"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 NASA Moon Plan gets an "F" as "Preparation for Mars"

In our MMM #191 DEC. 2005 editorial, "Dear Santa: a Moonbase made for Mars," we pointed out that *if* NASA's goal is to build a workable Mars Base and try it out on the Moon first, we would get several things advantagous to a moonbase that we might not get otherwise:

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

Unfortunately, NASA seems to have dropped the ball on at least some of these considerations.

NASA has zeroed out the budget for all further advanced (biologically based) Life Support Systems, shutting down both the BioPlex at Johnson Space Center in Houston and the NSCORT project at Purdue. To save money in the *classical* penny-wise pound-foolish manner, NASA will rely on just in time supplies of oxygen and water to the Moonbase, just as it does to ISS. Only in the latter case, the Russians are there to come to the rescue when NASA is grounded. This decision makes it unlikely that a Moonbase will be staffed indefinitely without short or long interruptions. We all know that the "penny wise, pound foolish" approach is sheer stupidity. Of course, we can always blame it on the financial black hole otherwise known as the war in Iraq.

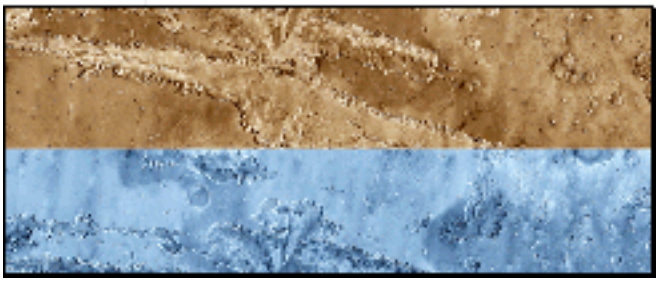
Some NASA moonbase designs show a modular ranch-style horizontal layout. But other mockups show the highly vertical, difficult to shield, Zubrinesque double tuna-can, in which at best, "sandbags" will be placed on top, is if the only direction of incoming radiation was from the Zenith. We are only at the paper stage as of now, so NASA may yet adopt the easier to shield horizontal approach. We predict NASA will take the cheapest "out," no matter what the consequences downstream.

No indications of a machine shop, repair facility, fabrication shop yet. We'll have to wait and see.

NASA seems determined to take the easiest way out in developing a lunar power system. [⇒ p. 2, col. 2]

How will Mars PioneersHandle Climate Shock?

At right, courtesy of a PhotoShop color inversion, we try to capture the "feel of Mars" as it looks, top. Somewhat like our Four Corners area: SE Utah, SW Colorado, NW New Mexico, NE Arizona – which can be quite hot on summer days. Below, the color inversion captures Mars "as it feels" – mirroring the full temperature range of Antarctica, a place very few would pioneer despite its fresh breathable air and abundant sea food. More, p. 4.



Moon Miners' Manifesto

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

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

www.Lunar-Reclamation.org/mmm_classics/
www.MoonSociety.org/publications/mmm_classics/

• **MMM's VISION:** "expanding the human economy through off-planet resources"; the early era of heavy reliance on Lunar materials; early use of Mars system and asteroidal resources; and establishment of permanent settlements supporting this economy.

• **MMM's MISSION:** to encourage "spin-up" entrepreneurial development of the novel technologies needed and promote the economic-environmental rationale of space and lunar settlement.

• **MMM retains its editorial independence.** MMM serves several groups, each with its own philosophy, agenda, and programs. Participation in this newsletter, while it suggests overall satisfaction with themes and treatment, requires no other litmus test. Any presumption that participating organizations can be labeled by indirect mutual association is unwarranted.

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

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

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

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•• **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." — www.MoonSociety.org - Contact information p. 9.

• **NSS chapter**s and **Other Societies** with a compatible focus are welcome to join the MMM family. For special chapter/group rates, write the Editor, or call (414)-342-0705.

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

• **Submissions**

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

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⇒ IN FOCUS Editorial continued from p. 1.

and that means that the agency probably will not predevelop a nuclear power plant for Mars to pretest on the Moon.

Is all this necessarily bad for Moon-buffs? We think so, but would be happy to be proven wrong.

1. That NASA has decided that the moonbase will ***not*** pretest systems intended for Mars, will cost Moon-supporters what support we had from the more thoughtful fraction of the Mars-enthusiast community. This "predesigned for use on Mars" formula was something Zubrin insisted upon to earn his concessionary support for prior moonbase deployment. NASA having reneged, the cautious support of Zubrin and other Mars supporters has evaporated, probably for good. I think that is sad. As I pointed out in last month's issue, on the face of it, Moon-supporters and Mars-supporters have many reasons to be allies.
2. This means that it is up to the Moon Society and private enterprise to push the development of practical biospheric life support solutions. This is not all bad, as I strongly feel that NASA was taking the wrong track. Biospheric life support should be modular, growing apace with the modular physical settlement complex. The private enterprise/academia success with the Antarctic South Pole Station Food growth Chamber is something to cheer about and pursue further.
3. Whether or not NASA includes an adequate workshop and fabrication shop in its moonbase plans, we should include one in our Lunar Analog Research Station designs, following the lead of the Calgary Space Workers.
4. The Moon Society should also push and promote research and development of robust power storage systems adequate to manage the two week long nightspan solar power drought on the Moon. This will allow us to set up shop wherever on the Moon it makes sense to do so on resource utilization grounds. Lunar industrialization is necessary if the Moon is to play its destined role in helping solve Earth's heretofore intractable and intertwined energy production and environmental degradation problems.
5. Passing the R&D torch to private enterprise and non-government funded societies and institutions is the only way to sidestep what it is becoming increasingly clear will be only a gestural NASA- led presence on the Moon. We will be there, in the sense that Kilroy was - if that means nothing to younger readers, don't worry about it. Baby Boomers and older persons get the allusion.

Unfortunately, there seems to be no way to insulate NASA projects or any other worthy government endeavors from the financial Katrina we are now experiencing currently and into the foreseeable future. On paper, the world economy is booming. In reality, accumulating debts are outpacing accumulating assets, and to this observer, it looks very much like a house of cards.

However, what is happening now in the private sector, especially with the COTS initiative, promises the development of private launch systems which could easily scale up to "do the Moon." On that silver lining note, we bring this discussion to a pregnant pause. PK,

MODULAR BIOSPHERICS ON MARS

by Peter Kokh

While in general, what we have been saying in the past few issues about the importance of integrating biosphere components with the architecture of an outpost and settlement in modular fashion, applies to Mars as well. It makes sense to adopt an expansion strategy that will automatically grow the biosphere as the physical pressurized complex grows. Not to do so would be a prescription for disaster.

So why is no one else talking about "Modular Biospherics?" Simple. No one else is talking about expansion of outposts or settlements in the making. Be that as it may, the situation facing the pioneers on Mars will be less challenging than that facing early Lunans.

Note these advantages for early Martians:

- ***Availability of CO2, N2, O2*** – Mars air can be made on demand. The need to recycle CO2 from exhalation into fresh oxygen will not apply. However, it will be a good idea and any amount of plant life within the complex will help. The other tasks of keeping air fresh, cleaning the water, and growing food remain.
- **Reaching sustainability** may be easier since future Martians will find it much easier to make up for losses from leakage or deficiencies in plant production of fresh oxygen and processing of waste water.
- The natural softer sunlight on Mars can be easily intensified, but more importantly, it is available on a **more Earthlike 24 hr 39 min cycle**. Getting the plants through the nightspan will not be the challenge that Lunans must meet.

Agricultural advantages:

- Vegetation provides a sink for excess CO2 (but that is so on Moon also.) But on Mars, there is an **abundant external source of CO2** in the atmosphere, and much more frozen at the poles or locked into the rocks, but releasable upon heating. The Martian settlements will find it easier to have a much more generous ratio of tonnage of vegetation to tonnage of the human population.
- This much greater abundance of the volatile elements needed for life may make it easier for Martian pioneers to justify the food expense of **raising live stock**.

Rejuvenating Mars' Climate:

- Note: we reject the word "terraforming." What we need to do is not to make Mars "more Earthlike" (all we really know how to do is make Earth less Earthlike) but to restore the much warmer, wetter, life-friendly climate of the early Mars: "rejuvenescence."
- As we slowly increase atmospheric pressure by finding ways to permanently melt CO2 frost and ice at the poles, we can be developing plants hardy enough for partly pressurized areas, then finally for the Martian outdoors. – *on Mars, biospherics will begin inside and then progresses to the outside*

Check the article "Redhousing" in MMM #93 March '96, republished in MMM Classic #10 <MMM>

Bringing the Ocher Martian Outdoors In & Taking the Green Inside Outdoors

Overcoming the "alienness" of Mars by integrating indoor and outdoor elements to visually integrate both environments

by Peter Kokh

A home furnishing and decorating goal growing in popularity, particularly but not exclusively in warmer, sunnier climes is "bringing the outside in, and taking the inside outdoors." For example, a home with a window wall and a patio beyond, will have the floor/ground space on either side finished with the same tile, patterned concrete, etc. There will be a visually uninterrupted flow of green foliage on both sides. Similar indoor-outdoor furniture will be placed on both sides. The idea is simple: the outside space should appear to be an extension of the adjacent indoors; the indoor space an extension of the outdoors. In the process, the boundary between home and homesite, between artifact and nature is blurred. The uplifting effect on the spirits of the home dwellers is significant and satisfying.

Future homesteaders on the Moon and Mars can do something similar, translating the above devices into the environmental languages of each world. Here we look at the opportunities before future Martians.

Window walls are not a near term: the pressure differential and the need to maintain radiation shielding create quite a challenge to this concept. However, the device of periscopic picture windows can be tweaked to create an illusion of a similar situation. A neat architectural choice would be to place any airlock so that anyone entering or leaving will do so in plain view out this picture window. This would make the outside area in view an obvious area for a "patio" treatment.

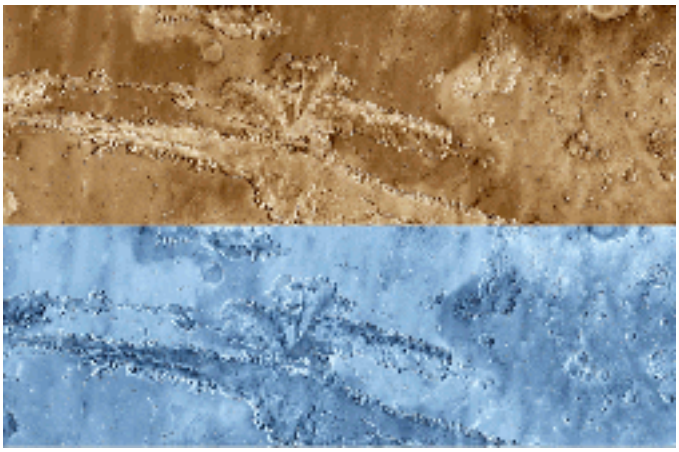
The same choice of Marstone pavers and/or tiles made of Martian materials can be used on both sides to suggest an uninterrupted flow of the homestead (or hotel, etc.) floor into the outdoors. Similar sculptures and other accessories could be used on both sides of the divide. Iron furniture with or without a pre-rusted surface could be used, a bench at least.

A Zen type stone and sand garden is another feature that could grace these two diverse juxtaposed environments. As for plants, faux plants made of stained glass elements could grace the patio. Long term, there are more exciting options: "Mars-hardy" plants bred to handle the slowly increasing air pressure of the slowly warming atmosphere. While that is not in the cards near term, there is no reason to delay experimentation now, here on Earth, by breeding various arid zone terrestrial plants to survive in increasingly more Marslike conditions. See the article "Redhousing" cited at left. Once we are on Mars, "redhousing" may become a very popular hobby among the pioneers, not content to just wait, wanting to help make it all happen.

To ramp up the possibilities, a well-sunlit quartz-domed (UV safe) "patio" area would be an environment transition zone between pressurized indoors and the raw outdoors. It could be lightly pressurized to 10 times Mars normal, 1/10th Earth normal. One would enter this "arearium" via an airlock with only a light pressure suit. This would serve as a "redhouse" for plant breeding experiments, blurring the inside/outside barrier. <MMM>

Acclimatization Shock on Frontier Mars

by Peter Kokh



Mars *as it looks,* top and *as it feels,* bottom

Mars is *cold*. If you get MMM by hardcopy, you cannot see what is suggested above. ***This image is online at:***

http://members.aol.com/tanstaaflz/vallesmarineris.gif

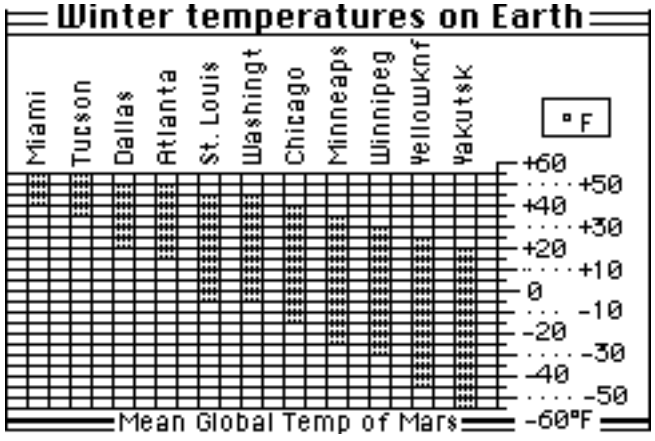
Being Honest About the Cold

From MMM #103 March '97 "Tempering Enthusiasm for Mars as The Next Human Frontier with Personal Honesty"

"A cherished dream dies hard. We have known for a couple of decades now, that the real Mars is a much colder, drier, thinner-aired world than the one we used to dream of colonizing, than the Mars of Lowell and Clarke and Heinlein and Bradburry, the Barsoom of Burroughs.

"We had ourselves prepared for thinner air, say that of Earth's high mountain plains 20,000 feet up. Alas, Mars' air is more comparable in pressure to Earth's at 125,000 feet, more than four times the height of Everest. We had ourselves braced for cool Martian summer days in the 60°s (F) and winter nights perhaps the same number of degrees below zero (F). But Viking meteorological stations showed a year in, year out pattern much much more bone-chillingly cold than that. *Mars has no Florida*.

"We still don't quite believe it. For the cold is "invisible" - there is no surface ice or snow - away from the polar regions - to give us a clue. We look at the Arizonesque scenery and we expect Arizonesque temperatures. Mars *looks* seductively tolerable."



Who will find Mars inviting enough to pioneer?

Most of us can put up with dismal conditions for a while, *if we know that things will change in the foreseeable future.* Those who by birth or by life-style decision live in sunny warm climates still must experience periods of unusual storminess, drought with fire hazard, etc. But those who live in colder snowbelt areas are somewhat hardened to seasonal changes, and many "join what they cannot beat" and learn to love winter. We northerners have to bear up under occasional blizzards and with frequent sunless cloudy periods sometimes two weeks long. Those with an internal sun flooding their lives with sunshine regardless of the weather, do best. But for all of us, we know that dismal conditions will sooner or later change for the better. *Not on Mars!*

How we do the indoors is critical

How will pioneer Martian settlers cope? Spacious interiors lusciously green with vegetation, and pools of sunshine-like over-illumination will work wonders on the soul. So these things are important. The longer we house ourselves in sardine cans, the sooner the settlement will catastrophically implode with general mental illness.

But will this be enough? The deceptive warm colors of the Martian landscapes hide an ice-blue reality. Even near the equator, only a handful of days will have highs well above freezing ("shirtsleeve" temperatures will be exceptional) with 22+ Earth months to go before the next warmup.

Homestead design options which allow the pioneers to "bring the outside in, and the inside out will also help. Homestead attached "redhouse" gardening spaces will further psychologically buffer that invisible ice-blue bone-chilling, life-sucking cold.

Selecting the Pioneers for Mars-hardiness

Volunteers from cold desert regions, even from arctic and subarctic tundra regions, will make for a significantly hardier stock of immigrants. Even so, the most arid desert is more lush with vegetation than Mars, and tundras are abloom with low-lying plants and flowers come spring. Spring will come to Mars only in terms of lighting conditions, astronomically, without signaling the awakening of life as it does on Earth.

Native-born Martians, even the first generation of them, will take the Mars climate for granted, even though they will be familiar enough, *second hand* through a video screen, that conditions on Earth are different. If the settlement is to survive, we absolutely must but childbirth on the fast track. If that means that women recruits board the ship to Mars pregnant, then we must do so and all considerations of caution become trivial.

There will always be fresh immigrants to Mars, but the quicker we can reach that state where the Earth-born fraction of the settlement population is a minority, the more assured we can be that settlement on Mars will truly "take." If, out of timidity, or moral pretense, we defer childbirth, then all we will succeed in doing is building a ghost town. As strange as it may seem at first impression, *only Martians can truly settle Mars.* The rest of us Earthlings can only make a pathetic attempt. None of us will have the right stuff. *Only native-born Martians will truly have what it takes.*

If this attitude sinks in, we have a chance. Human civilization will have taken root on Mars. **<MMM>**

Mascots on Moon & Mars – "Pixel"

A stray cat finds its way to the Mars Desert Research Station and stirs up a firestorm!

by Peter Kokh

Editor's Opinion Piece: Pet lovers and non-pet lovers cannot see each other's viewpoint. It's as if we are two kinds of human, or, as we animal lovers think, human and not-quite human. **Fact:** Humans evolved side by side with animals. Bones of domesticated wolves and dogs have been found in the relics of campsites dating back 100,000 years. In comparison, cats seem to have been domesticated by the Egyptians just 6,000 years ago. The upshot is that wolves became dogs *as* our ancestors became fully human, *together, in each others' presence,* possibly with results that could not have been achieved separately. In that light, non-animal lovers would seem to suffer from some kind of deficiency, perhaps via lack of reinforcing experiences. Sorry if I offend non-animal loving readers, but this is a subject on which I prefer not to pull my punches.

In "The Greening of Mars" Lynn Margulis and James Lovelock allow no place on Mars for animals. They give their reasons, but these are not reasons at all, only challenges to be overcome. The case histories of the mental health of both children and seniors who do or do not have animals in their lives are quite telling. *Mars without animals will be a people colony, but not a human one.* If Earth were ever to be destroyed and only an animal-free Mars survive, the humanity of humankind will have perished. – *PK.*

The MDRS Email Salvo

Per Robert Zubrin's direction, the cat is NOT to be returned to the Hab because it is not in sim [can't wear a spacesuit]. *We have to add more traps and poison (unless someone has a better idea). I'll see if I can come up with more sticky traps.*

–Tony Muscatello, MDRS Program Manager

Pixel seems have to become THE Mascot of MDRS. The very odor of the cat may ward off rodents wishing to board MDRS. [snip]

The cat is good for repelling rodents, and "damned good" for Crew Morale. Methinks kitty gets hungry enough, the ancient instincts kick in and putty-tat goes and kills a mouse to eat. No chemicals, just old fashioned hunting. [snip]

– Peter Gray

This is an ongoing discussion and some progress has been made but not finalized. I'm a cat lover.

– Maggie Zubrin, Mars Society Executive Director

[The editor does not want to give the impression that Dr. Zubrin is an animal hater. Maggie has horses kept at another property, and I have seen a photo of Robert *obviously beaming*, watching his daughter Rachel ride one of the horses. Rather, this is a debate on how animals can fit in, given the starting presumption that they don't.}

Previous treatment of this subject in MMM
MMM #8 Sep. '87 "Animal Life in Settlement Biospheres" followed by "Colonists' Animal Life Quiz" – both republished in MMM Classic #1 , pp. 23-24 (see p. 2 col A for download locations). Also online at:
www.asi.org/6/9/3/2/008/animal-life.html

We do not want to butt in on deliberations about an Animal Policy for MDRS. We might have to humbly retreat when we deploy a Lunar Analog Station! However, we must make these observations: The Mars Society could announce that only those non-allergic to pet hair and dander need apply for crew assignments, and then keep the cat (and any future successors.) Or animals can be summarily banned.

Now that won't work, because MDRS has long been infested with mice and occasional desert rats. The many openings in the hull make it all too easy for them to enter. So there will always be exposure to animal hair and dander. And the odor of Pixel may remain for some time.

The Mars Society can either live with this reality or choose to do something *effective* about it. That does not simply mean eradicating the present rodent population from all their many hiding places. It means, *first of all, denying access.* Otherwise they will simply return. In that light, "a cat out of sim" doesn't seem that bad. And morale wise, it can be a big boost for those crewmembers who have left beloved dogs or cats at home to come here.

Space group integrates animals into their vision
www.calgaryspaceworkers.com/animalsinspace.html

"Part of the Calgary Space Workers agenda is to demonstrate the subsistence and human-animal interaction needs in a lunar habitat analog situation. Lynn Gustafson, owner of a beautifully-run zoo just north of Calgary hosts some animals that might be expected to find a place in humanized outer space. Human interaction with animals in space is also therapeutic and therefore some desired animals may not be subsistence related. It is important to realize that it is easier to take a dozen eggs to space, have them hatch and then have the hatchlings mature and lay eggs and so on to produce both the chicken and the eggs for subsistence purposes. This is called "bootstrapping" and is like using computers in the manufacturing of more advanced computers. "Humans are more relaxed and enjoy the company of animals as animals are not as susceptible to the stresses of daily activities."

A Mascot on real Crewed Mars Missions?

Dog, cat, or something else? A pet that interacts with humans would be best, with dogs better at that than cats, but requiring more care. *Any animial would boost morale.* The inconvenience would be worth it! **<MMM>**

~~Killing Time~~ *Productively* on the Way to Mars *and* on the Return to Earth

by Peter Kokh

Background: Apollo astronauts complained about the long boring 3 day trips from Earth to the Moon and then again on the way home.

We wrote about the problem back in November, 1989.
"Wanted" MMM #30, republished in MMMC #3 pp. 55-7

WANTED: Split personality types for Mars Expedition. Besides being willing and able to leave Earth, family, and friends behind for three years or more, must *for the trip out and back*, have a high tolerance for sensory deprivation and thrive on boring routine tasks; and, at the same time, *for the period spent on the surface,* must be thrill- and challenge-positive, keenly attuned t o external situations with all their unpredictability. If you are such a Jekyll-Hyde combination, please send your resume to:

- Mars Expedition Personnel Office
- Mars Training Camp, Spitzbergen [Svalbard]

Continued:

"For as long as the era of chemical rockets lasts, interplanetary journeys to Mars or the asteroids, will be long tedious affairs that will be very trying for the kind of people ideally suited for the kind of life that awaits them at their destinations. This presents us with a choice. We can either look for persons with such chimeric personality combinations as suggested above who will perform reasonably well under such diametrically opposite circumstances, *or* we can start now to plan ways to structure the times of transit to better fit the personality traits of those best cut out for the exploratory and/or rugged pioneer life on the untamed worlds of their destination".

"First, we must recognize that the trip out and the trip home are radically different in the deep psychological challenges they present. Outbound, the crew will be filled with anticipation. Homebound, they may experience both anticlimactic letdown and an impatience to get back home."

Suggestions from this Earlier Article

Outbound Leg

□ Equipment Assembly: Items manufactured on Earth for use on the Martian surface, after all parts had been tested and checked individually and in verifying assembly, could, if they would travel more compactly unassembled, be disassembled for the trip out.

En route, they would be put together in a *Big Dumb Volume inflatable module,* launched uninflated and compacted. Ultra-critical equipment can be shipped preassembled, with less sensitive equipment and backup equipment shipped "knocked-down" (KD) for assembly en route.

The assembled equipment would have to fit into the fixed volume part of the landing craft. This limits this option to compact objects and compact subassemblies.)

Is this "make work?" I would not be so quick to dismiss the idea so casually.

Return Leg

□ Preliminary chemical & physical analysis of samples being returned to Earth, along with some building materials processing experiments.

Surface samples could be separated into two quota portions, those held safe and untouched for labs on Earth/LEO, and those on which preliminary analysis and experimentation can proceed en route

Trained geologists, mineralogists, chemists, micro-biologistss, exobiologists and other scientists will be essential to the crew.

□ Debriefings and reports, while experiences are fresh, can be followed by round table discussions of how the success of a follow-up mission could be best enhanced (new equipment, added tools, improved lab facilities, mmore comfortable housing, more amplelife support, better fresh food growth chambers, greater menu divdersity, etc.; better training; additional talents to be represented in the crew mix, etc.)

Sensory and other impressions can be set to canvas or disk by those on board of artistic, poetic, or philosophical bent.

□ EVA Sports: To NASA's abject horror, no doubt, there is a very real opportunity for totally new tethered-EVA sports outside rotating structures.

By shortening a tether to the hub, one would advance on the structure. Conversely, by paying the tether out, one would fall behind - simple conserva-vtion of angular momentum.

Using such maneuvers in tag matches might be risky, but rally-type events in which one faced the clock, one at a time, to land first on a forward perch or tag ring, then on one to the rear, before returning 'home', all by manipulating the effective length of the tether, could provide healthy, adrenalin-racing sport. This could be welcome stuff to a crew chosen to be optimally tuned to the pace of activity of the Mars surface part of the expedition.

Sports Media coverage of such "Space Games" might draw big audiences and could work to get across the idea that we can, if we but try, make ourselves at home in Space! Of course, there will be the critics who decry money spent on making such options possible. Providing the necessary equipment by Private Enterprise sponsors would cut that drivel talk short.

When such sport is embraced, either on the sly or with reluctant official consent, we'll have come a long way towards making the space lanes home. We recommend it for the way back. That way, should an injury or mishap occur, the ground mission on Mars will not be compromised.

"Dangle-Jectory" Rallye: From A to B to C to A

(The above illustration presupposed a three-armed rotating structure, should three craft travel to Mars together, not necessarily the likely option.)

What else can keep our Martian Explorers productively busy on the long tips out and back?

Outbound & Inbound:

- □ Continuing education courses, in their line of expertise or outside it, to develop other talents & interests, whether helpful only on Mars, only on Earth, or both
- □ Observations & measurements of the solar wind and other astronomical objects and phenomena even if these observations could either be done just as well from LEO, or if not, by robot probes.
- □ Data mining & digesting latest robotic feed news. It is a sad commonplace that budget pressures have forced NASA to prematurely halt data analysis from various missions leaving potential discoveries undiscovered.

Outbound only:

- □ Backup Expertise Trianing: Learn as much as possible about each other's areas of expertise to provide talent redundancy should a crew member be inhured or sidelined in any way.
- □ Self-schooling in useful areas of talent and expertise not represented in *any* of the selected crew members

Returnbound only:

- □ Expressing their recent experiences and fresh memories in painting, poetry, essays, song
- □ Comparing notes as the individual crew members each wean themselves from preoccupation with Mars and begin to focus on homecoming events and their anti-climactic afterlife on terra firma. Many of the Apollo astronauts experienced "anticlimax" effects. After all, being on Mars (or the Moon) is a hard act to follow!
- □ Webcasts & podcasts to students on Earth about various aspects of the just completed mission. (The Intrplanetary Internet [InterPlaNet (IPN)] will be in place in 2008.) These broadcasts won't be truly interactive until the crew is much closer to Earth. Even at a mere million miles out, the round-trip signal lag will be about 11 seconds. Prior simulations could suggest at what distance live conversations can effectively be maintained. This would be a near zero-budget chapter experiment. We suggested this in MMM #131, Dec. '99, p 6. "The COLLOQUIPAUSE: end of conversational space" (republished in MMMC #14)

Recommendations: inflatable "elbow room"

Provision of inflatable "elbow room" space on both legs is vital for morale and proper exercise. Simply designing in space that would make it possible to take "a walk" would be of immense benefit. Whether for exercise, to "cool off" tension or rising anger, of for "constitutional" purposes does not matter.

But space for individual exercise and perhaps for small team sports would really top it off. Health is essential not just for morale, but for productivity once the crew arrives on Mars.

If the return crew ship is *different* from the Mars crew lander, the inflatable module for the outbound trip could be designed to be easily deflated, compacted, and stored for entry through the atmosphere to landing on the surface of Mars. It could then be removed from the lander and transferred to the home-bound ship. *Or both craft* could have their own built in detachable inflatables.

Our scouts, no matter how exemplary cases of the "right stuff" they may be, cannot be expected to bear up in cramped conditions for many months at a time, either outbound or returnbound, without severe strains on interpersonal relations that could adversely affect the mission's success, and without suffering from low morale and depression. *Unless we are going to put them to sleep for the duration,* an old science fiction trick that we are not able to pull off at the present time.

It's not a simple proposition, however; at least, not if artificial gravity is to be provided at the end of a rotating tether with cargo etc. at the opposite end. In this case, the inflatable structure must be in line with the tether so as not to displace the crew module proper *off center.* The inflatable could be bottom-mounted, side-surrounding, or top-mounted. If an aerobrake shield is used for Earth atmosphere reentry, the inflatable could be in the form of a torous that sits on the rim of the shield as already suggested. An aerobrake is illustrated below.

Credit: http://www.spacephotos.com/catalog/images/detail_phototheque/S00308.JPG

A torus structure, while more difficult to produce, could be ideal, providing a walking/running track. It could be top-mounted with the tether through the donut hole, bottom mounted around the fuel tanks and just above the edge of the aeriobrake shield as in suggestion (c) above, or simply surround the crew module in the 'donut hole.' (suggestion (a) above. All of these options will require design and engineering ingenuity. We have the "right stuff" to do that, don't we?

Yes there would be a weight penalty. But I posit that we will owe our returning heroes this morale-boosting "luxury." They will already have deprived themselves of too much for too long.

Recommendations: Artificial gravity

On the way out, artificial gravity is essential. Our scouts must be in tip top physical shape on arriving on Mars, without having to rest up for a while, wasting a few weeks. The gravity level should be 3/8ths earth normal, the gravity level of Mars.

On the way back, an initial Mars level gravity should be increased gradually to full Earth normal over the months of the return, to put them in tip top shape when they next set foot on Earth after an absence of as much as three years. **<MMM>**

Terraforming Resources for Mars

Rejuvenating Mars Might be both easier and more troublesome than we had dared imagined

by Peter Kokh

Source: This Week in SCIENCE, Volume 315, Issue 5811
www.sciencemag.org/content/vol315/issue5811/twis.dtl

The bulk of Mars original generous endowment of volatiles, atmosphere and water, may not have "escaped" into space.

The New Good News

We have realized for some time now, that early in its history, **Mars was once wetter and warmer, and possessed a denser atmosphere than it has today.** It was natural to assume that this early thicker atmosphere, being constantly battered by the solar wind and held in place by Mars lighter gravity, evaporated into space.

However, Barabash et al. (p. 501) (report dated January 26, 2007) find that the escape rate today for gases in the martian atmosphere is very low, based on measurements from the orbiting Mars Express spacecraft. Propagating these rates backward over a period of 3.5 Gy would result in the removal of 0.2 to 4 mbar of CO2 and a few centimeters of water. *Rather than having left the planet, CO2 and water could instead be locked away beneath its surface.*

Implications for "~~terraforming~~" rejuvenating Mars

The early "easy" climate improvement projects still seem the right way to start. Dust the polar caps with carbon soot, derived from the atmosphere itself, to decrease the planet's albedo (sunlight rejection capacity) and heat the polar water ice/carbon dioxide ice caps to free the carbon dioxide. This just makes permanent a process that happens at each pole each summer. Frozen CO2 evaporates but only to refreeze over the opposite (winter) pole. By using the carbon soot dusting technique, we will prevent refreezing and thus permanently increase the global atmospheric pressure, which in turn will moderately warm the planet, again, on a global permanent basis.

Now we know that we do not need to follow this initial improvement up with a period perhaps centuries long in which water-rich comet chunks would be redirected to impact the Martian surface. That would be a risky proposition, not only increasing seismic activities, but bearing the risk that an errant ice payload might take out a key settlement!

We can skip all that! A favorite of science fiction from Edgar Rice Burroughs John carter on Mars series right through the ghoulish film "Total Recall" is the "atmosphere plant" which takes martian soil in and spits volatile gasses out.

1. We almost certainly have enough CO2 locked in the Martian rocks that can be released through heating by solar concentrators, whole farms of them! This process would be slow and gradual, at a pace at which increasingly more Mars-hardy breeds of redhouse-raised plants could sooner than expected survive on their own outdoors.
2. Most of Mars water could be preserved in aquifers, some of which might be deep enough (as on Earth, Mars crust is likelier to get warmer with depth) to have remained permanently liquid. That means that once the atmospheric pressure and temperature were great enough to support liquid water, underground reservoirs could be pumped up to surface basins. The deepest basin on Mars, where the air pressure will always be highest, is not in Valles Marineris, nor in the suspected northern ocean basin, but in Hellas. Hellas is one feature that has survived from pre-orbiter mapping to the present day. Called a planitia (rather misleading) it is the deepest and largest impact basin on Mars, and unlike similar basins on the Moon, not subsequently (post-impact) filled with layers of lava sheets.

The Good, Bad, & Ugly of Accelerated Climate Change

If the new calculations and findings hold up under scrutiny, and if future deep drilling confirms extensive and voluminous subsurface water aquifers, Mars could become a much friendlier place within the first century of the onset of a determined settlement effort.

Sloppy Mars

But forget about the progression "Red Mars, Green Mars, Blue Mars." First of all, Mars will get greener and bluer at the same time. More unwelcome is the news that Muddy Mars will come first.

With the onset of natural or chemical-induced precipitation (rain *and* snow), Mars' unfixed soils will be subject to substantial erosion, without vegetation ground cover which can only now first begin. It will take some time before vegetation starts to win battles with erosion.

Redhousing, *now,* to the rescue

The sooner settlers, following the lead and improving on the work of those terrestrial fans of Martian settlement who abandon the comfort of cheering from the of their demotivating sofas and roll up their sleeves and get their fingernails dirty by attempting to take arid-zone hardy terrestrial plants and breed them into ever more Mars-hardy strains, via "redhousing." [See the reference to the article on that name on page 3, column A. bottom. this issue] the sooner we will get a handle on the mud.

We need to have a diverse variety of fully Mars-hardened plant varieties ready to plant as the first rains start to fall - *if we are going to win the battle with mud and erosion.*

The Upshot: Mars in shirtsleeves? Not quite

Sooner than expected, Mars could become a much more benign, and attractive world than it is now. This requires both industrial projects like atmosphere plants and deep aquifer tapping, but also horticultural projects, breeding the plants that can thrive on the new "young again" Mars.

But this new Mars will not let settlers go outdoors with the same minimum of protection we are used to wearing. The atmosphere will be thicker, but still mountaintop-thin by our standards. UV dangers will be high. We may need light pressure suits and oxygen masks, and more than "sunscreen lotion" protection from UV. That said, the new Martians will begin to develop an abundance of outside sports, sporting, and recreational activities. And the climate will still be cold by Earth standards, with doubly long seasons. But in this born again Mars, the settlers will begin to truly thrive. Our human exclave will become permanent. **<MMM>**

The Moon Society

J O U R N A L

http://www.MoonSociety.org

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

Please make NEWS submissions to KokhMMM@aol.com

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

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

PROJECTS: www.MoonSociety.org/projects/

Moonbase Simulations - Lunarpedia wiki

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

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

Join/Renew Online - www.MoonSociety.org/register/

Mail Box Destinations:

□ **Checks, money orders, membership questions**
Moon Society Membership Services:
PO Box 940825, Plano, TX 75094-0825, USA :

□ **Projects, chapters, volunteers, information, etc.**
Moon Society Program Services
PO Box 080395, Milwaukee, WI 53208, USA

OUR LOGO above: the Moon in its natural beauty, empty and deceptively barren, waiting for human settlers to shelter and to mother as their adopted second human home world. We have work to do!

New Moon Society Projects & Initiatives

Your input and help is welcome

from Peter Kokh

Looking ahead to ISDC 2007 in Dallas, May 24-28

This particular International Space Development Conference, which one of our members, Kenneth Murphy, is co-chairing, presents a great opportunity for the Moon Society to reach out to the many hundreds of space enthusiasts who will attend. There will be a number of presentations by Society leaders We hope that you will choose to be one of them. For more information, go to:

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

Note: *current** Moon Society members may register at the NSS member rate. (Your expiration date must be no earlier than May 27th. Go to the "My Moon Society" link in the left hand menu column of our website to check, or write me at kokhmmm@aol.com)

The Moon Society is planning a major presence:
www.moonsociety.org/conference/isdc2007_participation.html

We are working against a deadline creeping up on us all to fast to help stuff the registration packets with information on the Society and its projects. Two things we hope to have ready are:

- □ **A CD with MMM issues and papers** (done)
- □ **A Press Kit**
- □ **A DVD on our Moonbase Exercise in Utah** last February and March. This requires locating all the high-res original files and someone to put it all together. We may luck out on both accounts but the it is going to be a tall order
- □ **Flyers on various Moon Society Projects**, including our new Moon Wiki, www.Lunarpedia.org

Planned, but not yet arranged are a special hospi-tality room for society members and friends, a reception-mixer and a town meeting.

Artemis Project™ Posters

We have way too many of these items and need to reduce our storage exposure. We are currently trying to identify ways to use up as many of these as we can in a timely fashion. If *you* have a need for extra posters for outreach purposes, that is to try to drum up interest in the Moon and the Moon Society, please write me at: kokhmmm@aol.com.

The Moon Society and The ASI MOO Community

To many people who regularly log in to the ASI-MOO, it might seem that the Moon Society is not eavesdropping and has no use for your opinions and input. *Guilty on the first score, quite the contrary on the second.*

I can only speak for myself, but I am already busy 18 hours a day with other things and cannot find time to tune in to MOO discussions. But I do value your input.

So how do we establish better communications? First, there are MOO-dwellers who are in fact on the Moon Society Leadership Council. Among them are Dana Carson, Charles Radley, James Gholston, and Mike Delaney. Ask them to share your input and concerns at the next Leadership Council meeting, or email me directly at kokhmmm@aol.com.

You can *also* go to the Teams site and c*hoose to join the Leadership Council yourself*. In that case, let me or Dana know so we can arrange the necessary permissions and get you on the Council email list. **PK**

Moon Society Volunteers Wanted

1) Moon Society Secretary. Ben Smith of Baltimore was elected to this post last August. But unfortunately both personal and work considerations have forced his to retire. The post will be up for nominees in the next round of elections this year. Meanwhile, a potential nominee could get a head start by volunteering to take over Ben's duties in the interim period. Duties include notifying Leadership Council members of the next scheduled meeting, and other low-burden duties. Reply to president@moonsociety.org subject line, "secretary."

2) Public Relations or PR Person. The Society is in need of a person experienced in issuing press releases to the media. We want the world at large to know the Moon Society response to important developments and its position on relevant subjects.

The Press Release Person will work with the Society President to develop responses to significant developments, helping fine tune the President's first draft, or proposing one him/herself. The Press Release Person will be free to take initiative in calling the President's attention to a matter where a statement would be appropriate.

The Press Release Person will also try to disseminate Position Papers and Policy Statements issued by the President with the approval of the Board of Directors.

Expanded Job Description - As this is a volunteer position, the PR duties can become what the volunteer has time and energy to make of them. Below are some ideas of appropriate additional self-assignments. A volunteer, possibly retired, with more discretionary free time might consider any selection of these options and assign them priorities according to his/her experience and comfort level.

- Participate in Leadership Council Meetings on ASI-MOO, the first and third Wednesday evenings of the month.
- Preview and give input on periodic E-Reports to current and former members of the Society prepared by the President and others, prior to their being sent out.
- Study the Society's mission objectives, as well as current and planned projects with a view to developing public relations strategies that will influence public opinion, motivate individuals to join the society, or otherwise promote the Society's work.
- Serve as an ex officio member of a liaison team tasked with finding areas of effective collaboration with other space-interest organizations
- Look for contest, competition, and challenge opportunities for the Society to sponsor or cosponsor at nominal cost
- Review and give feedback on promotional and outreach materials developed by the President or others.
- Coordinate production of budgeted. posters, brochures, prizes and other professionally produced items, including targeted advertising.
- Respond to requests for information from the media or designate another appropriate spokesperson or information source.
- Arrange public appearances, speaking engagements, exhibits, or other promotional opportunities to increase awareness of Society goals and projects and to promote goodwill. Look for those opportunities that entail minimal travel and lodging and/or shipping expenses, or which offer compensation for services provided.
- Look for low budget ad space opportunitiesCoach chapter and outpost people on effective communication skills - this can be done by email or by posting tips on the Space Chapter Hub at: http://nsschapters.org/hub/
- Monitor developing trends and key group interests and peruse market and public opinion research that give us an introductory topic

Given the many opportunities to pursue this role, there is ample room for a PR Team of volunteers. One is good. More is better to share the work load! If you are willing to take care of even a few of the items above, we want to talk to you! kokhmmm@aol.com "PR volunteer"

3) Moon Society Hospitality Room Manager for ISDC 2007 in Dallas, TX, May 24-28th. Duties for this temporary service include arranging snacks and refreshments (given a Moon Society budget amount TBD), and keeping Society literature and displays in order. If you are registered for ISDC, reply to kokhmmm@aol.com

4) Artists to create depictions of the Lunar Frontier Settlement for use in a new Moon Society brochure, for a possible new poster, and to help spruce up the Moon Society website.

MMM Volunteers Wanted

1) Cartoonist - Through the past twenty years we have had the services of several cartoonists, each for only a brief period. By the way, we are looking for humor, not satire or sarcasm! The editor can help with suggestions.

2) Illustrators - The editor has limited illustration abilities using unsophisticated paint programs. Three dimensional illustrations and drawings in perspective would help. Both black & white and color illustrations are desirable. The illustrator should be able to produce something with limited notice (a minimum few days to a couple of weeks.) Meanwhile, we will continue as we have for many years.

3) Assistant Editor - The idea is to take over various parts of the newsletter that involve mostly editing rather than writing, and thus to provide some relief for the Editor.

4) Circulation Manager - We are looking for someone with database experience to take over blending the mailing lists from the Moon Society and the client NSS Chapters in preparation for label production for each hardcopy mailing of MMM. LRS' Bob Bialecki needs a break after several years on the job!

Lunar Explorer Software

12 men have walked on the Moon…now, it's your turn
MMM/MSJ ***Reader Service Notice*** [abridged]

"Lunar Explorer lets *you* be the Explorer. You decide where to land on the Moon and which sites to explore. All of the historic landing sites have been simulated: Six Apollo sites, five Surveyor sites and seven Russian Luna mission sites. Lunar Explorer, developed by VirtuePlay, is based on a breakthrough software architecture called RADE that powers the entire Moon simulation to run in real time on PC home computers or laptops (~~*MAC*~~). This is the world's first interactive global model of the Moon available for home PCs. It gives you a realistic visual experience of being on the surface of the Moon.

"... the best available 3D lunar topography data from ... the 1994 Clementine mission. You will be walking on the actual terrain model of the Moon! On this terrain model ... additional detail layers ... are gradually switched on as you approach the surface. The ... surface detail provides a breathtaking visual experience. You will believe you are on the Moon!

Additional Features:
* Apollo sites, Lunar Modules, rovers, flags, experiments
* All man made objects can be examined up close
* You can explore the interior of the Lunar Module
* Listen to actual sound bites from the astronauts
* User controlled Sun position, dynamic object shadows
* Accurate star field with constellations and the Milky Way
* Take snapshots of interesting places.
* Standard navigation simulates space flight. Control thrust, velocity, go into orbit, surfce land and take off
* Free Camera and Auto-Pilot navigation
* Earth can be found at its correct location in the sky
* Navigation grid shows lines of latitude, longitude, both

System Requirements , Min Configuration, Availability
www.judieglenninc.com/4frontierstore/item.php?i=166

Introducing our new email newsletter

Moon Society *Frontlines*

We have periodically sent out email updates to everyone in our combined ASI/Moon Society database, current or expired, with a still valid email address. This list shrinks as people change email addresses without letting us know. The other problem is that these updates have not gone out on a regular basis, as it has required a separate additional effort on top of all others.

Instead, we propose to design a newsletter to use plug in information from MMM, the website, and other sources, so that it is much easier to put together.

And, to reach a much wider, and more receptive audience, we will use ***a permission-based mailing list.*** Anyone, present or past Moon Society or Artemis Society member, or simply a guest or visitor to our website, or someone responding to a flyer at ISDC, can go online and sign up for this newsletter, and be free at any time to unsubscribe without any ado. *No sign up, no e-letter!*

You will be able to sign up for text only or html versions. The html version will have a banner and occasional photos, illustrations, and other graphics.

The plan is to send out an issue of *Frontlines* to whomever is currently on our mailing list, within a week of finishing each MMM: *ten issues of Frontlines a year.*

We are using MailChimp free software to design and manage *Frontlines* and the email subscriber list. There will be a cost, however, for mailings, e.g. $15 for 500, $100 for 5,000 etc. At the outset, ye ol' editor will front the first few mailings until the Leadership Council and Board of Directors can get a feel of the product and some sense of its usefulness in spreading the Moon Society name, and building up the membership roster. At that time, the Society can vote to assume further costs, or to shut the project down with a "nice try" attaboy.

Want to sign up? *Simply go to:*
http://list-manage.com/subscribe.phtml?id=0006e65d5b

We hope to have the first issue go out in early April, within a day after uploading of the MMM #204 pdf file.

Structure: we are still playing with ideas. But our current draft index would look something like this:

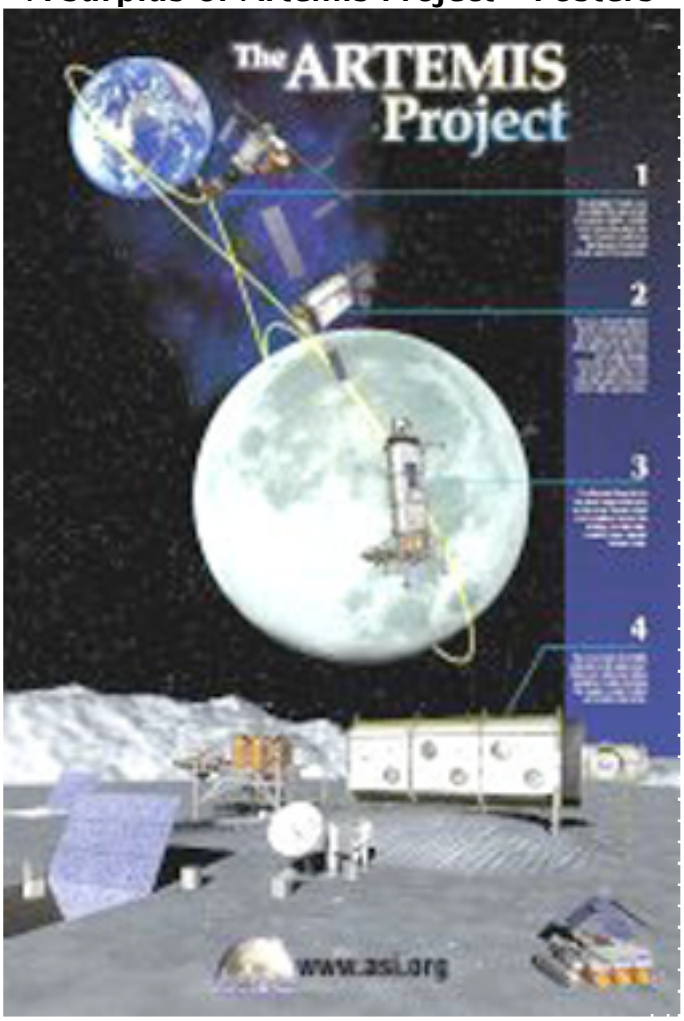
In this issue:
- Greetings from Moon Society President, Peter Kokh
- Moon Society Project Updates
- Report by Director of Project Development, Dave Dunlop
- A peek at the latest issue of Moon Miners' Manifesto

In each issue:
- Staying connected & in touch
- Local Chapters & Outposts
- Volunteering Options
- Giving Options

Do send us your ideas for Frontlines! kokhmmm@aol.com

Chapters & Outposts

A Surplus of Artemis Project™ Posters



Could your chapter or outpost use a good supply of these posters for outreach purposes?

You could give them to schools and libraries, as an incentive for chapter memberships; as prizes for chapter/outpost-run contests (design, art, essay etc.) and competitions; as science fair prizes, etc.

Just tell us how many you need, and we will ship them to you for the cost of packaging and shipping alone.

These posters have contact information for the Artemis Society International, which is in stasis, unfortunately, but they can still inspire the imagination. We are considering ways to overprint them with Moon Society contact information, and/or your chapter/outpost contact information.The posters are 24"x36" (61 cm x 91 cm)

We are working on an accompanying flyer that explains the innovative points in Artemis Project™ design.

If you have a novel use for these posters other than the broad categories listed above, please do share them with us <kokhmmm@aol.com>.

The Moon Society is also looking at productive ways to reduce the inventory on hand. **<TLRC/MSJ>**

Bay Area Moon Society

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

Meeting **4th** Thurs. montlhly at Henry Cates' in San Jose

Contact: Henry Cates <hcate2@pacbell.net>

Moon Society Phoenix Outpost Blog

http://www.moonsocphx.blogspot.com/

Contact: Craig Porter <portercd@msn.com>

This is a very active blog worth a regular visit! - P. Kokh

Moon Society Milwaukee Outpost

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

Contact: Petr Kokh <kokhmmm@aol.com>

The Milwaukee Outpost in conjunction with the Lunar Reclamation Society has looked at three upcoming outreach opportunities: Earthday March 21, Yuri's Night April 12, and Astronomy Day April 21 and decided that our best bet was to concentrate on the latter which offers two piggyback opportunities with the Wehr Astronomical Society and the Northern Cross Science Foundation. We are now looking at what we will exhibit, and possible presentations. Likely theme: "Astronomy from the Moon."

Moon Society St. Louis

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

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

Contact: Keith Wetzel <kawetzel@swbell.net>

Pages on the Moon Society St. Louis website that are worth your visit:

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

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

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

NSS Partner Chapters

- **Oregon L5 Society** - See page 17 below
- **Minnesota Space Frontier Society** - See p. 17 below
- **Lunar Reclamation Society** - See page 17 below

- **Calgary Space Workers**
  www.calgaryspaceworkers.com

CSW made two public outreach presentations on March 3rd.

1. Michael Bakk's talk was titled "It's all downhill from here: successful failures on the Moon." The topic covered successful and failed, manned and unmanned landers on the Moon starting with the Pioneer Probe launched August 17, 1958.
2. John Hadden gave a presentation called "Space Manufacturing: Building Space Factories at the Lagrange Points.

Both Mike and John are current members of the Moon Society.

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

Creative Ideas & Inventions from Science Fiction
http://www.technovelgy.com/

Scientists and Engineers for America
http://www.sefora.org/

Sports in Space
www.spaceagepub.com/ArticleArchive/20061010_1.html

Sweden Strikes "Aurora" Deal with Virgin Galactic
www.space.com/news/070128_sweden_virgin.html

Lunar Orbiter Photographs Digital Guide (NASA SP-242)
www.moontoday.net/news/viewsr.html?pid=22630

Using clouds of moondust to cool the Earth?
http://space.newscientist.com/article/dn11151-keep-earth-cool-with-moon-dust.html

Selene "Wish upon the Moon" Campaign
www.jaxa.jp/pr/event/selene/index_e.html

Independent human settlements beyond Eart.
http://www.thespacereview.com/article/784/1

Advertiser-supported free trips around the Moon?
http://www.thespacereview.com/article/783/1
http://www.freespaceshot.com/
There's a catch. It's just for kids under 13

To the Moon to enable a long-term future in space
http://www.thespacereview.com/article/791/1

Why Disbelief in Apollo Missions persists
http://www.thespacereview.com/article/787/1

Targeting pro-space arguments to specific groups
http://www.thespacereview.com/article/795/1

Should the "Vision for Space Exploration" be primarily schedule- or budget-driven?
http://www.thespacereview.com/article/799/1

Reviewing Inexpensive Ocean-based Launches
http://www.thespacereview.com/article/808/1

Commercial Space Suit Manufacturing Firm Startup
http://www.orbitaloutfitters.com

71 page paper on Lunar Space Elevators
http://liftportambassador.org/resources/Stuff/LunarSE/
[download file: NIAC1032Pearson-LunaElevator.pdf]

South Pole Food Growth Chamber top links
http://ag.arizona.edu/ceac/CEACresearch/International/004f.htm
http://cals.arizona.edu/CEAC/research/SouthPoleChamber/index.htm
http://www.growingedge.com/magazine/back_issues/view_article.php3?AID=170534

MARS TIME TESTS

Rotation length vs. Day length: While Mars rotates on its axis in 24 hr 37 min 22.66 sec, its angle to the sun is changing also day to day, Mars' *Noon to Noon* "day length" is 24 hr 39 min 35.24 sec [http://cseligman.com/text/sky/rotationvsday.htm]

Letter to Robert Zubrin* & Tony Muscatello**

* President, The Mars Society
** Program Manager, Mars Analog Research Stations

Re: Human Factors Opportunity on upcoming 4 month 1 crew FMARS simulation on Devon Island

FMARS is well north of the Arctic circle, and much of the planned 4 month FMARS mission may take place in around-the-clock 24 hour daylight.

This presents an unequaled opportunity to ***test the effects of living on Mars Time with a 40 minute longer day.*** *It would be interesting to see if some crew members experienced continual jet-lag, while others adapted easily.*

It occurs to me that "morning people", such as myself, who can't wait to jump out of bed every morning and get the day started, will find it difficult if not impossible to adjust, while late-sleeping "night people" may have no problem at all.

If such a study yields interesting results, indicating a problem for some, but not for all, that may suggest a parameter that should be considered in picking crews for actual Mars missions.

Such an experiment might get good press.

Just a suggestion. I will be following the mission with the greatest interest. This 4 month exercise is the right mission at the right time for the Society.

Best,
Peter Kokh, Wisconsin Mars Society
Veteran MDRS Crews #34 and #45

[There was no immediate response to this letter, but none was expected. The experiment would require improvising a clock (probably a digital clock programmed to automatically reset from 24:27:22.66 to 00:00:01) , writing procedures for implementation and for recording effects, etc.

One of the crew members already picked for the crew, and already tasked with experiments and responsibilities, would have to accept this additional work load. Yet it is still, in our opinion, a great idea, as well as an ideal one-time opportunity to test it.

There is also a widely subscribed to belief among Mars enthusiasts that adjustments to Mars time will be no big deal. I'd rather see experimental verification of this belief, based as it is on nothing more than sheer enthusiasm and Mars Macho bravado. Humans have evolved with 24 hr time, and while long term, we may be redefinable, near term, some of us will have more trouble adjusting than others. In general, our inner clocks take about five days to fully reset to a changed schedule, and there is considerable evidence that laboratory animals whose schedule is changed frequently without them ever getting five days to adjust to each change. live 5% shorter lives. That evidence suggests that we should put our bravado on hold while we do the tests. Of course, we are going to (and must) do Mars anyway. But we need to pick volunteers who are more plastic in their internal time clocks. *Peter Kokh*

MMM PHOTO GALLERY

Location of Devon Island in Canada.

Site of the Flashline Mars Arctic Research Station
4 Month long Crew Sim

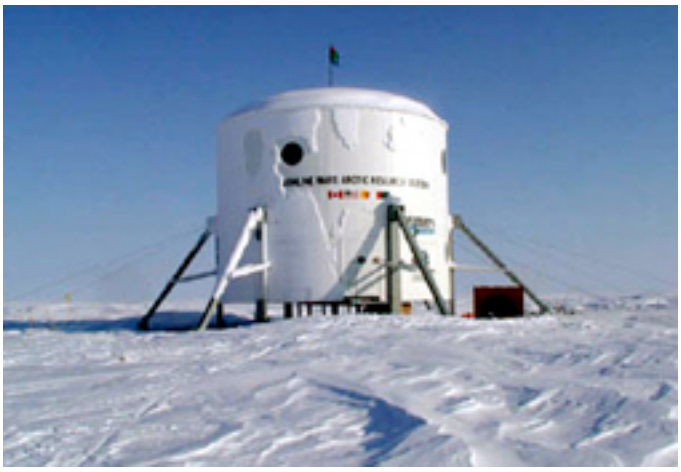
Relation to Resolute ⬇

Desolate Terrain of Devon Island

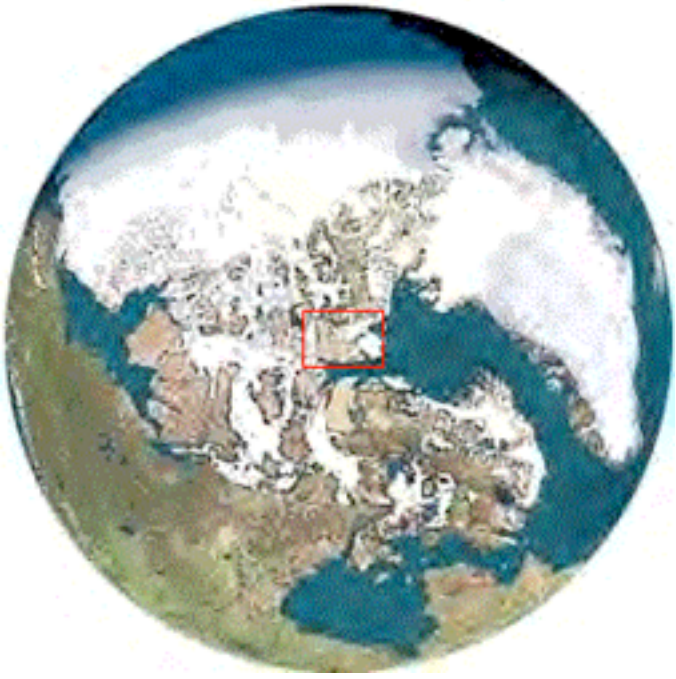
Uninhabited, this relatively untouched high arctic site is patrolled by Polar Bears & occasional Arctic Wolves

FMARS Crew member standing Guard.

Rifles are essential to scare the bears away



FMARS over the long, long winter
Actually here in Fall or Spring before 24 hour darkness overtakes the Island.



Devon Island in relation to Greenland, Hudsons Bay, and Northern Canada – as seen from above in space.

Panoramic views near the Station

First Hiking Maps Of Mars

www.sciencedaily.com/releases/2007/02/070212183559.htm

Scientists using data from the HRSC experiment onboard ESA's Mars Express spacecraft have produced the first "hiker's maps" of Mars. Giving detailed height contours and names of geological features in the Iani Chaos region, the maps could become a standard reference for future Martian research.

Inter-Planetary Internet to expand to Mars and beyond

http://www.itwire.com.au/content/view/9802/1066/

By Adam Turner - Excerpts

"Google Vice-president and father of the Internet, Vint Cerf, is overseeing efforts by NASA to build a permanent Internet link to Mars by 2008. ... **InterPlaNet** (**IPN**) will serve as a backbone for a future inter-planetary system of Internets"

This project is a collaboration between NASA and the Advanced Research Project Agency The InterPlaNet protocol iwill cope with delays of from 3 to 20 minutes each way caused by the vast shifting distances between Earth and Mars, each way. Mars ranges some 150 to 1100 times as far away from Earth as the Moon which is in Earth's backyard

The project will greatly increase the data upload and download rates between Earth and Mars surface rovers and orbiters, and, of course, set the stage for the human exploration of Mars. **</MMM>**

Golden Age Restores Edison's 1910 film "A Trip to Mars"

http://www.goldenage.com/

Golden Age Archives is making Thomas Edison's 1910 4-minute film, 'A Trip to Mars' available on DVD.

"I bought an original copy of the film on eBay last year," says Golden Archive's Robert Quesinberry. "It was in the early Edison Home Kinetoscope format. I scanned the whole thing (over 4000 frames) and reconstructed it using Adobe Premiere. It is taken from frames that are even smaller than 8mm -- the results are worthwhile. It is a terrific and very well done film, a fitting tribute as Americas first Science Fiction film. We are lucky that it is still in existence in any form."

"A Trip to Mars" (Catalog #M00780149) is available from The Golden Age Archives: (address above)

Crew Picked for Epic 4 Month Devon Island Mars Sim Stint

The Mars Society has announced the selection of 7 crew members and 2 alternates for the four-month Mars mission simulation that will be conducted at the Flashline Mars Arctic Research Station (FMARS) on Devon Island, **May 1 - August 31, 2007**.

The selected team is:

Melissa Battler - Commander, geologist, University of New Brunswick, Canadian
Matt Bamsey - Executive Officer, Canadian, engineer, University of Guelph, Canadian
James Harris - Chief Engineer, Austin Community College, US
Kim Binsted, Interdisciplinary scientist, University of Hawaii, US
Konstantinos Kormas - Chief Biologist, University of Thessaly, Greece
Kathryn Bywaters - Biologist, Miracosta College, US
Simon Auclair - Geologist, International Space University, Canadian

The Alternates are:

Ryan Kobrick, Engineer, University of Colorado, Canadian
Emily Colvin - (alternate), Engineer, Georgia Tech, US

Experience Needed

The 9 selected team members were chosen out of a pool of over 50 highly qualified applicants from all over the world. A requirement was previous service at either FMARS or the Mars Desert Research Station in Utah. Both Melissa Battler and Ryan Kubrick have commanded MDRS crews. We met both of them on February 26, 2006 as the Canadian team on Crew #44, headed by Melissa, turned over the Hab that Sunday morning to our Moon Society Crew, Crew #45. Both Melissa and Ryan have been back this winter to command MDRS crews; Melissa crews 55 & 58, Ryan crew 56.

A Science Team I

The crew will be backed up by Chris McKay of NASA Ames Research Center, and Penelope Boston and Shannon Rupert of New Mexico State University; a Mission Support group led by Robert Zubrin and Tony Muscatello of Pioneer Astronautics; and an Engineering team led by Paul Graham of Alpine Engineering Systems.

The Mission

For four months, the FMARS crew will attempt to conduct a sustained and highly productive program of field exploration in the polar desert of Canada's Devon Island, 900 miles from the North Pole, while operating under many of the same constraints that astronauts would face on Mars. During that time, they will engage in telescience collaboration with a Remote Science Team centered in the continental US. The mission will thus be an unprecedented full dress rehearsal for human planetary exploration. By conducting this extended mission simulation in such a way, the Mars Society hopes to gain advance knowledge that will be of great value in planning for human missions to the Red Planet.

Follow the Mission - You can follow the mission at:
http://www.marssociety.org/arctic/

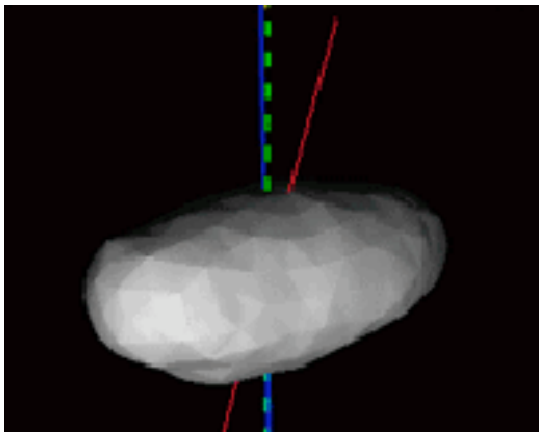
Area Weather: [Resolute, Cornwallis Island, Nunavut]
www.wunderground.com/global/stations/71924.html

Apophis Mission Design Challenge

from The Planetary Society - 09/01/2006

www.planetary.org/programs/projects/asteroid_alert/

www.planetary.org/programs/projects/apophis_competition/



watch apophis rotate at:
www.spacedaily.com/images/asteroid-99942-apophis-bg.gif
The close approach of the 400 meter astrochunk could put a wild twist on its rotation, making it that much harder to redirect its trajectory, should that become necessary.

A mountain of rock and iron is hurtling towards us from space. **Apophis**, a 300-meter diameter asteroid, is still millions of kilometers distant. But in 2029, it will make a spectacularly close passage by our planet. When it does, its orbit around the Sun will be affected.

A shift of just a few hundred kilometers, and Apophis could return in 2036 to slam into Earth, creating widespread devastation. What's really disturbing about this possibility of an impact with as much energy as 65,500 Hiroshima-sized atomic bombs, is that ***no one, anywhere, knows how to track this asteroid accurately enough*** right now to properly assess its danger to Earth 30 years from now.

We must confirm, one way or another, whether Apophis will pass through the "keyhole," the small area on its 2029 path that would cause it to hit Earth on its next orbit in 2036. If an impact is likely to occur, we're going to need all the time possible to plan and implement space missions to deflect it away from Earth.

You'd think the world's space agencies would quickly seize the chance that Apophis offers to find a solution to one of the biggest threats our planet faces, but you'd be mistaken.

That's why I'm writing you today. The Planetary Society, not content to wait for governments to come to the rescue, has come up with a plan to help advance our efforts to prepare for the inevitable -- whether it happens with Apophis in a few years, or another object a few decades from now.

Some of the world's leading space experts, like Apollo 9 astronaut Rusty Schweickart, recognize how urgent this matter is, and believe we need to act before it's too late. We have technology that could help save Earth from such an impact, and they're determined that we figure out how to use it.

"Tagging" potential impactors

The most accurate way to track and determine the orbit of a potentially dangerous asteroid is to send a space probe there and "tag" it. But that is something that, right now, no one knows exactly how to do. The Society will challenge the most innovative and brilliant minds on the planet today to design a space mission to visit Apophis and "tag" it for tracking

They might affix a lander there, or orbit the rock with some kind of beacon. Whatever they come up with, the best design will be selected as the winner of The Planetary Society's Apophis Mission Design Competition.

A mission like this would provide astronomers here on Earth with the highly precise telemetry they need to figure out exactly what will happen when Apophis passes Earth in 2029. More importantly, it would serve to jumpstart global planning for how to prevent an asteroid or comet impact.

To make this competition happen and bring out the very best ideas, we must raise **$100,000** right away to cover the prize money for the competition winners and the costs of a massive publicity campaign -- including raising public awareness about the dangers of asteroids and meteors, processing contest entries, getting the winning project noticed, and other expenses associated with such a global endeavor.

We're going to back this contest with **a $50,000 cash reward**, along with the alluring possibility that NASA or another space agency will actually transform the design into a real mission.

We can be the stimulus that turns long-range governmental planning into real, doable projects. And we can do it the way we always have: by leveraging our resources, knowledge, and reputation to make it happen. The next Near-Earth Object to threaten Earth might not be sighted until it's nearly on top of us. We may not have the luxury of time we have with Apophis.

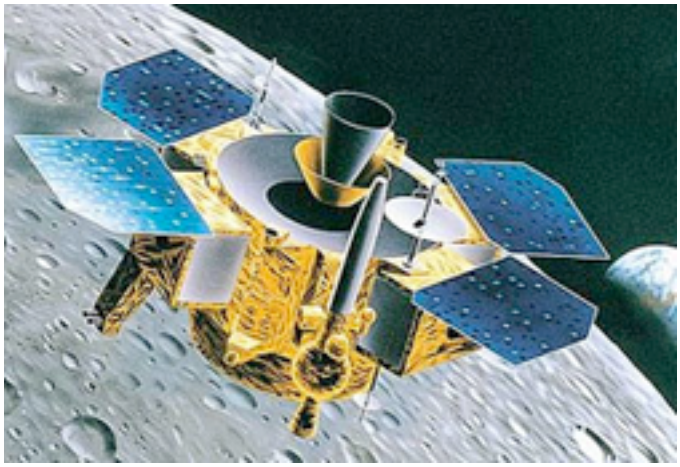
Help track this great threat to Earth. Donate online at: https://planetary.org/join/donate/apoph06/

Sincerely, *Louis D. Friedman* Executive Director

Japan's LUNAR-A Mission Gets Pink Slip

Dennis Normile

TOKYO--Japan's space agency terminated its LUNAR-A mission to explore the Moon's origin and evolution because its ambitious technology was still not ready to go even after delaying the launch for 12 years.



Full story at
www.sciencemag.org/cgi/content/full/315/5811/445a?etoc

Lunar Reclamation Society, Inc.

P.O. Box 2102
Milwaukee
WI 53201

www.lunar-reclamation.org

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

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

LRS News

• **MarsCon, March 2-4, Twin Cities:** Peter Kokh had been invited by MarsCon Science Room host, Ben Husset to be a Science Guest of Honor and prepared a talk about the Human Exploration "Triway" Into Space. But the trip to Minneapolis was cancelled because of continuing snow.

• **Astronomy Day, Saturday, April 21st**: We have looked at 3 upcoming outreach opportunities: Earthday March 21, Yuri's Night April 12, and Astronomy Day April 21 and decided that our best bet was the latter which offers two piggyback opportunities with the Wehr Astronomical Society and the Northern Cross Science Foundation. We are now looking at what we will exhibit, and possible presentations. Likely theme: "Astronomy from the Moon."

This year, a trial second Astronomy Day will be observed on September 15th. If our spring effort is sufficiently successful, we might go for an "encore!"

LRS Upcoming Events – March, April, May

Saturday, March 10th, 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. Peter will give a powerpoint presentation on the 3 main reasons for human expansion into space.

Saturday, April 14th, 1-4 pm

LRS Meeting, Mayfair Mall, Garden Suites Room G110
AGENDA: www. lunar-reclamation.org/page4.htm
Planning our Astronom Day event, one week to go.

Saturday, May 12th, 1-4 pm

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

MMM 7 NSS Chapters Strong

NSS Chapter Events

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

Oregon L5 Society

P.O. Box 86, Oregon City, OR 97045
voice mail / (503) 655-6189 -- FAX (503)-251-9901
[http://www.OregonL5.org/]

Allen G. Taylor <allen.taylor@ieee.org>
Bryce Walden <moonbase@comcast.net>
(LBRT – Oregon Moonbase) moonbase@comcast.net

Meetings 3rd Sat. each month at 2 p.m.
Bourne Plaza, 1441 SE 122nd, Portland, downstairs
March 17 – April 21 – May 19

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

Pix of Ben, Becky, and Scott's visit to Milwaukee for LRS & MMM 20th Anniversary, December 9, 2006
http://www.freemars.org/mnfan/LRS-MMM//
Congrats to Peter et LRS crew on 20 great years

Pix of NASA@Mall of America – Jan 26-28, 2007
http://freemars.org/mnfan/MOA-USGOV/2007/

Pix of February 10th screening of "Astronaut Farmer"
http://freemars.org/mnfan/MNSFS/2007-02-Astro-Farmer/
Thanks to Seth & Star for staffing

WISCONSIN

Sheboygan Space Society

728 Center St., Kiel WI 54042-1034

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

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

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

March 15th: UW-Sheboygan, Room 6101, **Sheboygan**
April 19th The Stoelting House, **Kiel**
May 17th: UW-Sheboygan, Room 6101, **Sheboygan**

PENNSYLVANIA

Philadelphia Area Space Alliance

PO Box 1715, Philadelphia, PA 19105

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

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

[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: March 17 - April 21 - May 19

February 17 Meeting Notes: We had an interesting meeting with Gary Fisher bringing news from various sources and ideas. He told us of the next (tenth annual) Mars Society Convention, August 30 - September 2 at UCLA in Los Angeles. Gary mentioned the next crew for the Flashline Mars Arctic Research Station "Extended Stay Crew" will be leaving for Devon Island soon. One of the requirements of this crew, and others later on, will be water needs while local streams are still frozen. Gary, and a Dr. Alred, are working on a solar powered melter system to use local snow as a source.

This brought up a lively discussion on the problem and the follow on talk about a new Mars Foundation initiative on Biospherics. A former Biosphere 2 rescue consultant will be director of this new project. Over the decades, we have looked at what will be needed for living in an enclosed environment, first as the "back to the land" movement in the '70s, up through various attempts at minimal impact living on Earth, to our people looking at what we will need beyond Earth.

Gary also brought several interesting publications to the meeting including two issues of the *Journal of the British Interplanetary Society* from January and February, 2007. There was a reprise of work on Rail Guns/Mass Drivers in one, and a SETI article in one of them as well. He brought *Aerospace America* from AIAA and, of interest to you "Lunans" in the readership, an announcement on a Lunar settlement conference at Rutgers University from June 3 to 8 (a weekday event). See lunarbase.rutgers.edu And much more! It was a delight to have Gary bring this wealth of material and his insights to the meeting.

Dorothy pointed out her annual report in *Dotty's Dimensions:* "The State I'm In" where she publishes her thoughts on various topics and events. Google and check subscription info. She also brought up a range of material from various sites including the listing of events that the Smithsonian Institution and its' various branches have. Most are weekday daytime events but one on Exploring the Surface of Titan will be held at 8 pm in the "Lockheed Martin IMAX Theater" on Tuesday, April 17. The speaker will be Elizabeth P. Turtle. And last and not least a film on women working on the International Space Station called "We Can Do It" , noon, March 7.

Larry, our webmaster, discussed the PASA blog site and how to participate on it Janice is planning to post on her research on ***Apophis*** to our blog and needed to talk about the how while Larry used the talk as an opportunity to explain again about this and additionally about the calendar we can use:
http://my.calendar.net/pasa_nss_phila .

Our website had a number of hits, which is great, and Larry also brought up another area of interest from **NOAA** data he was perusing: the variation in the annual sunspot numbers. We need more interesting material for our site(s)! more below.

Janice brought more material on the close approaches of the Asteroid *Apophis* and some of the data on it: 820 feet long, 25 million tons and moving at 28,000 miles an hour approaching within 22,000 miles, or less, of Earth. Her source is *Popular Mechanics* and a report by David Noland. She is also looking into other sources on this important topic. We had quite a bit of talk on what to do about this object including the conventional, "blow it up", "push it out of the way", and the more exciting possibility of reshaping its orbit to be another "Moon" or dropping it onto our Moon. It would be spectacular (and wasteful) to do this, but really an eye opener for the "It can't happen here" crowd.

Mitch brought word of his ongoing contact with the Engineering and Physics Departments at the Univ. of Pennsylvania. This will be for a Power Point presentation "The Case for Mars Settlement" that we could do.

Mitch also brought a news article on how Israel's claim to own 10% of the Moon! No, this is not because of a secret space program with landing and the planting of

survey markers as in Earth real estate claims, but is the result of sales to people that think you can buy something just because someone says you can. An entrepreneur (in *this* case, French for "crook" or "conman") claims that a UN Charter loophole allows this sort of purchase. Someone standing on the surface, or an agent of a legally empowered representative of a claimant, *could* stake claims , I think, but how that would be worked out I don't currently know. Since nobody is actually on the Moon, now or for the next decade as private individuals, making claims on paper is just a clever way to separate people from money in my opinion. You should see the article in *The World Jewish Digest* for February 2007.

Earl brought a copy of *Nuts and Volts* for February with a few brief pieces from the Technology report These include a short article on Ice Penetrating Radar that goes through a mile and more of ice that can map the Arctic and the Antarctic now, and gives us experience for our eventual Europa/Icy Moons examinations. There is also a Solar Cell piece about very high efficiency (40%) cells that can be produced now for space projects and other high performance needs. I reported on high efficiency cells in the late 1990s, but at that time the report was on single cells being produced as examples of what could be produced by extensive effort. Now quantities of cells with these numbers can be produced. Tied with the lasers from another publication (conversion efficiencies of 80%) a power beaming satellite and receiver could be done with scaling.

I should point out that these are "Concentrator Cells" with hundreds of suns of light on them. This would be great in space but might require a diffuse light concentrator on Earth. I would like to suggest that the diffuse light concentrator could be used on the Space Elevator lifters currently being developed for NASA's' competition. I first ran across these in the *Physics Today* magazine describing Dr O'Neill's' work with his Princeton students in 1972.

Note: March is annual renewal time, so join up now! Also: I will send pictures from our Carver Science Fair winners for posting to our webmaster, and to Peter Kokh for Moon Miners, and to NSS.

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

Miki Baker
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MikiBis@gmail.com

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Bill Hensley
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bil_h51@yahoo.com

Harold Schenk
Sheboygan, WI
schenk@excel.net

"

Helium-3? *If you get a small amount of that material, an ounce, it's enough to power our five biggest cities for five years!"*

– NASA engineer Donner Grigsby,

CALIFORNIA

OASIS

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.
• March 17 – April 21 – May 19

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

Upcoming Events

- **Sat March 17 th, 3:00 pm –** Meeting, at the home of Bob and Paula Gounley, 1738 La Paz Road, Altadena
- **Thurs/Friday March 22/23, 7 pm** – "The Dream Mission to the Asteroid Belt" by Dr. Marc Raymann, Proj. Systems Engineer, Dawn Mission (Vesta, Ceres)
- **Friday March 23, 10 am** – Beckman Auditorium, Caltech Film: "The Astronomer's Dream.: $5/person. For grades 5-12. One hour schoold day performance. Call Mary Herrera 626-395-6059 mhh@caltech.edu.
- **Saturday March 24 Griffith Observatory Tour and Star Party** – Get together with other OASIS members at the newly refurbished Griffith Observatory! The group will meet on Saturday, March 24, 2007 at 3:00 p.m. Meet at the Observatory Satellite Parking Lot at 5333 Zoo Drive, just south of the Los Angeles Zoo and the Autry Museum. *Reservations are **required***. Members *must* arrange for their own transporation. We recommend that participants book the **3:20 p.m.** shuttle. Reservations may be made on the Griffith Observatory website, www.GriffithObservatory.org (Click on the "Visitor Access" bus graphic), or call 1-888-695-0888. (Sponsor Los Angeles Astron'l Soc.)
- **Through April 29 10 am-5 pm** – "Exhibition Star Wars: Where Science meets Imagination." California Science Center, 700 State Dr., Los Angeles

Recuring Events

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

Looking Ahead

- **May 19-20, JPL Open House** -- The Jet Propulsion Laboratory will host its next Open House on Saturday and Sunday, May 19th and 20th, 2007 from 9am to 5pm both days. http://www.jpl.nasa.gov/pso/oh.cfm.

NAME _____

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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

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

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

CHICAGO SPACE FRONTIER L5
○ $15 annual dues

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

MINNESOTA SPACE FRONTIER SOCIETY
○ $25 Regular Dues

OREGON L5 SOCIETY
○ $25 for all members

O.A.S.I.S. L5 (Los Angeles)
○ $28 regular dues with MMM, as of 3/01/07

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
Lunar Reclamation Society Inc.
PO Box 2102, Milwaukee WI 53201-2102

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