needs to be emphasized that this means *all* foreseeable problems! Not just problems of physics. Not just problems of biology. Not just the fun or fascinating problems. But even boring or mundane potential problems whether in rocket science, political science, finance, banking, accounting, paper work, or even problems which might occur because of bureaucratic bungling or corruption. The broader issues of security for residents of space communities are just such problems. Let's be ready to overcome these problems when the opportunity to live in space comes. **<RRR>**

Richard's homepage:
http://richardpatricia.homestead.com

Mail For MMM

On thinking outside the box

I found a lot worth chewing on in issues 148 & 149 of the Moon Miners' Manifesto. *Your thoughts about "thinking outside the box" in # 148 were very cogent.*

Although our FBI and other police and intelligence agencies were not able to catch the people planning the hijackings and airliner crashes before they occurred, some of the information I've been hearing since September 11 suggests that the major problem may not have been so much being unable to "think outside the box" as not having enough resources to follow every lead in a timely manner. And part of the reason for that is, sadly the public's inability to "think outside the box", and give counterterrorism efforts a high enough priority on our agendas.

But your main point is very well taken. I think we do need a faith, but it needs to be particular kind of faith. We need the faith that we will find the means to accomplish our dreams of traveling to other worlds, exploring them, and living on them. But we need to be wary, and keep warning ourselves against the kind of faith (or dogma) that says that any given tool or method we've found is the (implying "only") way to do that particular job.

It is actually a good thing to have a set of methods in hand that we know work. They can be used as "fall back" methods if some new and improved methods we try don't happen to work (or don't happen to actually be improvements). But having a set of tools in hand shouldn't stop us from keeping an eye out for improvements or alternatives.

On distributing risks

I also found your article about "distributed systems" to be appealing. Having spent a number of years in the space business, I know folks strongly want to avoid "single point failures". I've heard a rule quoted that: "No single failure shall endanger the mission, and no two failures shall endanger the crew".

Perhaps, if we wish to live in space and on other worlds, and not just take occasional trips there, we need even stronger rules. Just as a "straw man" for people to take potshots at, maybe something like:

> "No two failures shall endanger whatever economic activity supports the base, settlement, or community; and no three failures shall threaten the lives of the population."

ox Wickman's propellant research

Lastly, I was fascinated by the short articles about John Wickman's propellant research. This is exactly the kind of research we've been needing to find out what propellant combinations can be gotten from the Moon or Mars, and how to use them in engines. I'm delighted to see that someone has actually been doing such work. When I've gotten my thoughts a little more together, I plan to ask him (with a copy to you) some specific questions about the propellants he's been working with.

Larry Friesen
<ljfriesen@ev1.net>

The National Space Society's vision:

People living and working in thriving commu-nities beyond Earth. NSS members promote change in social, technical, economic, and poli-tical conditions to advance the day when people will live and work in space.

♂ Mars Society Updates ♂

Australian Team Scouts Outback Site for 3rd Mars Research Station

http://www.marssociety.org.au

The Mars Society Australia (MSA) has undertaken its first scouting expedition into Australia's outback to identify suitable locations for future analogue research activities. The Jarntimarra 1 Scouting Expedition or JNT-1 is a 14 day working field excursion through the arid and ancient terrain of the Red Centre, from the Northern Flinders Ranges in South Australia to Alice Springs in the Northern Territory. The expedition left Adelaide [capital of the state of South Australia] on October 27 and was to return there on November 9. It enabled a specialised team of scientists including geologists and astrobiologists to inspect, evaluate and compare different types of Mars analogue sites.

"Jantimarra" is an Aborigine word for "star."

For more information including daily updates and an online media kit, visit the MSA Mars Society Australia website at www.marssociety.org.au

Aussie Chapter's Mars Rover Project

In 2000, the Mars Society of Australia (MSA) plunged into its first technical project, *Marsupial*, following an award of US$10,000 from the international Mars Society. You can now follow the evolution of a simulation platform designed to represent a real Mars pressurised rover online! Go to:

www.marssociety.org.au/TEC-MSP/marsupial.shtml

Their idea is to take a2nd hand van chassis (a Mitsubishi L300 Starwagon 4WD) and build a crew cabin that would test features desirable on a Mars pressurized rover. It serves no purpose to provide for pressurization itself and this makes the task of simulating other features that much easier -- and less expensive. As at the Mars Arctic Research Station on Devon Island in Canada, it is expected that simulation exercises with such a vehicle will be sure to produce some surprises while also validating some expectations. What kind of storage bins would be most useful? How should they be accessed? Where should they be placed? What kind of tools should be included? The idea behind such an exercise is that it is risky to bet the bank on paper exercises when simple and cheap simulation exercises can put our ideas to the test.

Two other teams, one U. Michigan, the other U-Toronto/MIT are also pursuing their own rover designs. The three teams were picked for Mars Society funding based on submitted proposals and team strengths. You can follow the other teams' efforts at:

http://marsrover.engin.umich.edu/
http://web.mit.edu/mars/rover/ **MS>**

"Hard Work, No Pay, Eternal Glory" Promised Mars Society Volunteers

Mars Society Website -- www.marssociety.org/

This will reach MMM readers too late for them to heed the call -- unless they have been monitoring the Mars Society website to keep abreast of this fast-moving and ambitious group.

"The Mars Society is requesting volunteers to participate as members of the crew of the Mars Desert Research Station [MDRS] in southern Utah and Flashline Mars Arctic Research Station [FMARS[on Devon Island during extended simulations of human Mars exploration operations during the period of December 2001 through August 2002. It is anticipated that the Desert Station field season will include two shakedown crew rotations during December 2001, followed by a set of rotations running from January through May 2002. It is anticipated that the Flashline Station field season will run from late June through late August 2002.

"Volunteers should state clearly whether they are volunteering for the Desert or Flashline station or both, and what segments of these spans they are available. Both volunteer investigators who bring with them a proposed program of research of their own compatible with the objectives of Desert or Flashline Stations and those simply wishing to participate as members of the crew supporting the investigations of others will be considered. Research proposals which focus the effort of or require selection as a team of up to the full six-person crew will also be considered.

"Applications will be considered from anyone in good physical condition between 18 and 60 years of age without regard to race, creed, color, gender, or nation. Scientific, engineering, practical mechanical, wilderness, and literary skills are all considered a plus. Dedication to the cause of human Mars exploration is an absolute must, as conditions are likely to be tough and the job will be very trying. Those selected will be required to participate in certain crew training exercises and to act under crew discipline and strict mission protocols during the simulations.

"All of those selected will also be required to sign a liability waiver. The Mars Society will pay travel and related expenses during training and simulation, but, aside for potential student stipends, there will be no salary. Applications including resume, character references, and a brief letter explaining why you wish to participate should be sent to Mars Society, PO Box 273, Indian Hills, CO 80454 no later than Nov 30, 2001. Those wishing to participate in the December 2001 Desert Station shakedowns should submit applications by Nov. 10, 2001. Total length of applications should not exceed 3 pages. Please include 9 copies." **<MS>**

Translife Mars Gravity Coriolis Force Feasibility Experiment Successful

From http://www.marssociety.org

An experiment conducted for the Mars Society at Pioneer Astronautics has demonstrated that the Coriolis forces that mice will be exposed to during the proposed Translife Mission will not be excessive. Coriolis forces are a secondary byproduct of rotating artificial gravity systems. It has long been argued by advocates of zero-gravity space travel that such forces would prove disorienting to astronauts, especially at rotation rates above 4 rpm.

The Society's Translife Mission will place a group of mice in low Earth orbit for about 50 days in a rotating spacecraft that will supply Mars level artificial gravity, 38% that of the Earth. During this time, the mice will be allowed to reproduce and the young will grow up in Martian gravity.

Subsequently, the capsule will be recovered and the mice and their descendants studied. The mission will thus serve as a key experiment to determine whether Mars level artificial gravity can be a countermeasure against the well-known debilitating effects of zero-gravity spaceflight, and to determine whether mammals from Earth can develop satisfactorily if conceived, born, and raised in Mars gravity. This question is central to the issue of whether humans can ever settle Mars, or any planet with gravity substantially less than that of the Earth.

To keep the size of the Translife spacecraft small, however, the rotation rate must be high. In particular, for the 1 m diameter capsule currently under consideration, the rotation rate must be about 25 rpm. This has raised concerns that the Coriolis forces would be so excessive as to disorient the mice and ruin the experiment. To resolve these concerns, an experiment was constructed consisting of a mouse habitat positioned on the edge of a turntable rotating at 25 rpm. This system thus creates 0.38 g in the outward direction, which combines with a 1 g downward acceleration imposes a total g-load of 1.07 g's on the mice. While this is different from the 0.38 g they would experience in this system on orbit, the Coriolis force is the same.

The system was started on August 30, 2001. Behavior of the mice immediately after start up was observed to be completely normal, indistinguishable from their behavior before the cage was rotated. The experiment has continued since that time operating 24/7. The mice have been observed to forage, groom, drink, eat and sleep. As of Sept 18, their behavior is still normal and their health is fine.

Robert Zubrin: "these results clearly show that the concerns raised by zero-gravity space-flight advocates over Coriolis forces are greatly overdrawn and that small low-cost long-duration artificial gravity experiments with mammals are feasible. **<MS>**

Mapping EUROPA's Ocean with Sound

MMM Special Report Based on these Sources:

http://www.cosmiverse.com/space09270104.html
http://sse.jpl.nasa.gov/whatsnew/pr/010926C.html
www.onr.navy.mil/onr/newsrel/to0109.htm#ocean

Ocean Scientists at MIT [Massachusetts Institute of Technology, Boston] estimate that massive ice fractures occur somewhere on Europa at the rate of about two a minute. And, they suggest, there should be some observable effects, including "cracking" noises. These sounds could be used to probe the interior structure and shape of Europa's ice crust and the ocean beneath.

Previously, we have expected that it might be necessary to drill through the ice crust at one of its thinner points (a kilometer or so?) and lower a probe into the ocean to make local soundings. With acoustics and a network of at least 4 surface sounder stations around Europa's globe, we could follow the precedent of Navy ships that have used soundings to determine water depth, and that of seismologists who trace the path and speed of vibrations through the crust to determine Earth's inner structure.

MIT Professor Nick Makris and his team propose that we start thinking now about deploying an array of vibration-sensitive acoustic sensors on the ice moon's surface. Not surprisingly, the Office of Naval Research is also keenly interested in the project, enough so to be funding the MIT research.

Terrestrial experience in our own polar areas shows that the vibrations from fracturing ice make sound waves that can penetrate thick ice layers and propagate for hundreds of kilometers through the underlying ocean. Acoustic sensors deployed on the surface of Europa could pick up echoes from the bottom of the ice layer and the bottom of the ocean as much as a hundred kilometers (sixty miles) below. Not only would this acoustic survey establish the existence of Europa's ocean, but it would map this ocean's upper and lower surfaces in some detail.

Europa's ocean, despite the fact that this world is a bit smaller than the Moon, is expected to be more voluminous than that of Earth. While Earth's ocean covers many more millions of square miles, Europa's is apparently much, much deeper.

Meanwhile, NASA, with the blessing of the Bush Administration and Congress, is planning a *Europa Orbiter* mission in 2008, and a Europa landing mission would follow. Last year, NASA decided that the lessons to be learned on Europa, including the possibility of life in its ocean, merited giving Europa equal top billing with Mars in prioritizing future missions.

[For more information on this ONR-funded program, or to interview Simmens or Makris, call Gail Cleere (Office of Naval Research) at 703-696-4987 or email <cleereg@onr.navy.mil>] **</MMM>**

AD ASTRA Nov/Dec 2001

Magazine of the **NATIONAL SPACE SOCIETY**
If you are not a current member, here is what you are missing.

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An Adaptation of an Apollo 11 surface image
Original image courtesy of Kipp Teague/Retroweb

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The Lunar Reclamation Society, Inc.

P.O. Box 2102
Milwaukee
WI 53201

www.lunar-reclamation.org

www.neighborhoodlink.com/org/lunarbase

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

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(* LRS Board Members)

LRS NEWS

• **Publicity for our sister Mars Society Chapter:** At the Oct. 20th WMS meeting, Jamal Abdul-Amin, a reporter from the *Milwaukee Journal/Sentinel* newspaper made a planned visit bringing along a photographer. After talking with members (including P. Kokh) for over two hours he put together an excellent article about the group. The article was in the Monday October 22 edition of the newspaper in the Metro section. The article can be found on-line at:
http://www.jsonline.com/news/metro/oct01/mars22102101a.asp

LRS DECEMBER Events

Saturday, DEC 8th, 1-4 pm

LRS Chapter Meeting, Mayfair Mall, Garden Suites **Room G110** (lower level, NE part of Mall) near the ground-level entrance below General Cinemas.

Our 15th Anniversary Pre-Holiday Event.

- Pot-Luck REFRESHMENTS
- Classic Space History MOVIE (2 pm) **The DISH:** (Sam O'Neil) - Offbeat, uplifting comedy about American & Australian scientists manning the Parkes, Australia radio telescope to provide video of Neil Armstrong's 1969 moon walk.
- Please DO bring friends

U.S. CHAPTERS

NSS Chapter Events MMM 8 Chapters Strong

Space Chapters HUB Website:

http://www.nss.ac/hub/

MINNESOTA

Minnesota Space Frontier Society

c/o Dave Buth, 3331 Cedar Ave. S. #2
Minneapolis, MN 55407

612-721-4772 (Dave Buth) 612-375-1539 (Jeff Root)
Email: mnsfs@freemars.org

http://www.FreeMars.org/l5/index.html

Sept. 29 Meeting at Radio City. Exec. Dir. David Buth, Assis. Dir. Ben Huset, Treas. Kevin Wilson, Counc. George Anderson, Kevin Buth, Joe Betz, and Tom Linebaugh attended -- a rare quorum!

Tim Halincarner came to talk about ANSMET, Antararctic Meteorite Expeditions, the folks that found the Mars Rock that may have fossil life.

Marscon will be at the Airport Hilton and this will mean a lot less space for our Science Room.

Annual Election Meeting November 18th:

MN Space Frontier Society's annual election meeting will be 7 pm Sunday, November 18 at the party room at 433 S 7th St., Minneapolis.

When you arrive, dial the party room to get buzzed in. If you want to join in an indoor picnic before the business meeting, come at 6 pm and bring your own main dish and something to share.

We will also be showing some tapes of very old fantasies of Lunar Voyages such as Georges Melie's "An Marche a la Lune" (1902) 'A Trip to the Moon' and Max Fliescher's "Dancing on the Moon" (1935) during the dinner hour.

After dinner we will have the elections. Offices open & their current nominees are:

- Exec. Dir.: David Buth (incumbent) and Ben Huset
- Assistant Director: Rich Brown
- Secretary: George Anderson
- Treasurer: Kevin Wilson
- State Councilor 1: Jim Cran
- State Councilor 2: ?

This is our first election with an actual race in many years! After the Election we may have a speaker about a new computer and robotics High School in Minneapolis.

WISCONSIN

Sheboygan Space Society

728 Center St., Kiel WI 54042-1034

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

☞ We meet the 3rd Tuesday of the month at **7-9pm**
NOV 20th at Foerster Academy of Dance, **Sheboygan**
DEC 18th MEETING at the Stoelting House in **Kiel**

OREGON

Oregon L5 Society, Inc.

P.O. Box 86, Oregon City, OR 97045
voice mail / FAX (503) 655-6189

http://www.OregonL5.org/

Allen G. Taylor <allen.taylor@ieee.org>
Bryce Walden <BWalden@aol.com>
(LBRT - Oregon Moonbase) moonbase@home.com

☞ Meetings the **3rd Saturday** of each month at **2:00 p.m.**
Bourne Plaza, 1441 SE 122nd, Portland, **downstairs**
NEXT MEETING DATES: **DEC 15th, JAN 19th**

Results of Oct 20th annual ORL5 elections:
Officers:

- President: Allen Taylor
- Secretary: Cheryl Lynn York
- Treasurer: Bryce Walden
- Archivist: Rea T. B. Young

Standing Committees:

- Lunar Base Research Team (LBRT; Oregon Moonbase): Robert D. McGown
- Mars Instrument and Science Team (MIST): R. D. 'Gus' Frederick
- Legislative Action Working Group (LAW Group): Thomas L. Billings
- Media: R. D. 'Gus' Frederick
- Program: Robert D. McGown

As per our Bylaws, these people constitute the Steering Committee and serve as the Board of Directors for Oregon L5 Society, Inc., Chapter of National Space Society. Congratulations to all!

ILLINOIS

Chicago Space Frontier L5

610 West 47th Place, Chicago, IL 60609

INFORMATION: Larry Ahearn: 773/373-0349

CALIFORNIA

OASIS: Organization for the Advancement of Space Industrialization and Settlement

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

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

Odyssey Ed: Craig Ward - cew@acm.org

E-mail: oasis-leaders@netcom.com

http://chapters.nss.org/oasis

Odyssey Newsletter Online

http://www.geocities.com/CapeCanaveral/Lab/4005/articles.html

☞ **Regular Meeting 3 pm 3rd Saturday of each month.** Information: OASIS Hotline, 310/364-2290; website.

NOV 17th -- OASIS Monthly Business Meeting at the home of Steve Bartlett and Tina Beychok, 7108 East Peabody Street, Long Beach.

DEC 15th -- OASIS Monthly Business Meeting at the home of Bob & Paula Gounley in Pasadena. The meeting will be followed by a Holiday Party.

• • **November 23 - 25, 2001 -- Loscon 28** , the annual science fiction convention of the Los Angeles Science Fantasy Society, Hilton Burbank Airport. *OASIS is planning to provide space science programming.*

• Recurring Events

- **Daily thru December only** * (call observatory 323/664-1191 for times) "Oceans of Mars," live, multi-media planetarium show. Griffith Observatory, 2800 East Observatory Rd, Los Angeles. $4 adults, $2 children, $3 seniors. http://www.griffithobs.org/.

  [* The Griffith Observatory will be closing in January 2002 to undergo renovations and upgrades. The Observatory is expected to reopen in 2003.]

- **Fridays, 7 pm** "Night Sky Show." -- **8 pm** Guest lectures. Santa Monica College John Drescher Planetarium, 2nd Floor Technology Building, 1900 Pico Blvd. $4 per show or $7 for both. Info: 310/452-9223 www.smc.edu/events/weeklyeven.

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

OHIO

Cuyahoga Valley Space Society

3433 North Ave. Parma, OH 44134-1252

c/o George F. Cooper III, Phone 216-749-0017

E-Mail: geocooper3@aol.com [new]

☞ Monthly Meetings, the 4th Thursday **7-9:15 pm**, **rm 106**, **Wilker Hall, Baldwin Wallace College**, **Berea**

NEXT DATES: **CALL for Holiday period dates**

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)

NEW URL http://pasa81.tripod.com

Note : PASA is now on the tripod.com system

☞ **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 17 th street side and go **left**. Look for table sign. Parking at Liberty One on 17th St.

• **Scheduled PASA activities**: Monthly meeting schedule for the first six months of 2001: 3rd Sat. of every month. NEXT MEETINGS: **DEC 15th, JAN 19th.**

ANNUAL ELECTIONS will be held at the **December 15th** Meeting. Call Earl or Mitch Gordon, 215-625-0670, to verify all meetings.

Report by PASA Secretary Jay Haines

• **Oct. 13 th Meeting Report:** Mitch Gordon led a discussion on our participation at the **Future Fest 2001** event to take place Sat., Oct. 20 at the Ethical Society on Rittenhouse Square. Four PASA members are making presentations: Jay Haines, Michelle Baker, Gary Fisher, and Earl Bennett.

Mitch also discussed the World Future Society convention taking place July 20-22, 2002 in Philadelphia. Michelle Baker discussed a suggestion from PASA member Robert Brabham Sr. on education options.

NAME _____ ÷

STREET _____ ÷

CITY/ST/ZIP _____ ÷

PHONE #S _____ ÷

❍ $35 **NATIONAL SPACE SOC.** dues w. **Ad Astra**

❍ $20 NSS dues if under 22 or over 64. *Must state age* ___ NSS, 600 Pennsylvania Ave SE #201, Washington DC 20003 (Make payable to local chapter *for 1st year **free** local dues*) (Offer not honored by Oregon L5 Society)

❍ $35 **MOON Society** dues with **MMM**

❍ $25 **Moon Society** dues for those already getting MMM Moon Soc. Membership, PO Box 940825, Plano, TX 75094

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=>for those outside participating chapter areas<=

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CUYAHOGA VALLEY SPACE SOCIETY

❍ $10 presently; Raise to $15 under consideration

CHICAGO SPACE FRONTIER L5

❍ $15 annual dues

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❍ $15 regular, ❍ $20 family, ❍ $12 student / senior cit.

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❍ $20 Regular Dues

OREGON L5 SOCIETY

NOTE DUES RAISE: ❍ $23 for all members

O.A.S.I.S. L5

❍ $18 regular dues

PHILADELPHIA AREA SPACE ALLIANCE

❍ Annual dues for all with MMM $16, due in March or $4 times each quarter before the next March

SHEBOYGAN SPACE SOCIETY

❍ $15 regular, ❍ $10 student, ❍ $1 / extra family memb "SSS" c/o B. P. Knier, 22608 County Line Rd, Elkhart Lake WI 53020

Moon Miners' MANIFESTO

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