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

Moon Miners' Manifesto

& The Moon Society Journal

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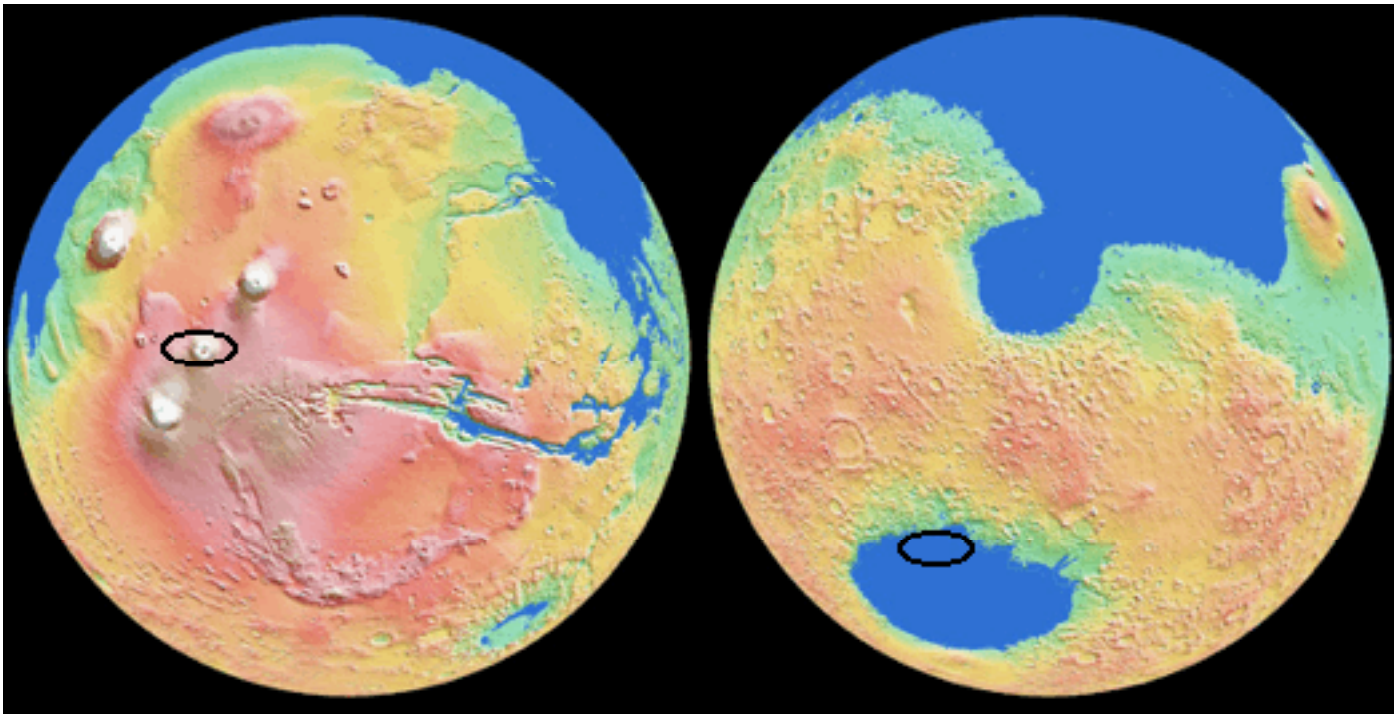


Evidence that Mars' Northern Depression once hosted an Ocean is now overwhelming

L: Pavonis Mons; **R**: Northern Hellas basin;
The two most strategic areas on Mars - see pp. 3-5

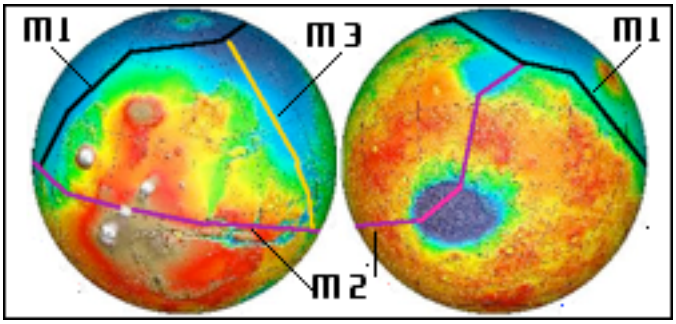
Feature Articles in This Issue

The Beginnings of a Global Mars Road Network

At right is a suggestion to jumpstart a global presence on Mars. Route M1 circles the northern hemisphere of Mars wholly within the northern (oceanic) basin. M2 connects that route with Pavonis Mons and the Hellas basin (two very strategic points: see pages 4-5. M3 connects the northern route with the mid-point of the southern route. Undoubtedly, there will be many more branches built as human presence grows and spreads.

IN FOCUS ◎ The Choice has been between "Moon Flags & Footprints 2" and "Mars Flags & Footprints 1"

Those who, in good faith. would settler for either F&F scenario, work to undermine our common dream, expansion of the human frontier beyond Earth orbit. Space supporters too concerned about the "giggle factor" to openly advocate establishment of real human frontiers on the Moon and Mars, do us all a disfavor. What it takes to mount human exploration missions on either world with minimal bases, is not at all what it takes to lay foundations for truly open frontiers. [=> p. 2, col. 2 3



Moon Miners' Manifesto

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• **Moon Miners' Manifesto CLASSICS:** The non-time-sensitive articles and editorials of MMM's first twenty years have been re-edited, reillustrated, and republished in 20 PDF format volumes, for free downloading from either of two locations:
www.Lunar-Reclamation.org/mmm_classics/
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• **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.
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National Space Society, 1155 15th Street NW, Suite 500, Washington, DC 20005; Ph: (202) 429-1600 - www.NSS.org
• **The Moon Society** seeks to overcome the business, financial, and technological challenges to the establishment of a permanent, self-sustaining human presence on the Moon." - Contact info p. 9.
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⇒ In Focus Editorial continued from p. 1.

That is, human exploration does not logically lead into human settlement. Not only is the list of pre-requisite technologies very different, but the public "sell" is also quite different. Of the three principal "vectors" of human expansion into space,

(a) Planetary defense from would-be killer asteroids
(b) Using lunar resources to help heal Earth's environmental wounds with virtually limitless clean energy, and
(c) Creating a second home world on Mars should the first two efforts fail,

Only the asteroid defense people seem willing to put their cards on the table.

To be fair, there are those of us lunar enthusiasts who do spread the message about how tapping lunar resources can help us better handle many of Earth's most intractable problems, but we are the minority, and the message that the public gets is that we just want to go to the Moon to satisfy various boring geological curiosities. And, we all see where this tactic gets us: a groundswell of opposition united under the banner of "been there, done that."

Yes, there is a giggle factor to using lunar resources. And we can remove that only by doing the right kind of research. Some of that research will need major investment by governments, but not all. We need to be brainstorming ways to demonstrate the feasibility of key technologies, especially those with terrestrial applications that could be rather profitable. There is nothing so convincing as concrete demonstration!

For Mars, the situation is worse. Even those who are for establishment of a human frontier on Mars seem to be afraid to talk about it, and push only for more digestible exploration missions. The problem is that such missions are most unlikely to choose locations best for settlement or to develop the technologies that will be needed to stay indefinitely on Mars as opposed to locations picked to satisfy scientific curiosities. After the worldwide excitement of our first landing, the boredom index will begin rising swiftly among a new generation of "been there, done that" chanters. And soon another hiatus will follow, perhaps as long as that which has followed Apollo 17, maybe even longer.

If we are going to do this (Mars, and the Moon), we need to do it right, or once again, all this expensive effort will be for naught. Geology and exo-biology bores the public. Settlement based on prior demonstrated technologies will captivate the world.

We must sell settlement, and be clear about the reasons for doing so. Selling exploration is not good enough and hardly prepares the way. The difference is that between a blind date and a marriage.

The problem is that we swell our numbers in order to look like a stronger movement, with those who do not share our goals or passion. That is a suicidal strategy that has been tested and failed over and over again throughout history. Will we learn this lesson before it is too late? **PK**

***Moonbeams* 2.4 pp 42-54 "Welcome to My World"**
"Best Mars short story I've read in many years," PK

Free Download (issue #5) from
www.moonsociety.org/publications/fiction/

The Pen*dul*um of "Mars"

From **"Once Earthlike but *Dying* World"**
to **"Dead World from the Start"**
and now back to
"Once Earthlike, and *still living* World"

A Remarkable Journey!

By Peter Kokh

Saturn's rings notwithstanding, and no matter that Venus is Earth's twin in size; reddish Mars has always been the planet with which we have been most fascinated – *by far.* Those readers who became aware of Mars after Mariner 4's flyby visit in 1965, which by misfortune, happened to be over the heavily cratered southern hemisphere, have always seen Mars as a dead, almost moonlike world.

But those of us born in the 1930's and 40's grew up with a vision imprinted on us by Percival Lowell, of a dying planet laced with canals, evidence of intelligent civilization that sent spring melt water from the polar caps to the temperate and tropical regions of the planet. That the canals were still working, whether their builders still survived or not, was clear from the season changes in shading, some areas getting darker every Martian Spring, a sign, no doubt of vegetation springing back to life. We knew of course, that Mars air was thin, maybe 10% of the atmospheric pressure we enjoyed on Earth.

Speculative writers differed on whether we would find the Martians still alive, just barely hanging on, in a brave old world, or whether we would find only ruins of a now long dead heroic civilization. If we found writings, we hoped to find a "Rosetta stone" of sorts so that we could glean from them their accumulated science, and wisdom. Maybe there would be some surviving wildlife.

Mariner 4's view of a surface as crater-pocked as the Moon's southern highlands, erased that dream picture in one quick second. But the romantic view above had already been under attack. Modern telescopes could not detect the canals of Schiaparelli and Lowell, and in 1961, Carl Sagan had come up with the correct and non biological explanation of the seasonal shading changes: the seasonal trade winds on Mars blew darker soil over lighter areas, which were later blown clean again.

Worse, we soon found out that Mars atmosphere was far thinner than anyone had expected, only 10% of the 10% we had expected, that is, only 1% of Earth-normal. The surface was exposed to radiation and raw, untempered solar ultraviolet. Mars was a harsh, life-squelching world. It might never have been "alive."

But then observers found what looked like beaches in the great northern depression called Vasitas Borealis – the Northern lowlands. For the past thirty years the debate has raged. Did Mars once have an ocean?

The brave and romantic among us were shakingly confidant that it did. Others could see no evidence. As you may know, none of us are perfectly objective. Our temperaments influence us one way or the other. There are those with a "need" to "know" that we are alone in the universe and prejudge all evidence accordingly. The there are those of us who wax eternally optimistic, buoyed by the dictum "nature never does anything once." Our temperaments determine what we thing of as evidence.

Suddenly, the impasse has been broken. We now have overwhelming evidence that the valley networks to the south of the northern depression are twice as extensive as thought and that their dendritic features could only have been produced by regular seasonal rains over millions of years. We are now suddenly confidant that, yes, Mars did have an Ocean! There is still room for debate on how deep that ocean was, that is, how far up the slopes of the great northern depression the waters reached. In time, we will find the maximum shoreline elevation. Regardless, we now know that Mars once had a considerable ocean-scale amount of water.

Where all that water went is the question. Some of it must have sublimated, as the air got steadily thinner. But it is impossible to believe that there were not suterranean aquifers that must still exist, however frozen. And it is likely that at that point drilling down where Mars internal heat begins to be felt, there may be some appreciable volume (in toto) of liquid water.

The water must have subsisted on the surface long enough during a period when Mars enjoyed warmer temperatures, to have favored the rise of living organisms from the amino acids that it now seems clear have been spread by interstellar gas and dust clouds everywhere in the universe. Life is not unique. It is natural, and must arise everywhere that it is given a chance, however fleeting.

The discovery of persistent methane in Mars' thin atmosphere suggests that microbes or bacteria native to Mars still survive. The "conservative" (temperament, remember!) view that this methane must be of geological origin flies in the face of the evidence that Mars has been geologically dead for some eons now. Pursuing the arguments further, it is the suggested abiological/geological mechanisms that are not holding up.

Finally, the evidence from Mars meteorites (it is their trapped gas species and ratios that tell us their origin) that what looks like fossilized life must be just that, is clearly routing all the abiological explanations offered. NASA has indicated that it will soon announce convincing evidence that Mars once had primitive pre-cellular life, and very well still may have.

In the past 45 years, we have come full circle, almost. Mars was wet and alive in its youth, and maybe through human intervention, can be restored to something of its former self. I personally do not like the word "terraforming." First, our whole experience is in DE-terraforming our own world. Second, to be true to Mars, we should be talking about "rejuvenating Mars," bringing it back to what it once was, and then meeting it halfway, adapting *to that Mars*, not to a recreated Earth. I call this rejuvenaissance, or *rejuvenation* if you will. I fear that we will try quick schemes to raise atmospheric pressure and temperatures that will box us into dead ends. The best results may come slowly.

Still not back with us are the mythical ancient Martians. There will be Martians someday. But they will be our descendants, not beings restored from trace DNA of former inhabitants that never existed. Plain put, Mars did not enjoy its Spring and Summer long enough to have evolved any type of advanced life.

All the same, it is good to be back believing that we have a human-welcoming sister world in our own Solar System, back believing that Humankind will someday thrive on another world, that all our eggs will no longer be in one basket. Meanwhile, here is a toast to the overoptimistic visionaries that once stirred our romance with Mars! – *vive les Martiens!* We will be them. **PK**

Mars: *Exploring* Now, *to Settle* Later

By Peter Kokh

Robotic Exploration Goals: Guiding Principle

"Learning whatever we can now with robotic probes, so that when we are ready to send first crews to Mars, we will be able to send them to the most promising sites for starting (a) viable self-reliant settlement(s)."

- Good sites are not good enough. We need enough information to pick the best. *Optimization of our chances of success in establishing a second egg basket for humanity is at stake.*
- At present, there is no guiding principle for choosing instruments to go on Mars orbiters or landers. Prospective Principal Investigators make proposals, and a team of scientists, not settlement experts or designers, pick on the basis of weight, cost, and design readiness. We end up with good missions, *but not good enough to get the job done.*
- The Mars Society has not lobbied for needed instruments. *But it is in the Moon Society's interests, to make sure that the Mars Settlement(s) is (are) a helpful trading partner for the Moon Settlements, to take up this cause.*
- In short, the Moon Society owes it to our own goals and interests to pickup where the Mars Society has failed to take the initiative.

What kind of probes do we need to learn what we need to know in order to pick best sites?

1) **We need more complete mineralogical mapping of all elements** needed for settlement supporting industry
2) **We need ground-truth core samplers** in sediment areas of the presumptive boreal ocean bed, and of river systems to the south
3) **We need ground-truth core samplers** of suspected permafrost areas in order to design adequate water recovery systems
4) **We need superior altimetry data** of 10-meter vertical resolution to plan for future drainage systems and for road and railroad routing

Finding the best places to begin Settlement

There are many things to consider:

- √ **water access:** is there handy subsurface ice or permafrost that can be tapped?
- √ **Coastal areas:** areas near both ancient river tributary systems (exposed sedimentary layers: material of varying mineral composition) and the northern (presumably oceanic) basin whose mineralogy may be different and somewhat complementary
- √ **Proximity to Pavonis Mons:** This shield volcano massif is known to be ridden with lavatubes and sits astride Mars" equator. *More on these assets below*
- √ **Proximity to the deepest basin, Hellas:** once remedial climate change ("terraforming" or "rejuvenescence" of Mars, i.e. to an earlier friendlier state) has begun, this basin will always have the highest air pressure.
- √ **Low equatorial areas (best climate)** Note that Mars northern hemisphere has shorter winters and longer summers than the southern hemisphere

Exploiting the Assets of Phobos & Deimos

Semi-officially, the Mars Society position would seem to be that Phobos and Deimos are irrelevant. The fear here is that a first manned mission might be to one of these mini-moons, delaying a manned exploration mission to Mars. But we do not need a Manned Exploration Mission! We should do all the exploration needed to determine a shortlist of settlement sites with orbiters and surface probes, so that the first manned mission to Mars will be "a Mission to Stay." Anything short of that runs an extremely high risk of being a one-time "Flags & Footprints" ("Kilroy was here") symbolic mission to be followed by more decades of nothing. We don't need another Apollo type dead-end repeat. Impatience always fails! Of course, the impatient never get that.

Phobos can help in two major ways:

1) **A forward base for the teleoperation in sub-second delay real time** of a whole fleet of ground truth rovers and core samplers, including lava tube explorers and polar cap miners. If we were controlling Spirit and Opportunity from Phobos instead of from Pasadena, the amount of productive exploration could be magnified a hundredfold or more. They go so slow because with a 6-40 minute time delay, we cannot afford to let them get too far ahead of us!
2) **If Russia's Phobos-Grunt mission should determine that Phobos is a carbonaceous chondrite,** rich in volatiles such as hydrogen, carbon, and nitrogen, an automated industrial operation to produce liquid methane and ammonia for export to the volatile-thirsty Moon could be a major source of income to any Martian settlement with which to pay for dearly needed imports. Given the lack of any other "identified" economic exports from Mars itself, this is not something to be dismissed.

Short-term goals of geological and exo-biological exploration are immaterial.

If this seems a brash statement, consider how much we would know about North American Flora and Fauna, about the continent's geology, its geological and paleontological past if only one or two "scientific expeditions had been sent (even with today's instruments and expertise) in comparison to how much we now know about the continent because continuous settlement has supported far more widespread, continuing, and in-depth scientific exploration of all kinds. Obviously, ***those scientists who dismiss settlement and want one or two scientific expeditions are willing to sell out the possibility of ultimate in depth exploration in order to get quick Nobel Peace Prize results now.***

Settlement of Mars is *the only way to support ongoing and thorough scientific research* on Mars of any and all types. Here as everywhere, impatience always backfires. The corollary is that settlement sites must be assessed not on the grounds of potential scientific yield but on the grounds of access to a complete suite of materials needed to support settlement should financial backing from Earth dwindle or disappear.

Those with scientific curiosity will arise in every settlement, just as on Earth, and eventually will explore every bit of Mars, and far more thoroughly. It is important to go to Mars for the right reason: to create another basket for humanity's eggs. Exploration will follow.

Long term, two sites on Mars stand out

1) Pavonis Mons:

"Peacock Mountain" astride Mars' equator, is an. enormous shield volcano, second to Olympus further to the NW. Its gentle western slopes offer **the ideal site for a launch track to orbit and beyond**. In Mars thin atmosphere, the track may be able to launch directly into orbit, with a minimal course adjustment motor.

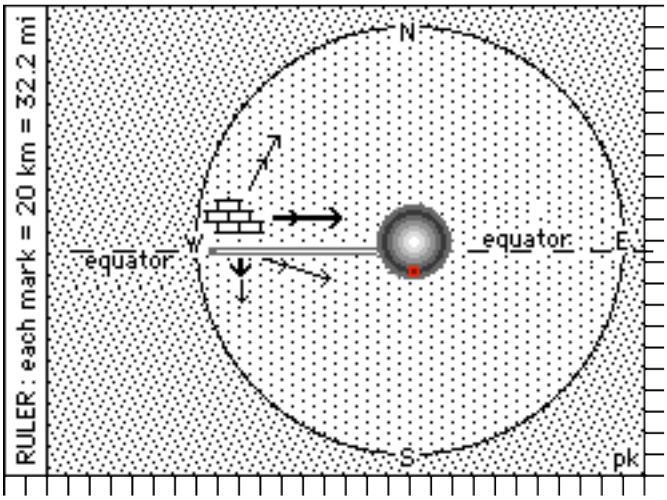
More, the crater rim itself is the best/only place on Mars to **anchor a space elevator** to Mars-synchronous orbit: a far, far superior site to anything similar on Earth, and requiring a much less massive cable.

Judging on the basis of the similar but much smaller northern California shield volcano of Medicine Lake, Bryce Walden, of Oregon L5, per our request [1994], deduced that Pavonis Mons

"has a volume 700-1000 times larger than Medicine Lake. (Pavonis is 7 times the diameter of Medicine Lake, covering 50 times the area and is perhaps 15-20 times taller). Taking the smaller figure and extending the same argument, we might expect 10 billion cubic meters involving wider, higher, longer caves spaced further apart. If we postulate an average Martian tube interior ceiling height of 30 meters, that gives us a floor space of about 150 million square meters = 333 sq. km2 = 128 sq. mi., the size of an American central city in the 1,000,000 population range - in a host mountain with a footprint of 40-45,000 square miles, bigger than Iceland and comparable to the size of states like Ohio, Tennessee, Virginia, Mississippi, Louisiana, or New York."

Pavonis Mons is midway between the coast of the long-dry northern basin ocean to the WNW and the Valles Marineris canyonlands system to the ESE.

The western flank of Pavonis Mons would be our suggestion for the first major settlement on Mars, very possibly in a lavatube, with ample room for expansion into major urban complex. Pavonis Mons is arguably the most valuable piece of real estate in the system, by far, and Mars' single most priceless asset.



Plan of the Pavonis Mons Metroplex Area: The lavatube-riddled shield volcano slopes cover an area about 250 mi. in diameter. The corridor for the launch track up the west face of this equator-straddling mountain is shown, along with the site for a Pavonis Space Elevator Base on caldera rim. The brick-pattern area indicates the suggested site for the first settlement with arrows showing logical directions of early metropolis expansion. Eventu-ally, the entire base of the mountain could be occupied, attaining a population of up to a million citizens or more.

MMM Sources:

MMM Classic #2 pp. 37- 38 "Pavonis Mons: Possibly the most strategic mountain in the Solar System"

MMM Classic #8 pp. 11-13 "Pavonis Mons/Peacock Metroplex:" The site for Mars Main Settlement

Both issues freely downloadable from:
www.moonsociety.org/publications/mmm_classics/

2) The Hellas Basin:

Halfway around Mars in either direction from Pavonis Mons, and between 30-50° South of the equator, this major impact basin sits more than 8 km (more than 5 miles) below Martian mean ("sea") level. Mars' highest atmospheric pressure is now, and will always be, in this basin. ***Hellas will be the site on Mars where conditions will first allow Mars-hardened hybrid plants to survive out in the open.*** *Hellas will always be the front line of any effort to improve Mars climate* (e.g. by permanently melting polar ice cap carbon dioxide ice. In other words, once deliberate climate improvement projects begin, ***Hellas north "shore' will be the place to be.***

Hellas does have some drawbacks. As a basin it is landlocked, and thus any Hellas Sea will very slowly become salty, but over hundreds of millions of years. It will be subject to longer winters and shorter summers than equivalent latitudes north of Mars' equator. In sum, for the near term, Pavonis Mons is the place to start. In centuries to come, Hellas will grow in importance.

Another ancillary location: the edge of the north polar ice cap 50° west of the latitude of Pavonis Mons.

If there is no adequate permafrost or other subterranean aquifer handier to the Pavonis Mons site, an enclosed, pressurized, and insulated aqueduct could transport polar melt water towards the equator. There would need to be pumping stations along the entire route. Once the aqueduct reached the tropics, it would have to climb up the Tharsis ridge to Pavonis Mons. This would be no easy feat, and the energy to pump water all this distance, and then uphill, would be daunting. Sites still within the northern Boreal basin would have the advantage. We picked a point 50° west of Pavonis Mons for the easiest route south to the equator.

Liquid Subterranean aquifers?

We suspect that there may be a level below the surface where Mars residual internal heat is sufficient to keep subterranean aquifers in a liquid state. We would have to find such aquifers. Their depth below the surface may be intimidating to engineers. The best place to look for residual heat may be below the Tharsis ridge itself on which Pavonis, Arsia, and Ascraeus Montes all sit. If an aquifer is found, it could be a source not only of water, but also of residual geothermal energy for a metroplex. However, the expectation is that Mars" core has been cold for some time. Yet "cold" is a relative term. The much smaller core of the Moon may still be hot.

Summing up

We must prioritize science missions that will tell us where the clusters of needed elements needed to support settlement can be found. All other science goals are postponable. *Exploration can wait for settlement.* **PK**

Mars Analog Research Stations

Settlement-related research should have priority over geological and exo-biological research.

By Peter Kokh, member MDRS Crew #34 Season 4;
Commander of MDRS Crew #45 Season 5

It has been a very special honor to have served on two Mars Desert Research Station crews and to have become a member of the very unique and privileged fraternity of those who have also been so fortunate. Both of these experiences will always be especially treasured for the rest of my days.

This participation would never have occurred were it not for connections made by my long-time friend, Ben Huset of the Twin Cities, who back in August 15, 1986 came to Milwaukee with others, in concert with a team from Chicago, to help launch what became the (Milwaukee) Lunar Reclamation Society.

I went to Hanksville, Utah in early 2005 to learn about the Mars Society operation and to prepare for a 2-week rental of this facility in the following year by the Moon Society. One goal was to identify any logical differences between a Mars Analog research program and a Lunar one. It was clear, that the Mars Society was trying to prove the value of human-robotic exploration of Mars, something the Apollo program had long since proved invaluable on the Moon. The Moon Society, if it had the opportunity, would concentrate on technologies and methodologies of expanding an initial outpost in the direction of settlement.

But while that difference seemed logical to me for some time, I now think that the Mars Society has been on the wrong track. Demonstrating the value of human explorers does not demonstrate either the importance or the value of human settlement, through which far more exploration would be done long-term. We now think that the program being designed for our proposed lunar analog research station would be a much better fit for Mars analog stations as well.

It has bothered me from my first visit that the Mars Society has not tried to expand beyond the original Hab and largely symbolic (ineffective) GreenHab. There is an observatory, but that does not expand the living space! In fact, at both the Arctic and Desert sites, the only expansion was made by the Moon Society on our time and dime: the framework of a "pretend pressurized" tunnel from the Hab to GreenHab that would allow crew members to pass from one to another without a "space suit" and preserving the useful pretense of being "in sim." But if you haven't been there, you wouldn't understand.

The sad thing is that the Hab has two airlocks which makes expansion out of one of them a real structural possibility. A ground-hugging "ranch" style one floor annex, perhaps to replace the crew quarters, could easily be shielded with sandbags for warmth in winter and for cooler temperatures in summer, making year-around operations feasible. And that would in turn make a real crop-growing greenhouse operation doable.

The two-story hab is a big mistake, both for Utah and for Mars. Two self-contained floors could ride the way to Mars on top of one another, then be connected side by side for better thermal management, and for safety. The ladder between floors is a major cause of accidents. The unshieldability of a tall vertical structure has exacted its price: a short field season.

Expansion of an original structure into a modular settlement should be a major vector of any Mars (or lunar) analog research program aimed at demonstrating the feasibility of settlement. This option has been totally ignored. *The effect is to reinforce the belief that the only reason to send people to Mars is to explore.* Yes, people and robots make a better team than people-only or robots-only. But strategically, it is far more important to the Mars Society's mission and goals to prove that settlement of Mars is possible, and that far more research by human-robot teams will be accomplished if settlement is the primary and fundamental goal, not something to keep hidden because of "the giggle factor."

No one wants settlement of the Martian Frontier more than Robert Zubrin. Yet no one stands more in the way of that happening than his strategic misdecision to support exploration alone first. On this point, the Moon Society is a stronger supporter of the opening of the Maritan Frontier as an essential trading partner for the Lunar Frontier in an interdependence, which will enhance the viability of both.

If the Moon/Mars Atacama Station in Chile becomes a reality, modeling modular expansion and modular biospheric systems will be a core vector of the program. The shift of the drive to settle Mars will be to this site in Chile.

Can MDRS be redirected? Absolutely. Rebuild the Hab with the two floors separated and then placed side by side with new modules being added at ground level, and insulated by sandbags or mulch bags in lieu of regolith. With a thermally moderate year-around season now possible, experiments with modular biospherics can begin so that as the physical complex keeps growing, its contained biosphere can grow apace.

While field research in geology and exobiology can continue, experiments with simulated lunar- and Mars-producible building materials should be a major focus. To better stretch expensive manpower on both worlds, experiments in pushing the limits of teleoperation should be a major focus as well.

Currently, by gambling everything on an Apollo-like one-time exploration mission to Mars, we risk selling out our dreams to those who do not share them. Yet we can't change or alter the MDRS/FMARS Research program and goals. You can lead a horse to water, but you can't make it drink. We can help by doing research at lunar analog facilities (and in Chile) that help promote settlement of both worlds.

The direction of the Mars Society is its own worst enemy. If any other MDRS/FMARS alumni/veterans would like to join us in developing a superior Mars Analog Research Program, please write kokhmmm@aol.com and tell us about your own experiences, interests, abilities, etc. If it is true, as we have long expected, that the Lunar and Mars Frontiers will either thrive together or both fail separately, an effort to salvage the Mars Society's analog program can only help support our own analog program.

Not all Moon Society members feel this way, and the Society is anything but a top-down dictatorship. But petty "either us or you" rivalry is self-defeating. We all owe it to ourselves to get out of the Moon or Mars mentality and into the Moon *and* Mars frame of mind. Start by reading this document:
www.moonsociety.org/reports/mars_conv2004/Moon_Mars_Similar.pdf

Beyond Moon & Mars! *On to the Stars!* **<PK>**

Mars Settlement-Preparation Research Outside of Analog Station Environments

By Peter Kokh

Some twenty years ago, Robert Zubrin revolutionized Manned Mars Mission scenarios by demonstrating that we could produce the fuel needed for the trip back to Earth from Mars' Atmosphere. This could reduce the total mass of the ship(s) setting out from Earth by as much as 90%. NASA eventually bought into a modified version of Zubrin's "Mars Direct" plan. See MMM #30, November 1989, "NIMF: **N**uclear rocket using **I**ndigenous **M**artian **F**uel: An Enabling Technology for Manned Mars Missions with Global Access in a Single Launch" by Robert M. Zubrin. Republished in MMM Classic #3 pp. 52-55
Available as a free pdf file download from:
www.moonsociety.org/publications/mmm_classics/

This was a historic and brilliant step forward, and he proceeded to build a working model of his adiabatic reactor, since duplicated by others. Unfortunately, in failing to pursue this research further, he/**we** have dropped the ball.

1. What besides Methane can we make from Mars Atmosphere?

Other fuels? Useful chemicals? Plastics? Shielding? Feedstocks for a basic aero-chemicals industry?

If our goal goes beyond manned exploratory sorties to real settlement, we ought to have been asking that question, and finding answers over the twenty years since! Mars' atmosphere is 97% Carbon Dioxide, 3% Nitrogen, some water vapor, and with a sampling of other elements such as argon and other noble gasses. Methane CH4 is certainly useful. But so are its "upgrades" Ethane C2H6 and **Propane** C3H8, a liquid fuel.

Ethylene, C2H2 is the most produced organic chemical in the world. And its polymer, **polyethylene** is the most abundant plastic. Low density and high-density polyethylene resins (**LDPE** and **HDPE**) are extremely versatile and fully recyclable manufacturing materials, whose diverse products most of us use on a daily basis.

Polyethylene has also been shown to be a superior thermal and radiation barrier. On Mars, it might be more difficult to loosen up pulverized powdered regolith soil to use as shielding than on the Moon. Mars' regolith may be more densely compacted because if the planet's 2.25 times greater gravity. Use of an atmospheric product for shielding could be a desirable solution, and allow keeping outpost landscapes in a more pristine condition.

Here on Earth, polyethylene is produced from petroleum. While all the needed elements are present in Mars' atmosphere, we may need catalysts and reagents to produce it directly from the atmosphere. If these are recyclable, to be used over and over, then this alternative process may be a practical one. *We need to try!*

Beyond basic hydrocarbons, nitrogen is available from the atmosphere as well. But taking a Mars' based chemicals industry any further (introducing chlorine, sulfur and other elements) must await development of a mining industry. The point is, that ***the more organic substances and useful materials for which we can demonstrate the production from Mars' atmosphere, to stockpile in advance of crew arrival as a jump start to a basic level of self-sufficiency for the pioneers***, the more support and less opposition the idea of settling Mars will generate.

We may already know the basic chemical process pathways involved. *What we really need to do is to develop the lightest weight equipment feasible for a given amount of production output.*

We also need to develop lightweight storage systems so any atmospheric byproducts can be stockpiled on location. Inflatable containers with rigid bottoms would be our suggestion, *lightweight and compacted for shipment.* On Mars, the chance of micrometeorite puncture should be much less than on the Moon, where filled inflatable tanks could be placed under a pre-built shelter to provide thermal stability as well. Inflatable bladders for gasses, liquids, solids and substances expected to change state with the seasons could be developed.

Now if these bladders could be produced on Mars that would be even more helpful. Providing a "produced on Mars" stockpile of as many consumables as possible is the name of the game: not just fuel for trips home!

2. Experimental Mars Agriculture in Marslike Air

That we can grow crops in a carbon dioxide atmosphere at 10% of Earth normal pressure, and in turn ten times the pressure on Mars, suggests *an agriculture that meets Mars "halfway."* These are experiments that are easy enough to do here on Earth in a project we have dubbed "redhousing." See MMM Classics # 10, pp. 25-27,
Available as a free pdf file download from:
www.moonsociety.org/publications/mmm_classics/

The greater the number and the variety of food crops, and of plants useful in other ways (fiber, spices, pharmaceuticals, dyes, etc.) that we can demonstrate can be successfully raised in "redhouse" conditions, the lower we will have reduced the threshold for successful Mars settlement. More, the idea of meeting Mars "halfway" will begin to look like a doable long range plan for settlers to go beyond subsistence to actual thriving on Mars. This philosophy should appeal to environmentalists and economists alike. Widespread support for establishment of a Mars Frontier will make everything easier.

And if a semi-automated, partly teleoperated food growth system could be set up so that the first crops were ready to harvest when the first pioneers arrived, what a welcome omen that would be!

We will get nowhere unless we dream what would seem at first to be absurd and impossible. It is not only the pioneers that need to have the right stuff. It is those who are preparing the way for them, maximizing the chances of success.

3. Finding Minerals for Martian Industries

We cannot live on organic substances alone! If we want Mars frontier settlement to succeed, we have to mount a campaign to skew the choice of instruments aboard future Mars orbiters and landers to include those that will identify not just those elements useful for a geological understanding of Mars' physical evolution, but also of elements necessary for industry. Taking a page from orbital exploration of the Moon, we need not worry about identification of areas rich in iron, magnesium, titanium, and thorium. But we need to know where best to look for many other vital elements as well.

This will take some campaigning! NASA (we might assume the same for ESA, China, Japan, India, etc.) goes through proposals from principal investigators and decides on the basis of which proposals are the most advanced, and which the least costly. How they fit the needs of would-be frontier-settlers does not enter into these decisions at all. While all science has some practical implications, as a constituency pushing to open the Martin and Lunar frontiers, we need to make the case for prioritizing practical applications and needs.

√ Instruments to map permafrost areas *and* to detect sub-surface ice and aquifers

√ Instruments to detect and map subsurface voids such as lavatubes and trapped gas pockets

√ Instruments to detect all industrially vital elements, such as copper, platinum, sulfur, phosphorous, potassium, and on and on.

The idea is to have data on which to base sound decisions on **where to set up industrial centers**. Not just anywhere will do, and certainly ***basing site decisions on geological and exo-biological curiosity alone is begging failure, and failure sooner rather than later.*** In the long term there will be immeasurably more geological and exo-biological exploration and research, if these activities are supported by a permanent and growing frontier population. Patience will pay off enormously!

4. Mars transportation systems

Mars is a big place, as big as all Earth's continents put together. We have already pointed out that the two most strategic places on Mars are half a world apart, some 7,000 miles or 11,000 km. Even if settlement of the northern part of the Hellas basin is postponed, we are unlikely to find everything we need for settlement self-sufficiency within short range of anywhere on Mars. And most certainly, monotonous appearances aside, one site is not as good as another!

There has been much talk about the feasibility of aviation on Mars. Enough talk! We need demonstrations and improvements and more demonstrations etc. We will need aircraft that can do reconnaissance but also carry passengers and some freight.

It would appear that ground-effects vehicles that could ignore the boulder-strewn fields of Mars and glide above the surface are unlikely. That doesn't mean we should not try to prove this assumption wrong. Railroads to haul cargoes and materials are a real possibility. How can we redesign them to suit the Martian climate and conditions?

The list of things we can do to demonstrate the feasibility of successful self-supporting Martian settlement is longer than we suspect. But we have to start making inroads if we are going to change opinions. There is a limit to self-sufficiency and the new Martians will need income-earning export options. Everything we can demonstrate that will give pioneers the edge, brings the day when we decide to open the Mars frontier *closer.*

Thriving Together vs. Withering Alone

How will future Martians pay for those things that cannot be produced (whether *not yet* or *not ever*) locally is the real question. It would seem that there is nothing Mars can produce that Earth cannot also make, except experiences. And very few will be able to afford the cost *and the time* for round trip tours of Mars!

We have seen science-fantasy suggestions such as life-saving pharmaceuticals (perfumes, aphrodisiacs, etc.) made from *special Mars' soils* that cannot be duplicated on Earth; or unique priceless gems made in the throats of Martian volcanoes. We have seen *no suggestions that are realistic* other than exporting things to the Moon at lower shipping costs than they can be shipped up (more quickly) from Earth.

On the other hand, building materials from the Moon, would be cheaper for building out LEO and GEO than equivalents rocketed up from Earth's surface. So helping make the lunar economy work is the key to making the Martian economy work.

Given its shallower gravity well, Mars will be a cheaper source of imports for the lunar frontier than Earth. Some items needed on Mars may be less expensive to import from the Moon. And this is our choice. Either prosper together, *Moon and Mars,* or face economic collapse apart. The Moon and Mars are logical trading partners. Those too proud to accept this will end up suffering the consequences.

In planning lunar industrialization priorities, it would pay then, to give some emphasis to those basic industries that could produce equipment and products of critical need on both Moon and Mars. Designing equipment for lunar and for Martian use may require some specific differences: but the two frontiers, in comparison to conditions on Earth, are similar in more respects those in which they are different. Equipment that proves out on the Moon may work on Mars with few adjustments, and if made on the Moon, for shipment to Mars, will cost less. And vice versa. It is only reasonable to expect one frontier to be ahead of the other in some respects, and the opposite in others. The most important thing in common is the need to become *as self-sufficient as possible as soon as possible*, should financial and other support from Earth decline or be interrupted.

There is much homework ahead of us. Leaving it to the government is not the answer. Working hand in hand (Moon and Mars supporters) should yield practical solutions and pathways for further investigation! If we spawn outposts on either or both worlds that could not survive collapse of civilization on Earth, or even an indefinite pause in support, then our effort to create additional baskets for Gaian and Human eggs will have failed. While such a level of survivability will be hard won at best, it is a goal that must be pursued in earnest from the outset. Dependency by design, intentional or not, is unacceptable. If we are going to expand the human world beyond Earth orbit, we need to do it right, and that means no half-measures.

In this respect, ***neither*** the Return to the Moon nor the push for a Mission to Mars, have been on the right track. We cannot assume that either NASA or any government bureaucracy, focused on exploration only, will understand these things. If it is our dream, we must take responsibility for getting it on the right track and keeping it there.

It is in the interests of Lunar Frontier enthusiasts to promote pre-development of any and all technologies that will help open the Martian frontier. Whether Mars frontier enthusiasts return the favor is immaterial. For us Lunans, this is a win-win situation. In time, "Mars only" advocates are bound to understand this. **<PK>**

The Moon Society www.moonsociety.org

An international nonprofit 501(c)3 educational and scientific organization formed to further the creation of communities on the Moon involving large scale industrialization and private enterprise

Objectives of the Moon Society

include, but are not limited to:

- Creation of a spacefaring civilization which will establish communities on the Moon
- Promotion of large-scale industrialization and private enterprise on the Moon
- Promotion of interest in the exploration, research, development, and habitation of the Moon, through the media of conferences, the press, library and museum exhibits, and other literary and educational means
- Support, by funding or otherwise, of scholarships, libraries, museums and other means of encouraging the study of the Moon and related technologies
- Stimulation of the advancement and development of applications of space and related technologies and encouragement their entrepreneurial development
- Bringing together persons from government, industry, educational institutions, the press, and other walks of life for the exchange of information about the Moon
- Promoting collaboration between various societies and groups interested in developing & utilizing the Moon.
- Informing the public on matters related to the Moon
- Provision of suitable recognition and honor to indivi-duals and organizations which have contributed to the advancement of the exploration, research, develop-ment, and habitation of the Moon, as well as scientific and technological developments related thereto.

Our Vision says Who We Are

We envision a future in which the free enterprise human economy has expanded to include settlements on the Moon and elsewhere, contributing products and services that will foster a better life for all humanity on Earth and beyond, inspiring our youth, and fostering hope in an open-ended positive future for humankind.

Moon Society Mission

Our Mission is to inspire and involve people everywhere, and from all walks of life, in the effort to create an expanded Earth-Moon economy that will contribute solutions to the major problems that continue to challenge our home world.

Moon Society Strategy

We seek to address these goals through education, outreach to young people and to people in general, contests & competitions, workshops, ground level research and technology experiments, private entrepreneurial ventures, moonbase simulation exercises, tourist centers, and other legitimate means.

Our Full Moon 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!

Masthead Design: Charles F. Radley, Society Vice-president

Monthly Moon Society Progress Reports: visit our Homepage http://www.moonsociety.org and scroll down the center of the page to the prominent yellow **Frontlines** link. This report has been issued monthly since April 2008.

The Moon Society & Mars

By Peter Kokh, President

The Moon Society has no official position on Mars other than statements included in our 2004 position paper: "**The Moon: Why and How we Should Return**" – http://www.moonsociety.org/whitepapers/moonreturn_positionpaper.html – Part 5.2: **Preparing the way for Human outposts on Mars. "** The Moon is the ideal place to field-test habitat designs, equipment, and life-support systems for deployment on Mars as well as to better study human factors engineering issues, and health/medical systems issues. Specifically:

- **Field Testing Equipment** (paragraph and 6 bullets)
- **Human Factors Engineering** (paragraph)
- **Frontier Health** Care (paragraph)
- **Long Range Considerations** – If the lunar and Martian frontiers are opened in step, Moon first, down the road, a lunar settlement could produce some of the heavy equipment needed on Mars at shipping cost savings.

Later in 2004, we had an exhibit table at the Mars Society Convention held in Chicago that year. Two of the flyers we prepared for this event are pertinent.

- "Lunar & Martian Frontiers will have Much in Common" www.moonsociety.org/reports/mars_conv2004/Moon_Mars_Similar.pdf
- "Moon Society – Mars Society: Collaboration & Joint Project Areas" www.moonsociety.org/reports/mars_conv2004/MS_TMS_Collaboration.pdf

Through the years we have made other salient points:

- Phobos and Deimos could be a source of needed vola-tiles such as carbon, hydrogen, and nitrogen, exports of which (as liquid methane and ammonia) could earn income for a fledgling Mars frontier
- Seasoned Lunar Pioneers might make the ideal settlers for Mars, as they would already be hardened to frontier conditions
- Both frontiers would be more viable as trading partners than if either tried "to make it" on its own.

To back this up, we rented the Mars Desert Research Station for two weeks in early 2006 to get a better grasp of analog research issues as they pertained to Moon and Mars outposts. We concluded that there are some things in common, other things special to one situation or the other.

On our new "Mars Page" we have made these very points. **www.moonsociety.org/mars/**

We have published two **Mars Theme** volumes, collections of **MMM Mars Articles** from yeas 1-10 & 11-20 respectively. There is ample room in our future for both frontiers, and reasons a plenty for collaboration. **PK**

Call for Nominees for Elections 2010 Moon Society Office & Board Openings

From Moon Society President Peter Kokh

It is time to begin the annual Moon Society Elections Ritual once again. Each year, we vote for two of our 4 officers, and in even # years, such as this one, we vote for 2 of our 5 directors, voting for the other 3 in odd # years.

Moon Society offices up for election or re-election are **President** (inc. **Peter Kokh**) and **Secretary** (inc. **Annie Bynum**.) Annie will not be running for re-election, as she is unable to maintain Internet access. So the office of Secretary is wide open. Anyone who wishes to do so may run for President as well. If replaced, Peter will continue to work for the Society as editor, chapters-coordinator and in other ways.

Moon Society Directors positions open for election or re-election are the seats currently held by **Fred Hills** and **Ben Nault**. However **a third director position has now opened,** as **Shaun Moss** has been unable to attend most meetings because of unexpected conflicts with his job. This opening, however, is for the second year of a two-year term. Whoever is elected to this seat will be able to run for re-election for a full two-year term next year.

Eligibility: Anyone who has been a member of the Society for a full year as of August 1, 2010 is eligible to run for a board seat or officer position. This covers all members with a membership number of 1568 or lower are eligible for election.

Recommendations: (1) Anyone who is unable to attend our meetings on a regular basis should not run for office. The Management Committee (officers and directors meeting together) meets the 1st and 3rd Wednesday evenings of each month, 9-11 pm Eastern, 8-10 pm Central, 7-9 pm Mountain, 6-8 pm Pacific. Times will be earlier in Hawaii and Alaska, Times in the Eastern Hemisphere will be on the following Thursday: wee morning hours in Europe, morning in India, and early afternoon in Australia. Our meetings are held in a private and dedicated chat room (in the ASI-MOO environment.

Recommendations: (2) Anyone who has not previously served in a Moon Society leadership capacity and who wishes to run, is encouraged to join us in our meetings *now*, so that you will be up to speed by election day. To gain access to the Management Committee meetings, please send an email to president@moonsociety.org so that access (restricted) can be granted.

At least 2 new people needed! As we have one incumbent who is not running for re-election (to the Secretary position) and one who is retiring early (Director Shaun Moss) we need at least two new people! Of course, anyone is welcome to run against any incumbent. In total there are 5 positions open. And if we have some contests this year, that will liven things up!

To all members not running: You are not restricted from giving input on matters of any kind that pertain to Society goals and directions, projects and programs, the website or newsletter. Do feel free at any time to send an email to president@moonscoiety.org sharing with us your concerns, opinions, and suggestions. We enjoy hearing from you, and are encouraged by your taking interest in this way. ***Many thanks!***

Still time to enter Apollo 13 Essay Contest:

"Manned Space Exploration is Worth the Risk"

April 1, 2010 deadline

See this online page for updated details:

www.moonsociety.org/reports/A13_contest_announce.html

For those not online, see last month's MMM for details. **Note:** the **submission email address has changed.** Please send your submission to:

president@moonsociety.org

If you have already submitted an essay, please resubmit to the above address as our secretary has lost Internet access. --- We have three great judges waiting to review the essays: noted author **Marianne Dyson**, former editor of Artemis Magazine **Ian Randal Strock**, and editor of Moonbeams Sci-Fi online magazine **Chuck Lesher**.

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Moonbeams Science Fiction Issue #5

Moonbeams' editor Charles Lesher has published the 5th quarterly issue. While these are all short stories, there are worth your reading. This one includes the best Mars short story we have seen in years (a personal opinion, of course!)

Moonbeams will be coming out with a special issue to include up to ten top entries in the Apollo 13 Essay Contest (see just above). This collector's issue will feature not only the wining entries and runner-ups but great artwork. Even more incentive to enter the contest!

You can download the latest Moonbeams issue or any of the four previous ones by going to this page and clicking on the image(s) of the cover page of the issue(s) you want to download:

www.moonsociety.org/publications/fiction/

Thanks, Chuck, for another great issue!

A new Moon Society F.A.Q. page

From Peter Kokh

Many organizations have F.A.Q. pages – answer to "**Frequently Asked Questions**" that visitors, new members, and even some old members may have about the Society, about its mission & goals, its projects & programs, its positions & affiliations; Questions about the Moon and other space destinations.

A couple of years ago we begn to compile a list of such questions and got diverted and sidetracked by other pressing issues of the time. Time to pick up this project and bring it to publication.

If you as a member or reader or friend or someone simply curious have a question you want included, please do send it to us. Any good F.A.Q. page should be open to expansion to cover questions that are not already addressed or to which current answers lead to more questions.

Send your question to kokhmmm@aol.com or mail your question or suggestion to:

Moon Society Program Office
PO Box 80395
Milwaukee, WI 53208-0395
1-888- 266-2385 (Peter) (7 am to 10 pm CT)

How does the Moon Society decide which projects to undertake and which projects started elsewhere to support?

The Moon Society Bylaws drafted in July 2000 at our Founding Convention give some guidance:

ARTICLE II - OBJECTIVES

Section 1. The objectives of this Society shall be, but are not limited to:

(a) The creation of a space-faring civilization, which will establish **communities on the Moon; promotion of large-scale industrialization and private enterprise on the Moon**;

(b) The promotion of interest in the **exploration, research, development, and habitation of the Moon**, through the media of conferences, the press, library and museum exhibits, and other literary and educational means;

(c) The support, by funding or otherwise, of scholarships, libraries, museums and other means of **encouraging the study of the Moon and related technologies**;

(d) The stimulation of the **advancement and development of applications of space and related technologies and encouragement of entrepreneurial development** thereof;

(e) The **bringing together** of persons from government, industry, educational institutions, the press, and other walks of life for the exchange of information about the Moon;

(f) **Promoting collaboration** between various societies and groups interested in developing and utilizing the Moon.

(g) **Informing the public** at large on matters related to the Moon; and

(h) The provision of **suitable recognition and honor to individuals and organizations** which have contributed to the advancement of the exploration, research, development, and habitation of the Moon, as well as scientific and technological developments related thereto.

Another useful guide, used by the Society President, is **a** "litmus test" called **"The Lunar Frontier Enabling Test."** This is an adaptation of the Space Frontier Foundation's "Space Frontier Enabling Test."

Our version reads as follows:

A "lunar frontier enabling" project, technology, or policy is one which has as its effect the acceleration of the creation of low cost access to the lunar frontier, and to the space frontier in general, for private citizens and companies, and/or which enables or accelerates our use of space resources, and/or accelerates the rate at which wealth can be generated on the Moon and in space.

In other words, we ask this question: **is the project or policy going to provide a return on our investment of time, energy, and money, if we define "return" to be the economically sustainable human habitation of the Moon and of space in general?**

Any project, competition, paper, technology demonstration or other activity, which does not meet this clear standard, no matter how well designed and energetically pursued, is simply a waste of time and resources and energies -- a detour or diversion.

Two very critical factors in making a decision about whether or not to undertake or support a suggested project are:

a) Does this require financial resources that are within our budget? and

b) Do we have the available volunteer personnel to undertake and manage this project?

All too often, we reluctantly must turn down an otherwise splendid suggestion for either lack of the needed financial resources or the needed volunteer personnel.

How can we change this situation for the better?

We are handicapped by not having the services of a person experienced in fundraising and/or grant proposal writing. Many projects require significant management time and our Society has no paid staff, only volunteers with limited amounts of discretionary time at their disposal. So sometimes we have to be content with giving moral support to a project that we really would like to see through to a successful conclusion.

Currently, a significant amount of work is done by retired persons who. Retirees often, not always, have significant discretionary time at their disposal, and are all too happy to have projects with which to structure that time. If you a retiree having trouble filling your free time constructively, why not consider what you might do to help the Society. Write president@moonsociety.org or call him at 1-888-266-2385 ("Peter") 7am-10pm CT.

Another showstopper may be money. While the Society's budget is limited, that is not a legitimate excuse. If a project is well designed and exciting, it should be able to attract donations both from members and friends. The corollary, however, is that if a project does not attract its own funds, it probably is not exciting to enough people. On this point, we lack the services and time of an experienced fundraiser, and of an experienced grant proposal writer.

If you wonder, for example, why we have yet to launch our own Lunar Analog Station – we certainly have big plans and big ideas for one – the answers lie above. Someone has to raise the money, contact potential co-sponsors and "tenants" (one way to do this is follow the financing strategy for a new mall: find an anchor tenant to pay advance rent, and use that rent to construct the Society's portion of an analog campus open to contractors and universities.) If we had someone to take charge of fundraising and finding sponsors, cosponsors and tenants, we would soon need a project manager.

So you begin to see why our projects have been small and modest. Yet we are proud of what we have done in recent years. Production of a great set of Videos; design and production of our own working desk top model of a solar power satellite to name the top two.

We certainly want to do more and need to do more. If you can help, please let us know. This is your society. We are all in this together. You can volunteer, you can run for office, you can help in ways of your own choosing that fit your talents and aptitudes, experience and available free time. And by all means, do write the president with your ideas and feedback! ***To the Moon!***

The Moon Society Chapters & Outposts Frontier Report

Moon Society St. Louis Chapter

http://www.moonsociety.org/chapters/stlouis/
Contact: Keith Wetzel <kawetzel@swbell.net>
Next meetings – Mar 17th, Apr 15th, May 20th
Meetings **3rd Wed** monthly at Buder Branch Library
4401 S. Hampton, in the basement conference room

Feb 12 – report on Moon Madness 2010 event, photos
http://www.moonsociety.org/chapters/stlouis/MoonMadness2010.htm

Moon Society Phoenix Chapter

http://www.msphx.org
http://www.moonsocphx.blogspot.com/
Contacts: Craig Porter portercd@msn.com
Chuck Lesher: chuckmiester999@yahoo.com
Meeting the **3rd Saturday of the month**
Moon Society Phoenix' next meetings are on
Saturdays **March 20th, April 17th, May 16th**

Report by Craig Porter: We had our monthly meeting the 20th. Don is working on two projects that he was going to send me a summary of. One is a Telepresence project for RC Cars with a Video Cam mounted on it for remote operation. A second project is a habitat for the Moon. I passed a Solar panel set and and a water pump for part of his habitat project.

I am working on a project for displaying our stand-ups without them taking up our outreach table space. The first proof of concept was to be there for the meeting but I had some bad glue joints and it broke while loading it in my jeep. So I explained what happened and then started re-evaluating the project. I've pretty much redesigned the display wall to make it stronger and more transportable, it will be made out of wood and the sections will be shorter with one section setting on the other and pinned together using keypins. This project has been delayed by other home projects and weather.

Craig Porter, Patti Hulstrand, and Don Jacques (with car)

Moon Society Houston Chapter

http://www.moonsociety.org/chapters/houston/
Contact: Eric Bowen eric@streamlinerschedules.com

The next meeting for the Houston Chapter of the Moon Society will be at the **Freeman Library in Clear Lake** City (16616 Diana Lane) in the first floor meeting room, beginning at **7 pm, Mon., March 15**. Our plan is to make this a joint meeting with the local NSS chapter.

For those of you who missed the last meeting in January, Marianne Dyson and Murray Clark of the local NSS chapter came and floated **a proposal that we consider merging the two local chapters to form a collaborating NSS chapter**. This development has the blessing of both The Moon Society and of The National Space Society as it is in accord with provisions of the 2005 Affiliation agreement signed by the two Societies.

There are several attractive possibilities for such a merger; NSS has a large local mailing list, a treasury, and a steady income from a portion of membership dues paid to the national organization while the Moon Society has a nucleus of active members and a regular meeting history. I believe that this proposed merger would be very beneficial to both organizations, and I encourage our Moon Society members to consider adding a membership in NSS (which would be a prerequisite to serving the organization as an officer or director).

Whatever your desired level of participation, though, I encourage you to come to the meeting. See you there! --------Eric H. Bowen

College of the Menominee Nation-Green Bay* Student Chapter (*Formerly, Green Bay, WI Outpost)*

David A. Dunlop dunlop712@yahoo.com

Chapters & Outposts Map (North America)

www.moonsociety.org/chapters/chapter_outpost_map.html

Chapters & Outposts Events Page

www.moonsociety.org/chapters/chapter_events.html

===== Moon Society Outposts =====

www.moonsociety.org/chapters/chapter_outpost_map.html

Moon Society Nashville Outpost – Central Tennessee
Contact: Chuck Schlemm cschlemm@comcast.net

Bay Area Moon Society, CA Outpost – South Frisco Bay
http://www.moonsociety.org/chapters/bams/
Contact: Henry Cates hcate2@pacbell.net
Informal meeting at Henry Cate's home in San Jose
The 4th Thursday every month

Moon Society Longview, TX Outpost
Contact: James A. Rogers jarogers2001@aim.com

Moon Society DC Metro, DC-MD-VA Outpost
Contact: Fred Hills Fredhills7@aol.com

Milwaukee, WI Outpost (MSMO)
www.moonsociety.org/chapters/milwaukee/msmo_output.htm
Contact: Peter Kokh kokhmmm@aol.com

NSS Partner Chapter News – pp. 17-19

Oregon L5 (Portland), **Lunar Reclamation Society** (Milwaukee), **Minnesota Space Frontier Society** (Minneapolis-St. Paul), **San Diego Space Society**

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/

Moon Society Mail Box Destinations:

Checks, Money Orders, Membership Questions
Moon Society Membership Services:
PO Box 940825, Plano, TX 75094-0825, USA

Projects, Chapters, Volunteers, and Information
Moon Society Program Services,
PO Box 080395, Milwaukee, WI 53208

< End Moon Society Journal Section >

GREAT BROWSING

Space Science and Manned Space Program
http://www.thespacereview.com/article/1547/1

Filming has begun on "John Carter of Mars"
http://movies.about.com/od/movienews/a/john-carter-filming.htm

Ganymede & Callisto twins in size, but that's all
http://www.space.com/scienceastronomy/jupiter-moons-comet-impacts-100125.html

Top 10 most intriguing Extra-solar Planets
http://www.space.com/scienceastronomy/extrasolar_planets.html

Private Space Stations edge closer to reality
http://www.space.com/businesstechnology/private-space-stations-bigelow-100120.html

First Space Hotel Under Construction
www.wjla.com/news/stories/0110/699430.html

Mars through the eyes of Spirit rover
http://jpl.nasa.gov/video/index.cfm?id=887

Spirit: 6 years of roving Mars
http://jpl.nasa.gov/video/index.cfm?id=887

Spirit designated a "Stationary Research Platform"
http://www.marsdaily.com/reports/Spirit_rover_to_remain_stuck_in_Martian_sand_999.html
http://www.marsdaily.com/reports/Spirit_Bogged_In_Sand_Now_A_Stationary_Research_Platform_999.html

Opportunity finds clues to Mars Interior
www.marsdaily.com/reports/Rover_Gives_NASA_An_Opportunity_To_View_Interior_Of_Mars_999.html

!0 reasons to scuttle Ares-1 and go commercial
http://www.orlandosentinel.com/news/opinion/os-ed-bob-werb-ares-rocket-012310-20100122,0,751736.story

http://spacefrontier.org/2010/01/26/ten-reasons-why-nasa-must-kill-ares-i-buy-commercial-rides-to-space/

Russia to debut new manned spacecraft in 2017
http://www.space-travel.com/reports/Russia_Set_To_Launch_Manned_Spacecraft_In_2017_999.html

New theory says Moon could be a result of natural nuclear explosion in Earth's crust
http://www.technologyreview.com/blog/arxiv/24721/?ref=rss

Paul Graham talks about OpenLuna Project
chrwradio.com/podcasts/94-9CHRWMon1930.mp3
http://www.openluna.org

Recreating Titan's methane lakes in a lab
http://www.saturndaily.com/reports/Studying_Titan_Lakes_On_Earth_999.html

Lobbying for a Shuttle-derived heavy lift vehicle
http://www.thespacereview.com/article/1552/1

Ares-1: pros (and cons)
http://www.thespacereview.com/article/1555/1

If Nixon hadn't cancelled the Apollo LSAM Program
http://www.thespacereview.com/article/507/1

Russia wants to charge more for rides to ISS
http://www.spacedaily.com/reports/Russia_wants_to_charge_more_for_rides_to_space_report_999.html

Role of NASA vs. Commercial Companies'
http://www.thespacereview.com/article/1559/1

GREAT SPACE VIDEOS

MOON COLONY VIDEOS – The Moon Society:
30 plus thought-provoking videos, produced for us by Chip Proser (Celestial Mechanics, Inc.) at.
http://www.moonsociety.org/video/
http://www.mooncolony.tv/
http://www.stickymedia.com/

ASSORTED SPACE VIDEOS

Bigelow Aerospace Inflatable Modules (3 parts)
http://www.space.com/common/media/video/player.php?videoRef=060607SNTV_Bigelow_pt1
http://www.space.com/common/media/video/player.php?videoRef=060607SNTV_Bigelow_pt3
http://www.space.com/common/media/video/player.php?videoRef=060607SNTV_Bigelow_pt3

Did Mars once have life then lose it?
http://www.space.com/common/media/video/player.php?videoRef=SP_090915_mars-show1

SPACE MUSIC VIDEOS

http://www.youtube.com/watch?v=3Pee4JQxb7g
and 13 more on the same page

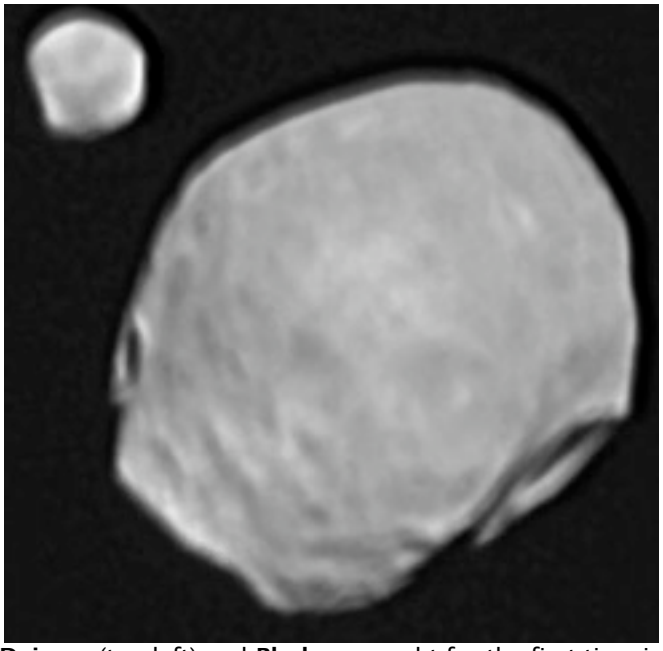
Russian Nuclear Rocket to Mars
http://www.youtube.com/watch?v=-5DQZOB6JSY&feature=player_embedded

http://www.youtube.com/watch?v=854wY7SzbXk&feature=SeriesPlayList&p=93188243F6D0495F

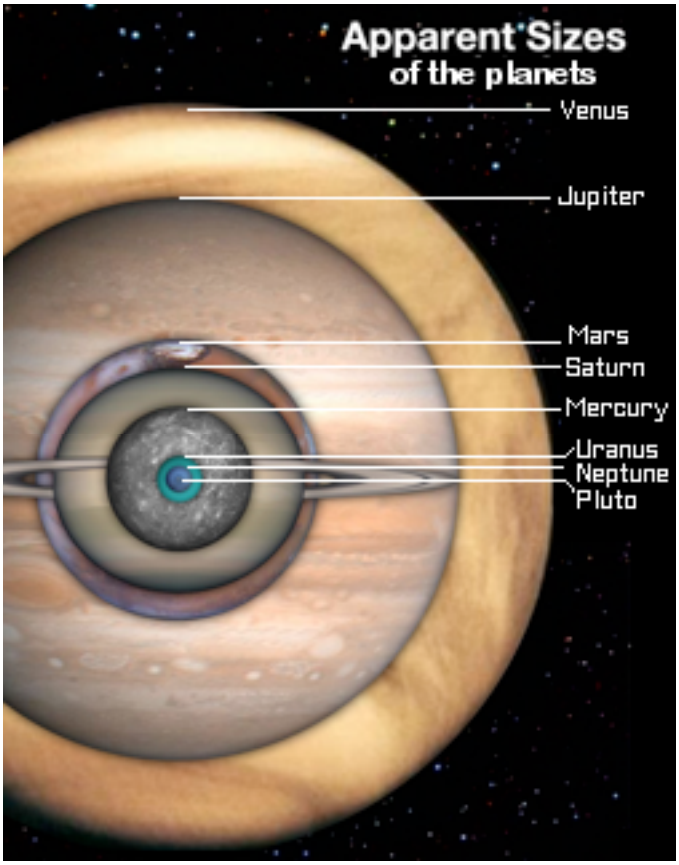
Humans have a vital role in space exploration and exploitation. Consider these headlines: ***"Mars Rover Finds Interesting Rock"*** and ***"Mars Astronaut Picks up Rock, Discovers Critter."*** Which one would create a storm in the world's media? – Bob Clarebrough

The winning patch for the last Shuttle Mission

MMM PHOTO GALLERY



Deimos (top left) and **Phobos**, caught for the first time in the same photo frame. Deimos, half the size of Phobos, looks even smaller as it is twice as far removed from the camera aboard the Mars Express Orbiter, 11/05/2009.
www.marsdaily.com/reports/Martian_Moon_Duo_999.html

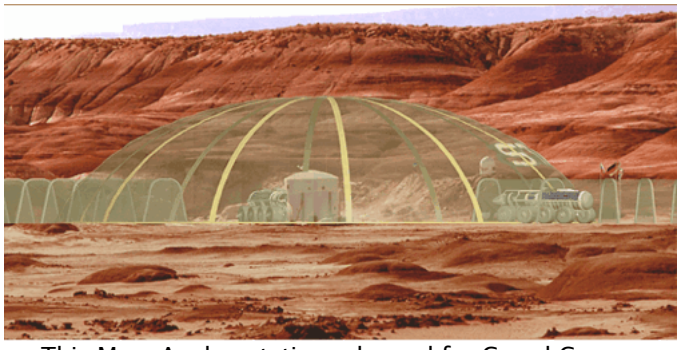


Apparent Sizes of the Planets through a telescope at their closest approaches to Earth. The apparent size depends on two things, actual size and distance.

ESA gives go ahead to ExoMars Program 2016-18
http://www.esa.int/esaCP/SEMIH8AK73G_index_0.html

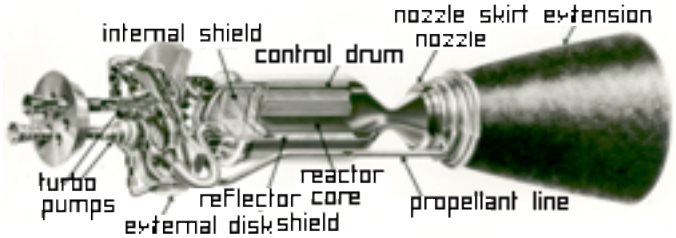
Apparent Sizes of the Planets through a telescope at their closest approaches to Earth. The apparent size depends on two things, actual size and distance.

No, groves of trees have not been discovered on Mars! The Martian "trees" are actually dark basaltic sand pushed to the surface of sand dunes by sun-heated solid carbon dioxide ice, or dry ice, sublimating directly into vapor. www.space.com/scienceastronomy/mars-tree-photo-illusion-100113.html But wouldn't we all like to see something like this "for real" someday?

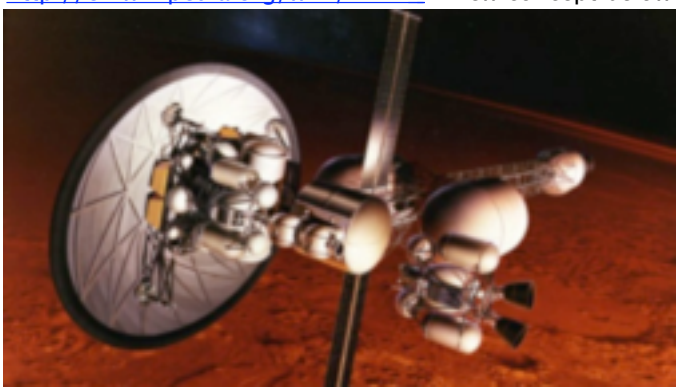


This Mars Analog station, planned for Grand Canary Island, is aimed more for tourism than for research.

Nuclear-Powered Spaceships Gaining Support in US and Russia



NASA's original "NERVA" engine *above*
http://en.wikipedia.org/wiki/NERVA - new concept *below*



Franklin-Diaz's VASIMIR Rocket Concept
http://technology.iafrica.com/news/space/2262880.htm

The LOX-Augmented Nuclear Thermal Rocket (LANTR)
http://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19960002346_1996102346.pdf

Russia revisiting Nuclear Rocket Designs
http://www.dailymail.co.uk/sciencetech/article-1223812/Russian-space-agency-plan-build-NUCLEAR-space-rocket.html

With NASA told to stop tweaking decades-old technologies and to start helping commercial companies pioneer new technologies, we can expect concepts like these to finally advance towards reality. **<MMM>**

"At least" 600 M tons of Water Ice found on Moon's North Pole by Chandrayaan-1

Source: http://www.space.com/scienceastronomy/water-moon-north-pole-100301.html

ISRO had invited NASA to contribute two instruments to its Chandrayaan-1 lunar orbiter. Both of them, the Moon Mineralogy Mapper M3 and the Mini-SAR radar have now contributed to the discovery of substantial amounts of water ice on the Moon. As data from the Indian probe continue to be analyzed, the discoveries keep rolling in.

"More than 40 craters ranging from 1 mile (2 km) to 9 miles (15 km) wide were found harboring water ice"

This comes as no surprise to those familiar with the findings of **Lunar Prospector in 1998-9**, whose instruments were sensitive to the signature of hydrogen. Prospector found that the hydrogen signature in the North Polar Region was twice as strong as in the south, indicating twice as much ice. Some scientists, such as Harrison Schmitt, thought that this signature may indicate only adsorbed protons (hydrogen nuclei) and not water. Yet that goes against common sense in that hydrogen is the most abundant element in the universe, and oxygen is #2, after helium. Nothing should be more surprising to find than water and water ice.

The skeptics pointed to the lack of reflections that an ice-sheet should give off. But *nobody* connected with Lunar Prospector has ever said that this signature was evidence of pure water-ice layers. On the contrary, given the suggested mechanisms by which water molecules have migrated and collected at the poles, the only reasonable expectation was that we had some sort of permafrost, a layer of regolith with some degree of frozen moisture.

Now those who want to go to the poles to escape facing head on the lunar dayspan-nightspan cycle and to have access to water, have a second destination to look at. But the North Pole should always have been in their sights, first because of Lunar Prospector's assessment, second because the North Pole is less than half the distance to the nearest mare "coast" (north coast of Mare Frigoris vs. south coast of Mare Humorum) as the South Pole, and thus a more strategically blessed place to start. In 2008, an ISU team picked the North Pole for this and other reasons as preferable to the south. Recovering the water from the frozen regolith may not be that easy. At extreme sub-zero temperatures, the ice is going to be very hard, and there will be many logistics challenges.

But, overall, this is very good news. One should keep in mind that Chandrayaan-1 found water (H_2O) molecules and hydroxyl (HO) radicals virtually everywhere on the Moon, a quite unexpected surprise.

Laboratory experiments on frozen regolith simulant mixtures at the temperatures involved should begin in earnest to narrow down the options for harvesting this resource to the most practical options. This means those options that require the least landed mass per harvest per time period, and those with the fewest failure (mechanical breakdown) modes. Waiting till we get there would be stupid. With this experimental knowledge, a ground-proof lander rover should be designed and sent to polar craters, both north and south. Without that feedback, a rush to the poles makes no sense. **<MMM>**

← Left: Orion-Bigelow Hybrid Crew Craft

An interesting concept from Gaetano Marano of Italy. **Top:** Orion capsule & attached deflated Bigelow module. **Bottom:** Orion with the Bigelow module fully inflated.

The idea is to provide more crew room on long journeys, such as to Mars. Mars Mission planners would do well to integrate inflatable modules into both Mars-bound and Mars-return craft and into designs for a Mars Outpost. They are lighter and thus require less fuel, and provide more elbowroom. Their thick envelopes would provide excellent thermal shielding on a planet with Antarctic-type seasons, and be a start towards radiation shielding.

The Orion would have to have deployable legs for landing and for leveling the complex. Note that this concept is adaptable to any crew capsule design. If Orion is scrapped, this option remains one to consider for Mars-bound expeditions.

www.gaetanomarano.it/articles/016_BigelowOrion.html

Mars Express buzzes Phobos
in 67 km (42 miles) pass
Phobos' internal structure is revealed

Source: www.space.com/scienceastronomy/mars-express-phobos-flyby-100303.html

March 4, 2010 - Mars Express, in an eccentric polar orbit over Mars, has been engaged in a series of 12 flybys of Phobos. At each close pass, various instruments have been trained on the mini-moon, gaining new information. The closest flyby was on 3 March at 20:55 GMT.

From this close range, Mars Express was pulled 'off-course' by the gravitational field of Phobos by no more than a few millimeters every second. To Earth-bound tracking teams, this deviation enough for a peek inside Phobos to expose how its mass is distributed throughout. Mars Express will make seven more close passes of the little moonlet in this series of orbits.

JSC Telepresence Avatars to the Moon?

http://www.popsci.com/technology/article/2010-02/nasas-project-m-puts-scientists-avatars-moon

[A must-watch video]

One thing you can do on the Moon, but not on Mars, is teleoperate in virtual real time. Experiments have shown that many people can master a 3 second time delay. On Mars, the 6-40 minute time delay is the reason it has taken 5 years for *Spirit* and *Opportunity* to do what they could have done on the Moon in a couple of months.

If JSC's plan goes forward, earthbound scientists wearing telepresence suits connected to C3PO type robots on the Moon, will be able to virtually pick up, feel, and examine all the moon rocks and dust they want, at as many locations on the Moon as we send such "avatars."

This method should be very productive. Now will it thrill the public? Probably not, unless NASA is PR-savvy enough to send one or more that ordinary people can try their hands as operating. Instead of wealthy people under-writing the cost by paying big bucks to take a turn at the controls, who gets a turn could be decided by a lottery. To enter, you would have to pass tests at your ability to wear and teleoperated a robot here on Earth with a built-in time delay, using the suit. The test would not be free, but if you passed, your name would be in a lottery for *With* the *next* **MMM** thing.

"After years of underinvestment in new technology and unrealistic budgeting, we finally have an ambitious plan for NASA that sets the agency on a reinvigorated path of space exploration," NASA Administator Charles **Bolden**

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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James_Schroeter@excite.com 414-333-3679
TREAS./ Database – *Robert Bialecki
bobriverwest@yahoo.com 414-372-9613

LRS News

● **February 13th meeting**: Peter brought a DVD called Apollo's Orphans about the effort to buy Mir from the Russians in order to save it from deorbiting and to use it for commercial purposes. The downpayment had been made and the tether secured to boost MIR to a higher orbit when NASA persuaded Russia to scuttle MIR. In historical perspective this trashing was unnecessary and most regrettable. But it was quite in line with NASA's unnecessary scuttling of each External Tank.

We got our NSS Annual Report in by the Feb. 15th deadline to qualify for a drawing for a free ticket to the chapter awards banquet at ISDC 2010.

● **March 13th meeting:** Dennis Groves will be bringing a DVD of last year's great movie, "Moon."

● **ISDC 2010 is** In Chicago this year, May 27-31, and we may have half a dozen chapter members attending.

● **The LRS web site remains off line, for some months now** in a dispute with Network Solutions. We hope to regain control and get it back up in the coming month. The option is to get a whole new domain name (perhaps "lunarreclamation without the hyphen or with an under-score instead of the hyphen. We prefer to keep the domain name we had. We confess to not understanding what this problem is all about.

LRS Upcoming Events
Saturdays: 1-4 pm
March 13th – April 10th – May 10th

LRS Meeting, Mayfair Mall, Garden Suites Room G110
AGENDA: http://www.lunar-reclamation.org/page4.htm
Besides our usual DVD, we will be talking about our preparations for the upcoming ISDC in Chicago.
Plans for Astronomy Day next month. If you know of an outreach opportunity, please let Peter know at kokhmmm@aol.com or at 414-342-075

News & Events of NSS "MMM" Chapters

Space Chapter HUB Website:
http://nsschapters.org/hub/

OREGON

Oregon L5 Society

P.O. Box 86, Oregon City, OR 97045

voice mail / (503) 655-6189 -- FAX (503)-251-9901
[http://www.OregonL5.org/]

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

* **Meetings 3rd Sat. each month at 2 p.m.**
Bourne Plaza, 1441 SE 122nd, Portland, downstairs
Mar 20th, Apr 17th, May 15th

MINNESOTA

Minnesota Space Frontier Society
c/o Dave Buth 433 South 7th St. #1808
Minneapolis, MN 55415

David Buth (w) (612) 333-1872, (h) (763) 536-1237
Email: info@mnsfs.org
www.mnsfs.org/

Proud hosts of the MDRS Web Cams
http://freemars.org/mdrscam/
The counter has now passed 1,000,000!

MN SFS's ISS-22 / STS-130 Space Display
http://freemars.org/mnfan/MNSFS/2010-02-ISS-22-STS-130-Display/
MN SFS Space Explorer Memorial Dinner pics
http://freemars.org/mnfan/MNSFS/2010-01-Space-Explorer-Memorial-Dinner/
Twin Cities Regional Science Fair pics
http://freemars.org/mnfan/TCRSF/2010/
April 2nd-4th, 2010 Sci Rm @ MiniCon 45
April 12th, 2010 MN Yuri's Night 2010

ILLINOIS

Chicago Space Frontier L5
610 West 47th Place, Chicago, IL 60609

Larry Ahearn: 773/373-0349 LDAhearn@aol.com

Host of ISDC 2010 – May 27-31, 2010
http://isdc.nss.org/2010/

.

WISCONSIN

Sheboygan Space Society
728 Center St., Kiel WI 54042-1034

c/o Will Foerster 920-894-2376 (h) astrowill@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 Thurs even # months 7-9pm
At The Stoelting House in Kiel, WI
● Apr 17th – Jun 19th – Aug 21st – Oct 16th

COLORADO

Denver Space Society
(FKA The Front Range L5 Society)

1 Cherry Hills Farm Drive
Englewood, CO 80113
http://www.angelfire.com/space/frl5/

Eric Boethin 303-781-0800 eric@boethin.com

Monthly Meetings, every 2nd Monday, 7 PM
Next: March 8th, April 12th, May 10th

Englewood Public Library, Englewood, CO 80110
1000 Englewood Parkway, First Floor Civic Center

CALIFORNIA

San Diego Space Society
http://sandiegospace.org/
info@sandiegospace.org

Meeting the 2nd Sunday monthly 2:30 to 4:30 pm
Next Meetings: March 14th, April 11th, May 9th
Serra Mesa Branch Library 9005 Aero Dr, San Diego
Quarterly Newsletter: ***The Bussard Scoop***

CALIFORNIA

OASIS: Organization for the **A**dvancement
of **S**pace **I**ndustrialization and **S**ettlement
Greater Los Angeles Chapter of NSS
P.O. Box 1231, Redondo Beach, CA 90278

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

http://www.oasis-nss.org/wordpress/

oasis@oasis-nss.org
Odyssey Newsletter Online
http://www.oasis-nss.org/articles.html

Regular Meeting 3 pm 3rd Sat. each month
Next Meetings: Mar 20th, Apr 17th, May 15th
Information: OASIS Hotline, 310/364-2290; website.

Sat., March 20, 3:00 PM OASIS Board Meeting
Home of Steve Bartlett & Tina Beychok
7108 East Peabody Street, Long Beach, CA 9080

Mon., April 12th Yuri's Night
LA Party 2010: Yuri Area 33, 11822 Teale St.
April 10, 2010 – 22:00 to 06:00
Per http://yurisnight.net/yn2010/ (Party List)

Sat. April 17th, 3 pm OASIS Board Meeting
Home of Phil Turek, OASIS' President

Sat., May 15th, 1 pm OASIS Board Meeting
Long Beach Public Library, 101 Pacific Hwy

Tentative: following Board Meeting
Free OASIS Lecture series: **Shuttle Retrospective Lecture**
by Ron Urquidi, Rocketdyne engineer.
Long Beach Public Library, 101 Pacific Hwy, Long Beach

Friday, May 21st Astronomy Night
Come do some sidewalk astronomy with us!
Cerritos Public Library, 18025 Bloomfield Ave., Cerritos

Thur-Mon, May 27th – 31st
ISDC 2010, Chicago, IL
InterContinental Chicago O'Hare Airport Hotel
http://isdc.nss.org/2010/

Friday, June 18th (tentative)
Tour of Space-X, 1 Rocket Road, Hawthorne, CA 90250,
(310) 363-6000 ***OASIS members only***

PENNSYLVANIA

Philadelphia Area Space Alliance
928 Clinton Street, Philadelphia, PA 19107

c/o Earl Bennett, Earlisat@verizon.net
215/633-0878 (H), 610/640-2345(W)

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

● **PASA regular business luncheon/formal meeting 1-3 pm**, the **1st 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/Mitch 215-625-0670 to verify all meetings.

Next Meetings: Mar 6th, Apr 3rd, May 1st
Note switch from 3rd to 1st Saturdays!

The March meeting will be on March 6th. However, the April meeting may be shifted *from April 3rd to April 10th* due to the proximity to Easter. We will discuss it.

February 20th Meeting notes: we had two visitors to our meeting this month: Wallace Kemp and Janice Guidotti. Their comments are part of the notes.

Dorothy led off with her Museums report this month talking about the Women in Aerospace exhibit for March, and a book signing of The Official Air and Space Guide by David Romanouski on the twenty-seventh. In April: Family Day on April 10 (Spring,yeah!). These are Smithsonian Institution events. And more, of course.

Larry, our Webmaster, made several points: he asked if we wanted an "ads free site?". Much enthusiasm. After he told us the costs our treasurer said" no". But the suggestion is noted. We also discussed going on twitter and My Space but the present members decided against using them. Larry supplied us with business cards for upcoming events. He will put our meeting notes on the web and keep several months available, and drop older material as time goes on.

Mitch brought up a number of points involving both our publishing in Moon Miners as our publication of record, and the addition of "associate members". We had not had a members vote on whether to continue using Moon Miners in this way and the members present did not express strong opinions either way except this correspondent. I like the range of materials in the Moon Miners and would subscribe if the group decides to do something else. In addition: Mitch suggested that non members who attend more than three meetings get to be associate members who have the same voting privileges as dues paying members and could participate in our activities, including judging or assisting at the science fairs as members of our group. I did not support this nor believe it is a good idea in general. I also suspect that our bylaws may not allow this nor would our groups insurance coverage apply for non dues paying associates in the event of a problem. I will talk about this at our forthcoming meeting with the group. Mitch also brought the winter Ad Astra, which included Space Ship Two photos! And he brought a special National Geographic Space issue. Great pictures.

Hank Smith told us of some leadership issues in PSFS in the area of who will chair the 2010 Philcon. They usually have this settled by now but this may not be resolved till an April vote. He hopes to go to Lunacon as time and finances allow.

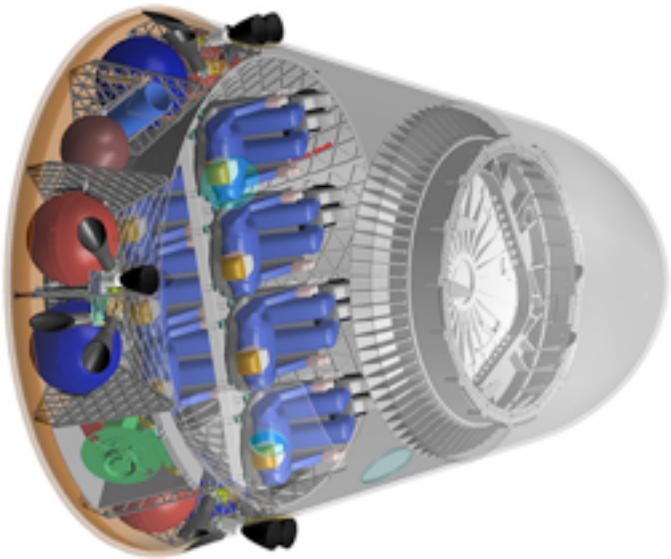
Earl brought in material on the *real* outer planets: Makemake, Eris, etc. Okay, they're Kuiper belt objects, but they are pretty big. And if Nemesis exists we could have a real planet sized (or larger) body out there. From ***Sky & Telescope*** for March, 2010 by David Jewitt.

This issue dexcribes the use of soft-=ware to analyze lunar transient phenomena: **Lunar Terminator Visualization Tool** http://ltvt.wikispaces.com/ltvt that lets light paths be analyzed in the high resolution data from sources like Kaguya's' laser altimeter. At least on near equatorial data we should still be safe in thinking that what we see is actually there!

And from the May issue of ***Analog***: a write up, in the fact section, on Robotic surgery. This should be of interest to all of us: we talked about this and Janice, who has had extensive medical training, thought that the delay time any further than, or even only as far as GEO, might make the use of this technique marginal. The application at LEO would be okay she thought. The delays would be in the millisecond range in this case. GEO would be in the tenths of a second range. This is something that might be impossible to compensate for as the surgeon using the technique might be disoriented by the added time shift between his/her motion and the response. "Robotic" in this is more in the Robert Heinlein "Waldo" vein rather than Asimov's robots. An interesting piece. Read the doctor/author's biography also.

I also looked at Space.com's website and found that a Falcon 9 was on the launch pad. It has not been mentioned in the news as having launched yet, but I suspect it will be up by the time this is printed. This is to be a cargo version test. The Dragon four-passenger crew capsule version will be tested later. See the video.

http://www.space.com/common/media/video/player.php?videoRef=SP_090713_spacex



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- **$20** NSS dues **if under 22 / over 64.** *State age* ___

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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

PHILADELPHIA AREA SPACE ALLIANCE
- Annual dues for all with MMM $25, due in March or $6 times each quarter before the next March

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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