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

Moon Miners' Manifesto

& The Moon Society Journal

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#245 | MAY 2011

The first lunar rover rolled out onto the lunar surface during the Apollo 15 Mission to Hadley Rille, July 31, 1971

Feature Articles in This Issue

Apollo 15 at Hadley Rille: The Paradigm Changer ➔
The Apollo 15 Mission, July 26- August 7, 1971, its 40th Anniversary coming up soon, was a real ground-breaker: the first mission to have real mobility - a lunar rover; the first to visit a truly scenic area; the first to visit a lunar rille, the relic of a collapsed lava tube. To commemorate this occasion, our affiliate, the Lunar Reclamation Society (NSS-Milwaukee) is running a design contest that carries these firsts much further into the near future. This contest gives *you* a chance to give the rest of us a preview what could lie ahead, and perhaps inspire others to help make it happen!. See pages 7-8.

IN FOCUS Switch to Commercial Carriers: Rough Time for Astronauts

After the late April Shuttle Endeavor mission to ISS, only one more flight remains, the last for Atlantis, coming up in June. All crew slots taken. After that, at least well into 2014, there will be but one seat on each or 3 or 4 Soyuz missions per year available to NASA.

Space-X Dragon flights will commence in 2014 at the earliest. And Dragon has 7 seats! [=> p. 2, col. 2]

Moon Miners' Manifesto

Published monthly except January and July., by the **Lunar Reclamation Society** (NSS-Milwaukee) for its members, members of participating **National Space Society chapters**, members of **The Moon Society**, and individuals worldwide.

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• **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.

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

The Russians intend to challenge Dragon's safety but their "huff and puff" is unlikely to stand in the way. Hopefully, shortly thereafter, Bigelow Aerospace 330 modules will be ready to ship to space for construction of various commercial stations. But that does not change NASA's need for astronauts. The core is already down to 61 from a high of 150 in 2000, when Space Station construction was just beginning.

We will see a professional commercial astronaut training service arise instead, or a number of them, to serve all needs. Meanwhile, Russia, China, and India will have their own astronaut training facilities, open to candidates from other nations as well. A bit of rivalry can but help keep standards high. Cutting costs to turn out "certified astronauts" at a faster clip, will be a temptation, but in this business, where safety often hangs on a thread, training that is not quite up to par will backfire sooner or later. Competition increases the level of overall quality *in the long run.*

Meanwhile, as now, there will be many grades of astronauts and their training will vary accordingly. It is one thing to qualify as a pilot/commander, another for EVA duties, or for mission specialist. The latter may be the most numerous, and the easiest to attain.

Commercial activity, which can only bring costs down across the board, will, in the end, mean greater opportunities for more people to participate actively in the opening of the space frontier. The unholy relationship between NASA and its cabal of aerospace contractors has kept costs at a maximum, and if the agency is now losing programs and missions, it has only this cozy arrangement to blame. We've said it before; NASA is not "as American as Apple Pie!" It is a socialized space program and there is nothing "American" about that.

Indeed, it is because of strong space advocate insistence that Congress agreed to put a sunset limit on the Shuttle. When the Shuttle was being designed, we all thought it would bring costs down. Instead it greatly increased them, proving #1 detractor, Senator William Proxmire, to be right on the money. The shuttle we got was not the one we wanted. The then new "Space Transportation System" was what the contractors wanted. It was also an unholy compromise between NASA needs and US Air Force needs – compromise and co-promise are two different things. Compromises made on the basis of politics are most unlikely to be rational ones. But it all comes down to the Shuttle being a government-owned system, not one of several commercial competitors.

While there may be a lull ahead in astronaut activity, in the end, as Commercial providers come on line and as Commercial users arise, we will see much more astronaut activity in space. The real Space Frontier has yet to open. When it does, it will expand quickly and involve many more individuals and companies, including civilians, including the likes of you and me.

The Age of New Space is a-birthing! Old Space is dying. And in Europe and Asia, national space agencies there will have to adjust as well. The lid will come off the pot. The Space Frontier will be truly open. Our young people will be free to really dream and plan. The present system discourages dreaming, because controls are in political hands. That is about to change, whether our generally ignorant cabal of lawmakers like it or not.

Keep the faith! **PK**

Lunar Mascons
Masterpieces of Complexity

By Ron Brooks, Ed.D.

1. Introduction

Since the 1950's knowledge of our Moon's gravitational field has grown, leading to some significant discoveries. Of the most intriguing is that of gravitational anomalies referred to as high-density mass concentrations or mascons. Research conducted on both the near and farside has produced a great deal of data on how these enigmatic and complex anomalies formed and their effects on the Moon's gravitational field. In recent years, our ability to understand the anomalies has greatly improved with the use of technological advancements such as multiple synchronous satellites, imaging techniques and Doppler. It is true that our knowledge has steadily grown about mascons, but all this gain has been from a distance. A thorough understanding will most likely not happen until the long awaited time arrives that we are able to move about the Moon again and conduct rigorous research first hand.

The information presented is for those with varied levels of interest in the Moon and is not intended to be exhaustive or definitive in coverage. The references can provide a basis for anyone wishing to pursue in-depth readings.

2. Gravitational Anomalies

Investigations and predictions by H.C. Urey, starting as early as the 1950's, were revealing the possibility that some sort of gravitational anomalies may exist within the dark maria *on the Moon (Urey, 1956). A decade later,* in 1966, the Russian Luna 10 Orbiter while circling the Moon confirmed these predictions by detecting anomalies generating from some of the maria (Christy, 2010). The growing accumulation of data was showing that something definitely was going on over the maria.

Then by the mid 1960's, enough data was being accumulated about the Moon's gravitational anomalies that an acceptable theory about what the anomalies were and how they were formed was near. In the spring of 1968, after extensive research and continued data coming from the Orbiter 5 satellite, P.M. Muller and W.L. Sjogren felt certain enough to describe the geological formations that produced the gravitational anomalies and assign the name mascon(s); short for mass concentration*s (Muller & Sjogren, 1968).* This benchmark of insight set the stage for more intensive on-going research. Muller and Sjogren received credit in the spring of 1968 for the discovery of these (high-density) mass concentrations. Both received the Magellanic Medals by the American Philosophical Society in 1971 for their discovery.

Mascon Formation

All impact basins and mascons exhibit unique geology and structures, especially those found on the farside. However, all mascons still share a common geological history. During early research, it was suggested that mascons might have been caused by collisions with heavy bodies of nickel and iron. However, this was dismissed as not credible and is now fundamentally believed to be the results of huge impacts on the Moon's surface.

In a short sequence, an impact would have instantly created an excavation basin. Simultaneously, the force would have broken through the Moon's crust and fractured the Moon's mantle. This colossal force not only produced the traumatic fracturing but also an impact rebound that triggered the uplifting of the mantle bringing it to or close to the surface. The uplifted mantle, after some degree of compensation, would become frozen in a static state. In most cases, after a passage of time lava flows would fill the impact basin. Together, the iron rich mantle uplift and lava flows would create the mascon. The above sequence is rather simplistic, but it serves as a basic framework in which a more comprehensive understanding can be developed.

More Ideas Regarding Mascon Formation

In the early 1970's, Muller and Sjogren theorized that mantle uplifting after an impact produced near surface mass shaped disks (not to be thought of as necessarily circular). They found that the midpoint of the disks emanated the strongest positive gravitational anomalies while the outer edges produced a negative gravitational anomaly *(Muller & Sjorgren, 1972).* In contrast to the nearside gravitational configuration found by Muller and Sjogren, Namiki et al., after studying Doppler measurements from the SELENE satellite mission in 2009, found that farside mascons seemingly emanate positive and negative gravitational anomalies in alternating concentric rings (Namiki, et al., 2009a).

Regardless of the gravitational configurations, the uplifted mantle structures from the impacts seemed to defy the principle of isotactic compensation and once lifted remained in a static state. However, this static state may not have been achieved immediately following the uplifting. S.C. Solomon and R.P. Comer believed from their research that the topographic relief of a newly formed basin was at least 50 to 60% compensated (a seeking for equilibrium with the regional topography) by crustal thickness and temperature variations prior to any lava flows beginning. Mare Tranquillitatis on the nearside was used as an example of demonstrating significant compensation prior to any lava emplacement while the South Pole-Aitken basin on the farside was used as an example of not exhibiting any significant viscous relaxation (Solomon & Comer, 1982). The Moon's lithosphere apparently solidified at various stages of compensation for each discrete impact basin. In a summary rendering, it seems probable that any discrete mascon was not "frozen" immediately but at some point in its stage of isostatic compensation.

Temperature variations or the thermal conditions below the impact basins were a major factor in solidification. After researching data about the viscosity of the Moon's interior, J. Arkani-Hamad concluded that there have been no thermal convection currents inside the upper 800km of the Moon since the formation of the mascons or about 3 billion years (Arkani-Hamad, (1973). This conclusion and other data about the Moon's internal thermal state seems to confirm that the Moon's crust was already ridged and the interior temperatures were cooling soon after the Moon's molten state (most agree it had one) which leads to a relative rapid (in geological time) solidification. Even with isostatic compensation occurring, the crustal rigidity and lower interior temperatures seemed enough to stop the compensation and hold the mantle up sufficiently to help generate a mascon.

2. Basin Lava Flows

As stated earlier, the impact of fracturing set the forces in motion causing not only the basin uplifting of the mantle but also allowing an iron enriched lava to spew into the impact basin. However, it seems generally accepted that lava flows did not happen immediately after impact, and the basin uplifts where frozen in a superisostatic state long before the lava flows started (Neumann et al., 1996). It is possible that impact basins and their uplifted mantel formations may have lain dry for about 100-500 million years before flows began (Shoemaker, 1964; Baldwin, 1970*). After the flows began,* they repeatedly moved through the basin fractures, one over the other in varying degrees for over a billion years *(*Ronca, *1972).*

It is interesting to note that L.B. Ronca asserted the idea that some of the later flows were "tongue-shaped" indicating that later lava flows did not come from fractures below the impact basin but from fractures in the circumferential region around the basin (Ronca, 1973). This would indicate that some of the final flows were emanating from hot places likely beneath the surrounding highlands.

This idea of the transfer of mass (lava) from the highlands to the impact basin is further supported by Arkani-Hamad (1973b). He presented the idea that a laterally heterogeneous thermal regime developed in the Moon's interior after the impact. This development seemed to result in the following possible events. The thermo regime created a lithosphere that supported both the formed basin mascon and the highlands surrounding it. It also induced the fast cooling of the region beneath the lava emplaced basins and in reverse caused the remelting (on a slower scale) of the base below the surrounding highlands. The mass of the highlands and the additional weight and pressure brought on by the thick insulating ejecta blanket on the highlands surrounding the basin augmented the base remelting. The result of the remelting was an amassed collection of viscous material. These dynamic events produced high stress fractures in the highland lithosphere lying between the forming viscous material and the upper levels of the highland surface. The stress fractures became the conduits for the transfer of the viscous mass (lava) from beneath the highlands into the basin. These events are complex but do eliminate any exclusivity to the concept that the basin lava flows emanated strictly from fractures beneath the impact basin.

The Japanese SELENE mission revealed yet another interesting dimension to the lava flows. Mare Serenitatis was found to have a regolith coating layered between subsequent lava flows. This helps to validate that enough time elapsed between flows to build up (sandwich like) stratification (Ono , 2009). It would seem very likely that most maria would have this regolith stratification.

3. Volcanism

Moon volcanism, such as the large basaltic lava flows in Oceanus Procellarum, has not produced the discovery of any significant gravitational anomalies. This finding has eliminated volcanism alone as a serious contender as a cause of mascons. There are also mascons on the Moon's farside that have limited if any emplaced lava flows. This seems to confirm that uplifting of the mantle alone may be sufficient enough to produce a mascon. As it appears, mantle uplifting and lava emplacements contribute to mascon formation collectively or that uplifting alone can create a mascon discretely.

4. Where are the Mascons?

Of the five major nearside maria containing detected mascons, Mare Imbrium is the highest density site followed by Maria Serenitatis, Crisium, Nectaris and Humorium. (See the Gravitational Map Figure 1). A moderate density mass concentration lies between Sinus Aestuum and Sinus Medii that is probably an ancient ringed mare. Mascons are found in Mare Orientale, which wraps itself around the far western limb to the farside and the crater Grimaldi (a large walled plane) that lies close to the western limb. More mascons are being identified as research continues. In 2000, A.S. Konopliv presented evidence that about 12 additional mascons existing in impact basins have been discovered on the nearside or close to the limb (Konopliv, et al., 2001).

Gravitational Map Nearside

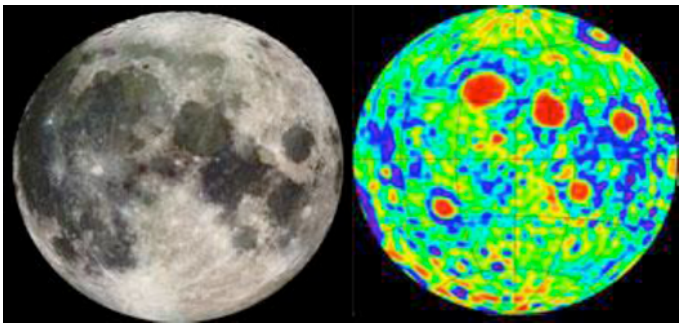
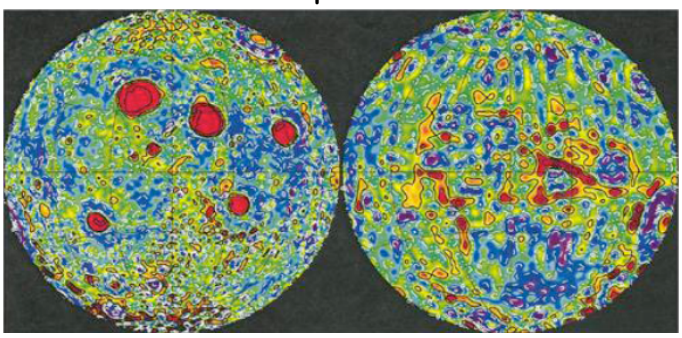


Fig. 1 The 5 large red globule shapes (right gravimetric map) are mascons. You can see how the red globules match the maria to the full Moon image on the left.

Right Map – right to left: Mare Crisium, Mare Nectaris, Mare Serenitatis, Mare Imbrium and Mare Humorum.

Image Credit: NASA (Left Image from Galileo mission – Right Image from Lunar Prospector)

Gravitational Map – Near and Farside



Left – Near Side -- Right – Far Side

Figure 2 Above is a gravity map of the near and farsides of the Moon made by the Lunar Prospector spacecraft (*Konopliv et al., 1998).* The map shows the mascons of the nearside (left) as shown in Figure 1 and the mascon formations on the farside (right). The red globules show the intensity of the gravitational anomalies. The reader can see the intensity variance of the mascons on the two sides of the Moon. Image Credit: NASA

The gravimetric maps above clearly show mascon locations. The intensities are also shown and contrasted between the near and farsides.

5. Differences – Near and Farside

It is obvious in Figure 2 that the nearside mascon basins are much more predominant and appear geologically different from those on the farside. It has not been clearly established why this has happened. However, it is probably linked to several unique geological differences that have existed between the near and farside. The nearside has a thinner crust placing the mantle closer to the surface. Sjogren believes the crust difference on the farside is close to an additional 33 km. (Sjogren, 1977). This difference would make the lithosphere much more rigid on the farside. However, this is not to say that the crust depth is the main or only contributor to the maria differences on the two sides of the Moon. Nor, can we logically say that the nearside just took larger impacts, which resulted in the surface differences. Unraveling the complexities seems problematic.

However, a plausible additional theory of differences is the comparatively very high lithosphere temperatures that existed below the nearside basins as compared to the farside. The enduring high temperatures under the nearside basins would have melted the lower crust and upper mantle boundaries into a viscous material. This viscous layer allowed a prolonged basin/maria deformation that continued even after the final lava emplacements. (Most likely, the ridges and rills found in the nearside maria are validation of this deformation.) The viscous material amassed at the crustal/mantle boundaries would have also relaxed the upper lithosphere and would have contributed to the sea like appearances of the nearside lava emplaced basins.

The actual crustal and mantle boundaries' temperatures for the nearside were in excess of 1000K, whereas the crustal/mantle boundary for the farside was less than 800K, which would be sufficient to produce the lower crust and upper mantle melting (Namiki, 2009b). The differences in the thermal evolution of the lithosphere and the crustal variances would contribute greatly to the near and farside impact basin differences.

Namiki, et al. developed the map (Fig.3) below that demonstrates some of these geological basin differences (Namiki, 2009c).

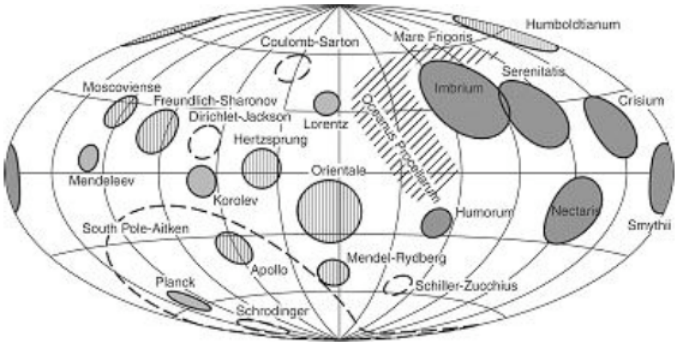


Figure. 3 from: Farside Gravity Field of the Moon from Four-Way Doppler Measurements of SELENE (Kaguya) Reprinted with Permission from AAAS.

Note: Figure 3 displays the names and locations of major lunar basins/mascons on both the near and farsides. The lunar nearside is on the right side of the figure, and the farside is on the left. The western limb of the Moon viewed from Earth (270^0E) is at the center front. Within Figure 3 of the Moon, Namiki, et al. displayed three basin/mascon designations:

(1) Darkly shaded are Type I basins or basins with a sharp gravity peak with excess mass at the center.

(2) Hatched shaded basins are Type 2 basins that have broad gravity peaks, generating 20^0 to 60^0 less magnitude than Type 1 basins and account for the principal farside mascons.

(3) The dashed lined basins are unclassified. The reader can see the clear difference in the types of mascons that formed on the near vs. the farside.

Some of the significant mascons on the farside, as shown in Figure 3, are Orientale, Smythii and Mendel-Rydberg which wrap themselves around the far to the nearside. Other significant farside mascons are Apollo, Planch, Mendeleev, Moscoviense, Freundlich-Sharanov, Hertzsprung, and Korolev.

6. Do Mascons Exist on Other Rocky Planets?

To this date mascons have been detected on the planet Mars and possibly Mercury (Atkinson, 2008). It seems research is indicating that mascons do not exist on Venus. Peter James of MIT believes that plate tectonics may be unique to Earth and not a rule for rocky planets. James further believes the absence of mascons is consistent with the idea that the Venus surface experienced some type of catastrophic overturning about 500 million years ago, and it is possible that Venus periodically goes through a "resurfacing" process. This of course would eliminate any possibility of mascon formation (*Bettex*, MIT news, 2010). Venus looks as if it has had no plate tectonics and has taken a very different course.

On our home planet, mascons have not been discovered. We know that Earth has had continuous plate tectonics. This convulsive crustal movement on Earth has provided for a more homogenous distribution of dense mass materials destroying the possibility of mascon formation.

7. Mascons and Exploration

The mascons have had dramatic effects during past exploration and will need to be considered in future planning for satellites and manned missions. One example of the effect that mascons can have was clearly demonstrated during the Apollo 11 mission.

In 1969, the Apollo 11 landing module was pulled downrange from its planned landing site by up to 6 kilometers by the mascon Lamont located in the western Mare Tranquillitatis (Dvorak & Phillips, 1979). The module was being pulled off course and over a crater and a field of large car sized boulders. If it were not for the skill of Neil Armstrong who took over the controls of the Lunar Module in the last few minutes of the landing approach, the Apollo 11mission may have ended very differently. This was one of the first dramatic effects of a gravitational anomaly produced by a mascon.

During the Apollo 16 mission in 1972, a small subsatellite (PSF-2) was released for a scientific experiment. The satellite was to maintain a low orbit around the Moon. The orbit fluxed widely and the satellite came as close as 6 miles to the Moon's surface and then would return to a safe 30 miles away. After two weeks in orbit, the satellite crashed onto the Moon. The increased gravitational pull of the mascons seemed to have been sufficient to alter the orbit and eventually bring down the satellite.

Trudy Bell reviews the gravitational effects of mascons in her NASA article, *Bizarre Lunar Orbits* (Bell, 2006). Bell states that Konopliv believes the Moon to be

a gravitationally lump place and sites Konopliv saying:

"The anomaly is so great – half a percent – that it actually would be measurable to the astronauts on the lunar surface. If you were standing at the edge of one of the mare, the plumb bob would hang about a third of a degree off vertical, pointing toward the mascon. Moreover, he further states: If an astronaut in full spacesuit and life support gear, whose lunar weight was exactly 50 pounds at the edge of the mascon would weigh 50 pounds and 4 ounces when standing in the mascon's center."

With the examples cited above, one can clearly see that mascons can create interesting but somewhat benign effects or forces that can be dramatically perilous and must be accounted for as exploration continues.

8. Conclusion

Even with growing knowledge, mascons are still somewhat obscured in mystery. Most scientists agree that the mascons resulted from large impacts on the Moon's surface. The impacts broke through the crust and fractured the iron rich mantle allowing it to uplift. Most likely, the uplifted mantle in the impact basin laid dry for millions of years. Once the lava flows started, they repeated over long periods allowing emplacement of one flow over another with later flows probably emanating from the highlands as demonstrated with Serenitatis.

The uplifted mantle and the lava flooding within the basin are probably collective in producing the mascon strength. However, mascons exist with little if any lava flow emplacement. This fact indicates that mantle uplifting may be sufficient to produce gravitational anomalies.

The similarities and differences among mascons can be striking. Many of these differences are most dramatic as compared to those found on the near and farsides. Still, further research needs to be done to comprehend mascons in all their dimensions regardless of location or geological formation. Some questions about mascons may not be answered until we are able to move about the Moon and conduct the research first hand. Even when that is accomplished, these master-pieces of complexity will still add another dimension in making our Moon a unique and intriguing world.

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Note: this article is online at:

http://www.moonsociety.org/science/Mascon_Article_Ron_Brooks.pdf

Ron Brook lives near Akron, Ohio and is a candidate for the Moon Society Board of Directors. With his considerable scientific knowledge about the Moon, he has a lot to offer.

MMM hopes to publish more fine articles by Ron in the future.

Apollo 15, Hadley Rille, and Beyond
Ideas for Encore Missions and Projects

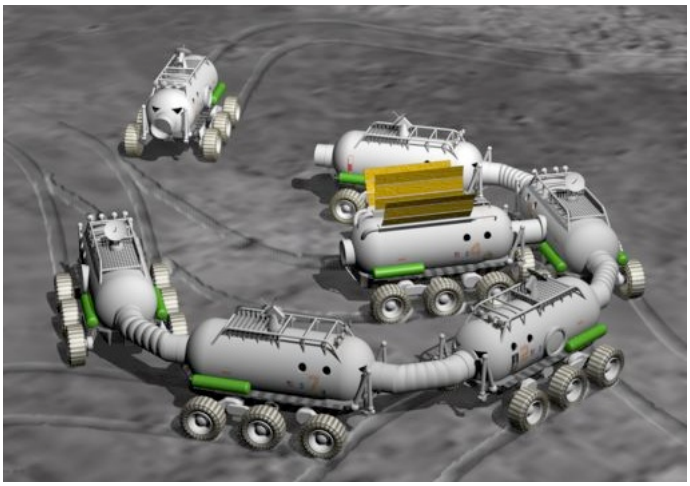
By Peter Kokh

Future Lunar Transports

Apollo 15 was the first Moon mission to include an open, electric "moon buggy" to allow the astronauts to explore farther afield. Given that the chosen landing spot was the first truly scenic and geologically complex area visited to date, this was a very timely inclusion.

In the years since, NASA has tested a variety of successors, concentrating on suspensions, at first. More recently, NASA has been testing a pressurized rover from which astronauts could exit out on to the surface via what I cal "suit-locks" instead of air-locks with their time-consuming pre-breathing process. (Below) More on that in a special article in next month's MMM, #246.

All sorts of utility vehicles will be needed if we are to establish a permanent outpost, not just explore. But there have been studies of mobile outposts where the whole purpose is to explore on the move. (Below)



Gathering the wagons into a circle for nighttime camp: straight out of the US Western expansion days in the second half of the 19th Century! There could be a large inflatable for special functions. Unfortunately, to visit a neighbor 3 "wagons" away, you would have to make your way thru the intervening ones!

On the Moon, night does not come on a convenient 24-hour schedule, so perhaps some shading provision should be made when one's 24-hr scheduled "night" is at local "high noon!" It would help with heat management.

For another concept of a "mobile base" on the move, as illustrated by Pat Rawlings, go to:

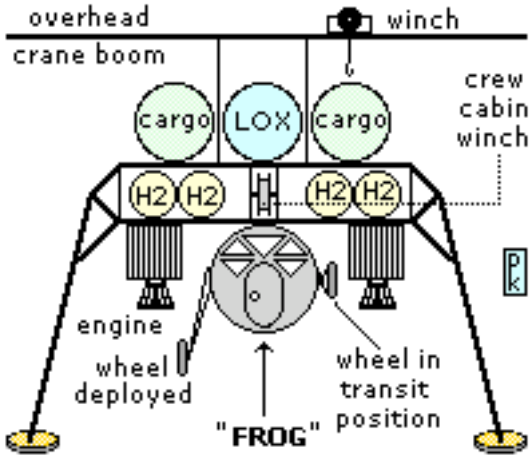
http://www.moonsociety.org/images/changing/asi20010 0007.jpg

A 15-person Moon bus designed by Gregory Bennett and Shane Pekney for the Artemis Project 1999

For a full set of drawings for this 15-person bus, see: http://www.moonsociety.org/images/changing/asi19990 0030-33.gif

"Amphibious" Lunar coaches

In our 1991 paper on the Lunar Hostel, we introduced the concept of amphibious vehicles, capable of traveling in space and on the lunar surface. The "Frog"



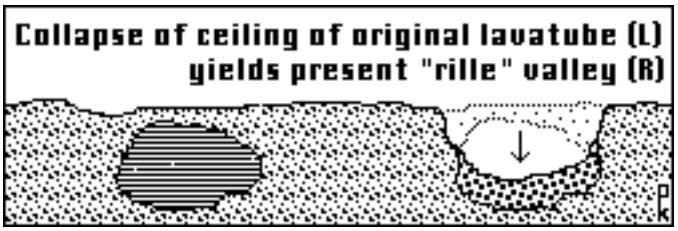
This lander crew cabin, with its own ground chassis, would winch down to the surface, and after its mission was done, winch back up for the ride home. Thus one crew cabin serves as transport on the Moon as well as to and from the Moon. The "Toad" would be similar, but stay on the Moon for the rest of its service life.

http://www.moonsociety.org/publications/mmm_papers/hostels_paper1.htm

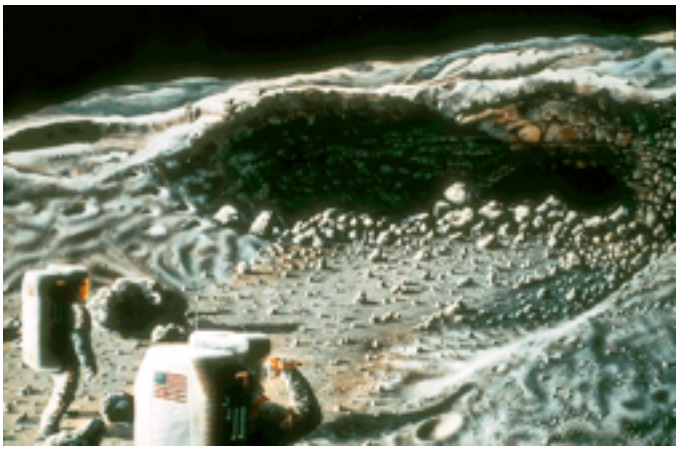
Later, Pat Rawlings developed a similar amphibious concept with the chassis waiting on the Moon for the arrival of a lander crew cabin. Lowered on the waiting chassis, it drives to the waiting outpost. An *improvement*, this universal chassis can fit various width cabins.

Exploring Rilles

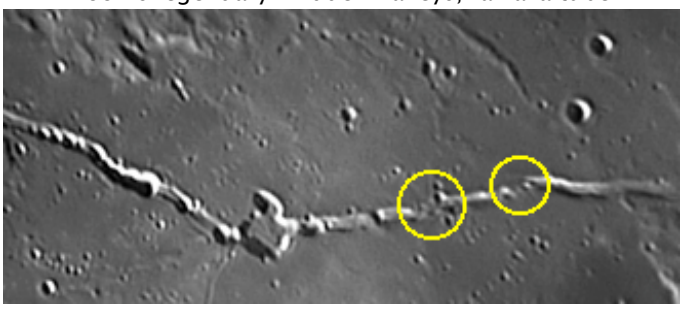
Rilles are universally believed to be the collapsed remains of very large lava tubes whose ceilings were not thick enough to prevent collapse. But there are borderline cases where part of the original tube has collapsed, part remaining intact, and that presents the opportunity to access a lavatube from within the rille. The vertical cross section of a rille depression gives a good indication of the cross-section area of the lavatube whose collapse left the rille as a relic.



The classic Pat Rawlings painting that follows shows astronauts gazing at such an entrance, which as collapsed rubble or talus, will be challenging to traverse in order to get inside.



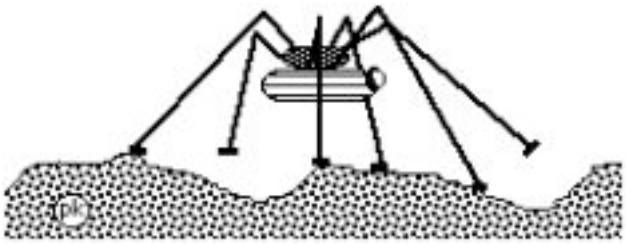
The discovery of spacious waiting shelter! One of the Moon's legendary "Hidden Valleys," a Lava tube!



Above: suspected intact tube sections in Hyginus Rille

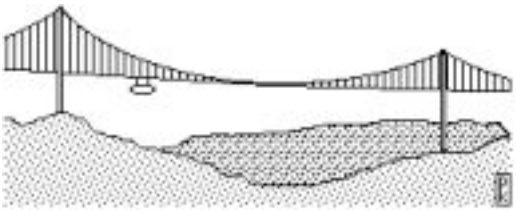
Rilles as Obstacles

We find rilles in the otherwise relatively smooth- and easy traverse lava plains or maria. Some rilles are short, a few miles or tens of miles, but others meander considerably longer. Crossing them could be a challenge. But a detour could mean trips tens to hundreds of miles out of the way**. If we foresee a need to cross such an obstacle repeatedly, we'll have to engineer some way to do that.** A bridge would be warranted only for expected high traffic, however. So what could we rig in the meantime? In the early years? Some rilles are narrow, others quite wide. **This is the subject of one of the design contests announced on page 16 this issue.**



Above, a "Daddy Longlegs" spider craft such as we have suggested as the vehicle of choice in many rugged highland areas, would be one way to climb down into a rille and up the other side. Could we program it to return to the first side on its own? Or if we found it parked on the other side, could we signal it to come back to our side and fetch us?

A future solution, once traffic warrants.



Fantasy

Is it far fetched to think that future scenic drives or parkways or scenic train routes might hug the crests of meandering rilles? Not sure about the green faux turf, but someday, we might go even further, vaulting and pressurizing larger rilles and creating luxuriant green "national parks" within them. Lunar pioneers will need to dream and dream big, and to keep pursuing those dreams. Frontier life is rough, and chasing dreams is essential to eventual prosperity and fulfillment.

At least there is nothing wrong with letting our imagination help us introduce the future bit by bit! Send us/MMM your own suggestions and designs! **PK**

Don't Forget!

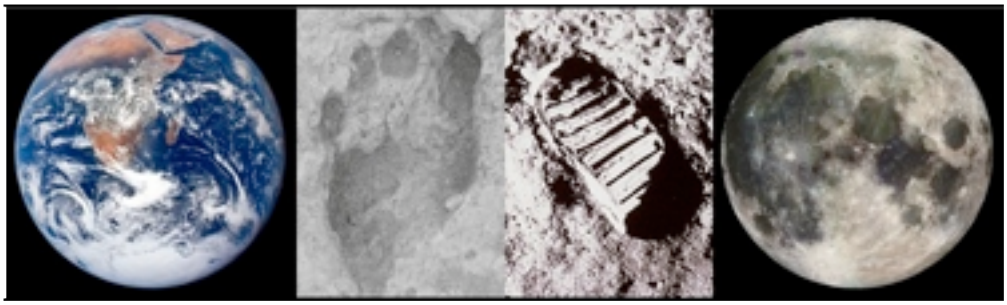
Deadline for entries to our

Space Tourism Essay Contest

July 1st

http://www.moonsociety.org/reports/space_tourism_contest.html
http://www.moonsociety.org/publications/moonscapes/2011/moonscapes7.html

From Africa to the Moon, the Human Epic, told in footprints, Continues to the Stars!



Our Goal is Communities on the Moon involving large scale industrializa-tion 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 involving large-scale industrialization and private enterprise.
- 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, 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, competitions & contests, workshops, ground level research and technology experiments, private entrepreneurial ventures, moonbase simulation exercises, tourist centers, and other means.

Interested in having input? Any member may ask to join the Leadership Committee and attend our Management Committee meetings held twice monthly. You may even express opinions. Decisions are often made by consensus, so this input has value. Write president@moonsociety.org

Moon Society Elections 2011 Ballot

From the Moon Society Elections Secretary

Dear Moon Society member,

We are now conducting the annual election of officers and directors of the Moon Society. This election is being conducted by both email and paper mail ballots. You may vote either way. Your ballot must be received (email) or postmarked by August 1, 2010.

Three **Directors** will be elected or re-elected this year: all for 2-year terms

Two **Officer** positions of **Vice-President** and **Treasurer** are up for re-election as usual in odd # years, for 2-year terms. This year, the other two officer positions – **President** and **Secretary** are open as well, the first through retirement, the second through vacancy. Both are to fill the remainder of terms normally open in even # years. The incoming President and Secretary will be able to run for election to full 2-year terms next year

An electoral statement for each candidate is included at the end of the ballot [pages 10-11]. Please consult these statements for guidance in voting.

We have sent an email ballot out to all current members with valid email addresses on file. If you did not receive them, it may mean that we do not have your current address or it was blocked by your spam filter.

If voting by email, please include your member-ship number, if you know it, and email your completed ballot to this email address:

mailto: elections@moonsociety.org

If you vote by mail, send the paper Ballot to:

Moon Society, PO Box 940825 Plano, TX 75094-0825

Postmarked by August 1, 2011. Do not forget to *sign* the ballot and, if you can, enclose your *membership number.*

OFFICERS VOTE

President (Vote for one) for remaining year of current term ending in 2012, being vacated by Peter Kokh
[ ] Kenneth J. Murphy #1272 (since May 4, 2003)
[ ] write in candidate _____
Vice-President for 2-year term ending in 2013
[ ] Paul Banyai #1126 (since August 22, 2001
[ ] write in candidate _____
Secretary for remaining year of term ending in 2012
[ ] Peter Kokh #239 (since June 26, 1995)
Treasurer for 2-year term ending in 2013
[ ] Dana Carson #10 (since September 1, 1994)

BOARD OF DIRECTORS VOTE (in order of seniority)

[ ] Bryce Johnson #700 (since March 9, 1999)
[ ] Jason Tuttle # 1549 (since March 18, 2009
[ ] Ronald Brooks #1554 (since March 20, 2009)
[ ] write in candidate _____

Voter's Signature_____

Membership # (if known) _____

Moon Society Candidate Statements

For President, Ken Murphy # 1272,
[2nd half of term ending 2012]

The space industry faces many challenges as it transitions to the 21st Century, and so does The Moon Society. Despite offering enormous resource and energy opportunities, the Moon remains an unknown domain for most people in the world.

To address this challenge, as president of The Moon Society I would undertake the following strategies:

1) Grow the membership rolls, especially amongst younger Moon-interested audiences.
2) Use the growth in membership to spur the formation of more chapters and outposts.
3) Task the chapters with organizing talks and lectures in their local communities on Moon topics.
4) Continue to grow the organization internationally.
5) Secure a stronger financial position for The Moon Society so that it can undertake increasingly ambitious projects.

The framing of our near-term space efforts, absent leadership from NASA, is quickly gelling around the idea of "Cislunar Space" as a place for increased commercial activity, which works to the benefit of The Moon Society. There will be increased interest in the Moon along non-traditional lines, and The Moon Society is well-positioned to be a thought leader in that regard. Not just in the U.S., but around the world.

As President of The Moon Society, I would work diligently to promote increased awareness and education about the Moon in popular culture, to focus the space industry on the Moon as a destination and marketplace, and to build on the foundation laid for The Moon Society by its leadership to date. I would work to further strengthen ties with other space organizations like NSS, SFF and SEDS to achieve our common objectives. I have a number of ideas for new projects in addition to the existing efforts of the organization.

However, ambition is wedded to resources, and so it is crucial to strengthen the resources of the organization, both in membership numbers and financial wherewithal. Without these two crucial ingredients all of our brilliant ideas are nought but fancies, and so these must be a priority not only for the office of the president, but for all of the membership if the organization is to grow and prosper in the years ahead.

To that end, I challenge each member to find another Moon-interested individual in his/her community and tell them about The Moon Society. It might be someone in the local astronomy club, or a Solar System Ambassador, or a student. Make it your job to get them signed up.

To further these ends, if elected president of The Moon Society my first act will be to invest in a lifetime membership in the organization as a sign of my commitment to making the Lunar frontier a priority for the 21st century, and The Moon Society one of the leading proponents.

For Treasurer, Dana Carson #10, 2 yr term

I'm a computer consultant dealing in web-based systems. Previously I worked for Westinghouse Aerospace building tools for the embedded systems developers. I've been a space enthusiast since Apollo and have been on the board of the Moon Society since its founding.

For Vice President, 2 yr term: Paul Banyai #1126

It is time to enter the 21st Century. We need to keep up with the times in order to keep growing and improving. We need to become a single united social network representing the dreams and hopes of an age of true space colonization.

I have been a member of the Moon Society since 2001. While I was aware of the Artemis Society for several years before joining the Moon Society, I did not join it because it was already starting to look outdated and ineffective. When I originally noticed the statement about "Our **Virtual** Lunar City" my first thought was "how awesome that this group is so tech savvy that they have something like Everquest or Ultima Online." However, I soon learned that instead of a cutting edge representation of lunar colonization it was instead an 80's style text game with some basic instant chat included in it.

I joined both the Moon Society and the Mars Society a few months before graduating college with a bachelor degree in geology with a personal focus on space. I kept my membership in the Moon Society since it was more focused on what individuals can.

We need to expand our connection to lapsed/non-subscribed members and to new potential members. Our presence on Facebook is in fact almost double that of the Mars Society with over 2800 people familiar with us which makes me wonder why we have less than 200 active subscribed members out of at least 1600 enrolled members. Assuming that a quarter of our enrolled members are on Facebook we could have over 2000 potential new members. We need to give them an incentive to become paid members, to stay paid members, and to invite their friends to become members. I would revitalize our social network pages with current Moon Society events and activities as well as teasers of membership benefits and how volunteers can help get us back to the Moon. I would also bring our internal communication system into the 21st Century and bring back the eye catching **wow** factor that the Moon Society can actually lead the way to lunar settlement.

Outside of online social networks there countless individuals who only show their interest in space by purchasing space related items i.e. books, magazines, dvds, etc. For example we have "endorsed the Space Settlement Initiative as the most realistic and achievable method for encouraging private enterprise in outer space", yet there are countless people who are purchasing Virtual land deeds without any true forum for representing their interest in space colonization. These people are essentially stuck with the same archaic situation as our text-based Virtual Lunar city. There can be *no* Space Settlement without first *real* representation.

For Secretary, Peter Kokh #239,
[2nd half of term ending 2012]

I much appreciate the strong member support given me as President of the Society for these past seven years. I have done my best to grow the Society in every way I could: exciting new projects chosen to advance our goals; growing our family of publications, supporting our chapters. But despite all those efforts, our membership level has just been steady, new members balancing those not renewing. To some extent, this is a sign of the times, as most other space supporting organizations have seen strong declines in membership.

There have been frustrations as well: we have not been able to put together the teams needed to pursue ambitious projects to their conclusion. One of the projects dearest to me, a lunar analog research station of our own, would requite considerable sums of money as well as a broad member support team. Both of these have remained out of reach. All of these things remain quite doable but only with a larger membership base and a proportionately larger team of active volunteers

It is time to pass the torch. I am delighted that Ken Murphy has stepped forward. He is bright, talented and accomplished and deserves member support. His focus will be on growing the membership, particularly among younger generations. So my decision to step downs seems to have been timely.

But I will not be disappearing. As Secretary of the Society, a position that has been empty for some time, I will be a voting member of the Management Committee (Officers and Directors together). I will work to support Ken's initiatives, and assist, where asked, in website maintenance, chapters support, exhibits, and elsewhere as it suits him. I will continue on as Editor of Moon Miners' Manifesto indefinitely, so long as I am able. And perhaps get a start on "MMM the Book" ("A Pioneer's Guide to the Lunar Frontier")

While NASA's focus will be elsewhere, now is the time for us to lay foundations and promote developments that will *accelerate* things in the long run.

For Director, Bryce Johnson #700, 2 yr term

I was elected by the Society Board of Directors in November of last year, to fill a Board seat vacancy created by James Rogers' departure for military service. In the brief time since, I have helped connect the Moon Society leadership with expert input for the Lava-tube Skylight Explorer engineering competition effort, and assembled a contact list of veterans' organizations for our membership outreach. Currently, I am renewing development of a chapter in my hometown of Rockford, Illinois.

With Board approval, I am also initiating contacts with former members of the Moon Society to renew their interest or at least get their input on the Society's future. And the year is only a third over. Building membership isa particular interest of mine. I have set a personal goal of adding five new members to the Society this year through these efforts.

A thriving, vibrant society needs frontiers. I reject completely the notion that this is not the time or circumstance for a U>S> return to the Moon. On the contrary, a well thought out program for lunar settlement is one of the most powerful tools at our disposal for dealing with our economic circumstances. The Moon Society is uniquely placed to bring the potential of lunar settlement to the public view. We can help people find their inner astronaut.

Going forward I value communications with other Moon Society members and hearing their views and suggestions about where to go from here. S[ace has worked hard for us. It is time to return the favor. ***

For Director, Jason Tuttle #1549, **2 yr term**

On May 19, 2011 I was elected by the Moon Society Board of Directors to the office of Vice-President of the Society, this position having been vacated in mid-term by Charles Radley. Now I am running for a full 2-year term.

I live in Lenoir City, TN about 40 miles ESE of Knoxville. I originally found the Moon Society while conducting research for a paper regarding communication. I quickly fell in love with the ASI-MOO, as many of those frequenting this special chat room have similar/same interests as myself.

I have been working in the computer industry since 1992/1993. I have always had a love for the Moon, and a general passion for space in general. I would like to see us furthering our reach and making more people aware of the Moon Society. One particular demographic would be middle-school and high-school students.

I have been working on a draft proposal for the i6 Challenge, set forth by President Obama. I have enlisted the assistance of the local EMA Director, the Captain of the TN State Swiftwater Rescue Squad, the commander of Homeland security for Tennessee, and a personal friend and a upper-level/manager at the Dept. of Energy. So far, I've been focusing my efforts of the proposal to include a theme based around a mock-Moon settlement.

In connection with the above project, I am interested in investigating the suitability for some local marble quarries as a lunar analog site. There may be one or two sites with possibilities but some are flooded and draining them might not be feasible. One is near the University of Tennessee.

For Director, Ron Brooks #1554, 2 yr term:

I have been a member of the Moon Society for two years and have enjoyed the association with those with the same interests. Within that time, I built an extensive lunar library and a research database. I enjoy researching varied topics especially the geomorphologic aspects of the Moon.

Astronomy and space exploration have been a lifelong interest. However, I become deeply involved in the early 1990's after joining a local astronomy club. My interests continued to grow in all aspects of astronomy. However, during many club observation nights the Moon held little interest to most of my club members and was looked upon as uninteresting and commonplace. Then, a couple of years ago, on a clear crisp night in my own backyard, I turned my telescope to the Moon and began to study it. I was captivated with what I saw and with revitalized energy; the Moon became my complete focus of attention.

I was in education 39 years. For 23 years, I served as an elementary teacher, principal and county supervision director. I finished my time at Lake Erie College as an Associate Professor of Education. I also had a very rewarding opportunity to teach an introductory course in astronomy in the Science Department. I lived and taught in England. Afterward, I returned to England yearly with students from the College to study the English/Welsh education system.

I have belonged to many societies and organizations as a member and in leadership capacities. I have extensive experience in writing and organization and have always been eager to take on new assignments.

I received my masters in 1972 as a Mathematics Specialist and a Doctorate in 1988. I would like to help our society in any way that I can and hope some of my experiences and preparation can be used. I would be very pleased to contribute in keeping the enthusiasm alive for exploring and colonizing our Moon. ***

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 **Dec 19th , Jan 19th, Feb 19th**

Moon Society Phoenix April 16th Meeting Report

Meeting was held at Denny's at 3: pm on the 16th with four active members attending.

We reviewed and discussed our various panels and demonstrations for the Leprecon37 convention. I will be repeating my "Disaster Strikes" panel from Copper-Con30 with our new member, Felix Polz, assisting in the presentation. I have also added a panel for the "Industrialization of the Moon" which will be Felix's presentation primarily and also a panel for "Lunar Ground Transportation" which will be a review what has gone before, including designs for advanced Lunar Rovers, then move on to Peter's Railroads for the Moon and my Maglev Monorail for the Moon. Offering the advantages of each and their part in the settlement of the Moon.

Don and Stuart will have a demonstration of the "Telepresence Radio Control Racing" in the Hotel Court Yard Saturday Morning and Afternoon, also in the Court Yard prior to the RC Racing will be a panel on "Regenerative Survival Systems".

Don will also have a panel on "One-Way ticket to Space", one definitely not to miss and it fits into our basic premise on settling the Moon. Don, being an author also has a reading late Saturday afternoon and an erotic panel "Share the Love and Lust" late Saturday evening.

We will have our Out-Reach Table up and running Friday afternoon until Sunday evening. We will have someone on the table the whole time to hand out material and answer questions. Part of the time the manning may be by MENSA people as a favor to us, but they will be familiar with the Moon Society and our Goals.

Moon Society St. Louis Chapter

http://www.moonsociety.org/chapters/stlouis/
Contact: Keith Wetzel <kawetzel@swbell.net>
Next meetings – Dec 16th, Jan19th, Feb 16th
Meetings 3rd Wed monthly at Buder Branch Library
4401 S. Hampton, in the basement conference room

The April meeting of the St. Louis Chapter of the Moon Society was held Wednesday evening, April 20th, with Karl Strassman, Mark Rode, Bob Perry, Dabney Tolson, Dave Dietzler, Jim Merriman, Steve Massey, and Wesley Garener in attendance. Jim met Steve and Wesley at "Yuri's Night at St. Louis University" and he invited them to our meeting. Since they were new, we went around the table introducing ourselves with brief "bios".

Another result of Jim going to Yuri's night, we have been invited to participate in "The 1st Annual Youth Gateway to Aviation Day" at Parks Aeronautical College, a branch of SLU, on June 11th, by Brooke Lund. Brooke, Steve, and Wesley are active in SEDS at SLU. Mark led off with an overview of his innovative rocket design, entered in the "Create the Future 2011 Design Competition".

http://finance.yahoo.com/news/Design-Engineers-Worldwide-prnews-3906687303.html?x=0&.v=1

We will post his summary on our website.

Next, Bob Perry played a 4-m video by Marcin Jakubowski, "Open-sourced blueprints for civilization"

http://www.youtube.com/watch?v=6GEMkvT0DEk

Marcin talked about open-source building basic machines from scratch and providing that information to the world on the Internet and on CDs. Dave talked on in situ resource utilization on the Moon. Since exporting anything to the Moon will be prohibitively expensive in the foreseeable future, *what is the minimum seed for bootstrapping an industrial society on the Moon?* The Moon will become the gateway to the solar system, as exporting things from the air-less Moon requires only 1/20th the energy as from.

Bob launched into one of his favorite topics, Fermi's question. We are certain that the human race will establish itself on the Moon and Mars and spread out into the solar system. By the end of this century we might be so successful in utilizing the resources of the solar system and the energy of the sun, we might send out star ships. If daughter colonies are established in other solar systems - beware of planetary chauvinism, space habitats may be the way to go - then they might send out colony star ships in two hundred years or so. With exponential expansion, the human race will colonize the galaxy in a geologically short period of time. So, Fermi's question, if we can do it, and our solar system is 4.5 billion years old, and the universe is 14 billion years old, why hasn't some older race done it - "where is everybody?" One possible answer is Roddenberry's "Prime Directive".

Another "Bob subject" is NEOs and the impact hazard. "Earth is too fragile a basket for all humanity's eggs". Bob sent Steve and Wesley some relevant URLs.
Bob and Jim are going to ISDC 2011 in Huntsville next month. Then in June we will participate in the event at Parks and then, the first weekend in October, Archon 35.

Moon Society Houston Chapter

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

The Houston Chapter's next regular meeting is scheduled for **Monday, May 16 – see details below.**

April Events Report: The Clear Lake Area (Houston) NSS & Moon Society chapter hosted a special party this past April 12 in observance of the 50th anniversary of the first human spaceflight (Yuri's night) and the 30th anniversary of the first Space Shuttle flight. The party was held at the home of one of our friends, and we munched on snacks and enjoyed refreshments while watching *Space Cowboys* and *The Right Stuff*. Marianne Dyson brought some of her memorabilia from Mission Control on the STS-1 flight, and we had the chance to meet and hear from some seasoned Apollo program.

The Houston Chapter's next regular meeting will be at 7:00 p.m. Monday evening, May 16, in the conference room of the Bay Area Community Center in Clear Lake Park; 5002 NASA Road 1; Seabrook, TX 77586. We hope to see you there! – Eric Bowen

Chapters & Outposts Map (North America)

www.moonsociety.org/chapters/chapter_outpost_map.html

Chapters & Outposts Events Page

www.moonsociety.org/chapters/chapter_events.html

< End Moon Society Journal Section >

GREAT BROWSING

SPACE TRANSPORTATION

http://nextbigfuture.com/2011/03/**vasimr-plans-for-5-10-years**-path-to-6.html

http://www.ted.com/talks/**burt_rutan_sees_the_future_of_space**.html

http://www.spacedaily.com/reports/**TED_Talks_For_Space_Junkies**_999.html

http://www.pddnet.com/news-**lockheed-martin-shows-test-spaceship**-032211/

THE MOON

http://nssdc.gsfc.nasa.gov/planetary/lunar/**lunartimeline**.html

http://en.wikipedia.org/wiki/**List_of_artificial_objects_on_the_Moon**

http://www.**mapaplanet**.org/explorer/**moon.html**

Flight Opportunities to Low Lunar Orbit

http://www.spaceflightservices.com/MHome.php

MARS

http://www.**mapaplanet**.org/explorer/**mars.html**

http://www.marsdaily.com/reports/**Time_Is_Now_For_Human_Mission_To_Mars_999.html**

http://www.colonyworlds.com/2011/03/**conquering-mars-via-bouncing-rolling-robots.html**

ATEROIDS & COMETS

http://www.scientificamerican.com/blog/post.cfm?id=**which-near-earth-asteroids-are-ripe**-2011-03-30

Research finds asteroid Itokawa an ancient rock

http://spaceflightnow.com/news/n1103/13hayabusa/

http://www.dailymail.co.uk/sciencetech/article-1368732/**Test-version-Nasa-Orion-craft-built-given-new-lease-life-Space-Station-docking-vehicle.html**

OTHER PLANETS

http://www.**mapaplanet**.org/

http://www.livescience.com/13282-**nasa-mercury-spacecraft-surprising-facts-messenger**.html

http://www.colonyworlds.com/2011/03/**mercurys-mysteries-may-meet-their-end-with-messenger-probe**.html

http://dalje.com/en-world/**european-space-missions-in-jeopardy**/346780

ASTRONOMY – OTHER SOLAR SYSTEMS

http://www.allvoices.com/news/8463534-official-**huge-telescope-on-the-agenda-in-sw-china**

SPACE STATIONS ISS

http://www.boston.com/news/science/articles/2011/03/17/**nasa_unpacks_humanoid_robot_in_space/**

TECHNOLOGY

http://newscenter.lbl.gov/news-releases/2011/03/14/**breakthrough-in-hydrogen-storage/**

http://www.**hydrogen.energy**.gov/

SPACE TOURISM

http://en.wikipedia.org/wiki/Space_tourist#**List_of_flown_space_tourists**

http://en.wikipedia.org/wiki/**Space_tourist#Orbital_flights.2C_space_stations_and_space_hotels**

GREAT SPACE VIDEOS

MOON COLONY VIDEOS – The Moon Society

30 plus thought-provoking videos, produced for the Moon Society by Chip Proser (Celestial Mechanics, Inc.) can be found at.

http://www.mooncolony.tv/

http://www.gaiaselene.com/

NOTE: Some of these videos were produced by Chip on his own, such as the one on "Global Warming" on which the Society has taken no stand because the leadership is split on this issue

Featured this month:

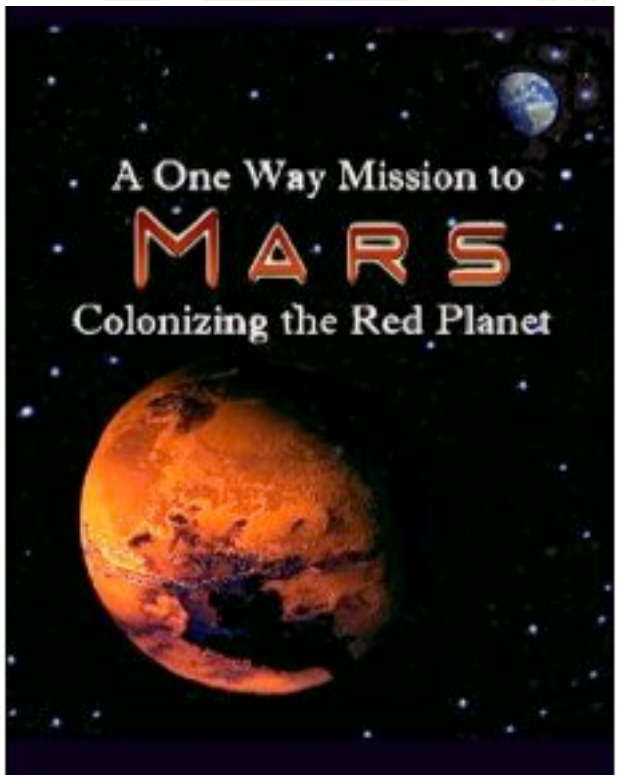
Turtle-Back Spacesuits (in new lunar rover video)
http://www.wimp.com/lunarrover/

National Space Society YouTube Videos
http://www.youtube.com/nationalspacesociety

Space Based Solar Power Alternative
http://www.youtube.com/nationalspacesociety#p/c/17121734C7C43BE7/1/YiU9MibyBJ0

Ways to save the planet – orbital power
http://www.youtube.com/nationalspacesociety#p/c/17121734C7C43BE7/13/oor-ZNFyWSc

THE BOOK WORM



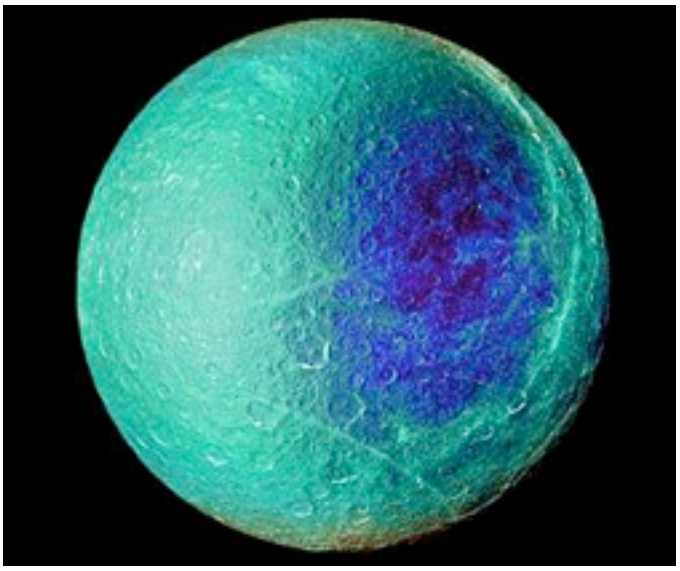
Authors: Edgar D.Mitchell, Harrison H. Schmitt, Markus Hotakainen, Penelope J. Boston, Bruce Mackenzie, Johannes J. Leitner, Pabulo H. Rampelotto , Rhawn Joseph, Paul Davies: **Author-Editor**: Dirk Schulze-Makuch

Hardcover$48 from Amazon.com

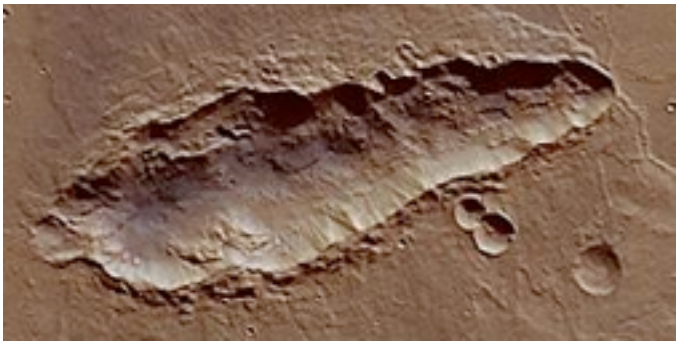
A review at: http://www.zeenews.com/news693015.html

MMM PHOTO GALLERY

Opportunity perched on the SE rim of Santa Maria Crater



Dramatic color view of Saturn's moon Rhea (953 mi diam)



Impact Scar in Mars Southern Hemisphere

NASA considering Orion Capsules for Asteroid Mission

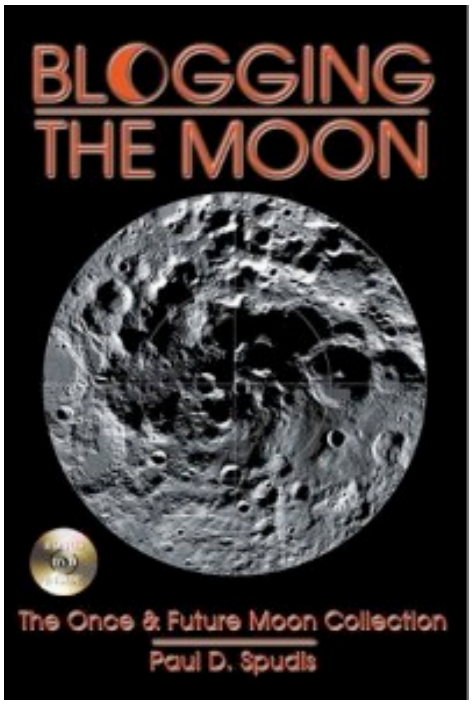
Perigee full moons **L** (closest to Earth c. 216,000 mi) are as much as 14% wider and 30% brighter than Apogee full moons **R** (farthest from Earth c. 252,000 mi)

Yuri Gagarin (white helmet) walking to his capsule for his historic flight April 12, 1961 – 50 years ago.

"And now", as Paul Harvey would say. "you know the rest of the story" – what the next 50 years would bring.

What all will we have done by the 100th Anniversary?

A Book Review by Ken Murphy: "Blogging the Moon" by Paul D. Spudis



Published in 2011 by Apogee Prime, the book weighs in at 328 pages, plus a DVD of his talk "Luna Nova" and a slideshow of his personal Moon quest over the past three decades. Well edited, with the only noted errors in the included commentary.

It might seem counterintuitive to publish a print book of web content, but it's not new in the space community. The first notable example of web content collected into book form would likely have to be the PERMANENT book, drawn from the www.permanent.com web site which addresses Projects to Employ the Resources of the Moon and Asteroids Near-Earth, Near-Term. Which sounds an awful lot like what Dr. Spudis is talking about.

The book opens with a brief preface describing how the author came to have a blog at Air & Space Magazine online entitled The Once & Future Moon, which name is taken from his 1996 book, it's title an homage to the T.H. White book that all future leaders should read as a young lad. As so often happens with blogging of substance, the frequency of the blog posts may not have been what management expected, the posts themselves were usually worthy of their episodic (rather than periodic) nature. (Paul has admitted that blogging is a lot more involved than he had anticipated. Amen to that)

The original offer was to have Dr. Spudis "live-blog" the launch of India's Chandrayaan-1 probe, which carried Dr. Spudis' Mini-SAR instrument to the Moon, recounted here as "India Aims for the Moon". The story continues with "Hitting a Bull's-Eye on the Moon", where he recounts the thoroughly modern story of sitting in his hotel room at 4am, having just gotten images from Chandrayaan's Moon Impact Probe (MIP) that evening, and live-streaming the upcoming Endeavour launch and seeing a full Moon slowly rising above the horizon in the Florida twilight, from Bangalore. This is also the first post to include the article's comments.

Readers want constant novelty (for free!) and so there is a constant pressure on bloggers to generate new posts to try to get the traffic numbers up. This leads to Dr. Spudis posting on a variety of topics, in many cases policy-related, but also regarding legal issues, Lunar water, myriad reports on space issues, and a host of other things, for a total of 65 chapters dating from October 21st, 2008 to July 23rd, 2010.

Over that timeframe, NASA "bombed" the Moon with LCROSS, and the President released a new prescription for NASA, one involving less work on a custom new launch vehicle system (that was apparently too expensive to actually do anything with once built) and more work on moving the technologies useful for doing things in space, like fuel depots, rendezvous & docking, on-orbit assembly, radiation shielding, many-restart rocket motors, and so on. Which technologies can be used by the private sector to serve not only their own ends, but also those of NASA.

Dr. Spudis doesn't quite see it that way, and spends much of the latter part of the book detailing his views on the shortcomings of the President's directions to NASA. His argument seems to boil down to "NASA needs to have a specific target and direction before they can achieve great things". The danger therein, however, is that NASA's results tend to be optimized to that particular target/direction, with little cross-adaptability to any other application in space activities.

Including the comments that people leave at the blog expands the context of each post to that of a dialogue with both the author and other commenters. In some instances this aids in understanding each post, in others the thread can be drawn astray from Dr. Spudis' intent, and has to be shepherded back on topic. Even these diversions, though, often have their own value.

Overall, the book is an interesting foray from Lunar science in India, to rocket design in the halls of Congress. It's readily accessible to the layman, but given Dr. Spudis' position in the forefront of Lunar science it also offers numerous insights on the advantages of the Moon for more informed readers. The book format allows for easier flipping back and forth between related blog posts, as well as the ability to jot notes in the margin to capture important points. I'll have to be sure to get the Paul to sign the review copy in the Lunar Library at the next ISDC, where he is slated to receive **the University of Luna award** from the Moon Society.

A solid work in every way, this one gets a Full Moon rating. KM

Other Books by Paul Spudis

- **The Once an Future Moon** (Nov. 1996)
- **The Clementine Atlas of the Moon** (May 2004) (with Ben Bussey)
- **The Geology of Multi-Ring Impact Basins: The • Moon and Other Planets** (February 2005)
- **Moonwake: The Lunar Frontier** (Dec 2005) (with Anne Spudis)

Mars: Ever Cold, Mostly Dry
An Alternative Reading of Mars' Past

MMM Special Report on a S.E.T.I. Presentation

By NASA Ames Mars Scientist Pascal Lee

The **Haughton impact crater** site on **Devon Island**, in Canada's High Arctic, is one of the most Mars-like places on Earth. Since 1997, the Haughton-Mars Project (HMP) has been conducting science and exploration research at the site, from the HMP Research Station (a kilometer from the Mars Society's analog research station. HMP is now the largest privately operated polar research station in the world, sponsored by NASA, The Mars Institutue, and the Canadian Space Agency.

↑ Map of Devon Island |Aerial view of Haughton Crater ↓

Geology and astrobiology investigations on Devon Island have led to the formulation of the "Mars, Always Cold, Mostly Dry" Model that clashes head on with the "Warm and Wet Early Mars" model now in vogue. While the first reaction may be "Oh, No!," the more you look and listen, the more it becomes clear that Pascal's reading of the Devon Island landscapes is clearly a closer match to what the various Mars orbiters and rovers have found and are finding on Mars itself.

The tug of war between Mars "romanticists" and Mars "realists" has been going on for centuries. And the truth may prove to be somewhere in between. That early in the history of the solar system, the sun was not as hot and brilliant as it is now has been a hurdle for the "warm and wet" interpretation.

Most of us are far, far more familiar with river and valley systems formed by seasonal rains than we are with at-first-blush-similar features formed by sub-glacial flowing water. Pascal shows the clear differences, as are evident with features on Devon Island that are a very close match to features we see on Mars.

Do watch Pascal's 45 m. presentation given at

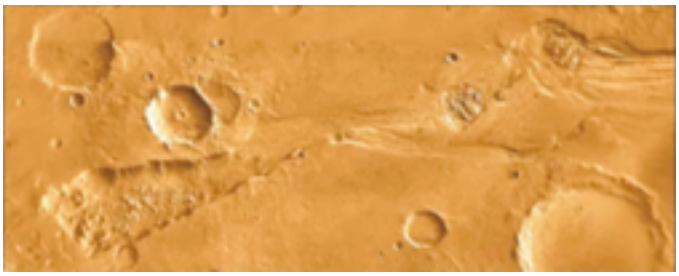
http://www.parabolicarc.com/2010/11/19/video-pascal-lee-haughtonmars-project/

http://www.youtube.com/watch?v=nJWinS8fi-8&feature=player_embedded

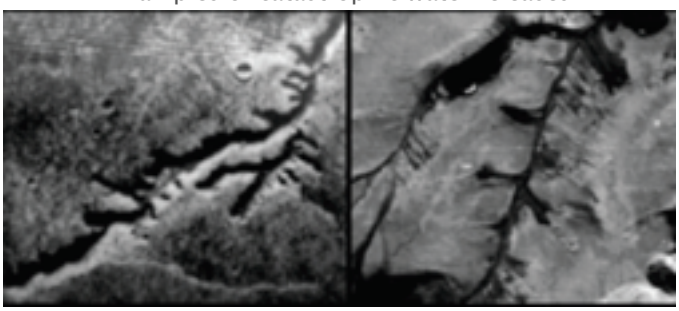
"The Haughton impact crater site on Devon Island, High Arctic, is one of the most Mars-like places on Earth. Since 1997, the Haughton-Mars Project (HMP) ↑ has been conducting science and exploration research at the site, and established the HMP Research Station, now the largest privately operated polar research station in the world. Geology and astrobiology investigations have led to the formulation of the "Mars, Always Cold, Sometimes Wet" Model. Dr. Pascal Lee will describe how Haughton is being used to conduct exploration investigations which are helping pave the way towards the first human mission to Mars."

Major issues for "Warm-Wet Mars" models

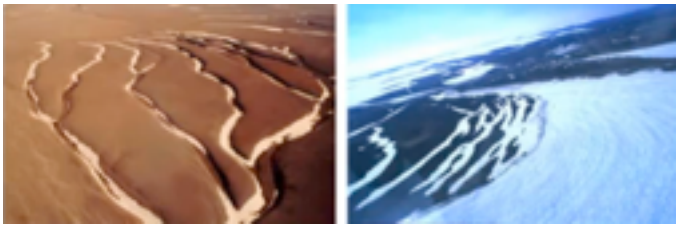
1. Faint Early Sun Paradox: Sun was 25-30& dimmer during Early Mars period
2. Climate Models have extreme difficulty making Early Mars Climate Wet and Warm – an atmosphere 2-10 times as thick as Earth's would be needed,
3. Poor Analogs make for Wrong Conclusions. Geomorphology as a tool should be used with caution.



Examples of catastrophic water releases



Only confined water flows (e.g. underground, sub-glacial) can be forced to flow "uphill.



Pascal Lee has illustrated his case well and convincingly. Cold Dry Mars is now the hypothesis to beat. **MMM**

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

LRS News

● **LRS decides to sponsor design competition:** At our April 9th meeting, we discussed using some of our Bequest funds to sponsor design contests that would key into the 40th Anniversary of the Apollo 15 mission July 26-August 7th.

- Design **a pressurized rover for tourists**;
- Design **a first tourist hostel**;
- Design **a way to cross to the other side of a rille**.

We approved this idea and will see if Apogee books would be willing to co-sponsor. See the Moon Society announcement for details.

● **ISDC 2011 in Huntsville:** It looks like only Dave Dunlop will be going this year as registration rates are excessive. Last year in Chicago, we had at least six members and a major exhibit.

● **ISDC 2012 will be in Washington DC:** details to come

LRS Upcoming Events

Saturdays: 1-4 pm

May 14th, June 9th – *no Meetings in July or August*

LRS Meeting, Mayfair Mall, Garden Suites Room G110

AGENDA: Video: "**First Orbit**" What Yuri Gagarin might have seen out his window as filmed from ISS along the same orbital path he took 50 years ago!

Ideas for a possible summer Field Trip. Last year, 8 of us toured Growing Power on N. 55th at W. Silver Spring.

Preliminary planning for our upcoming 25th Anniversary in December.
How can we make this one really special?

New exhibits?, catered meal?, special speaker?
Door Prizes? Super special movie?

www.moonsociety.org/chapters/milwaukee/meetings.htm

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
May 21st – June 18th – July 16th

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
Jun16th – Aug 18th- Oct 20th

Our December Meeting will be held as usual conjointly with the Lunar Reclamation Society in Milwaukee, Saturday, **December 10th** – Annual Christmas Party

ILLINOIS

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

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

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 6:15 PM on Tuesdays
May 10th - June 14th – July 12th
Englewood Public Library, Englewood, CO 80110
1000 Englewood Parkway, First Floor Civic Center

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/

Yuri's Night – April 12th
www.freemars.org/mnfan/MNSFS/2011-04-Yuris-Night/
We ran "First Orbit" http://www.firstorbit.org/ [free] created to celebrate 1st 50 years of human spaceflight

Ben's Friday 4/22 Minicon Pix
http://www.facebook.com/media/set/fbx/?set=a.10150173475713516.320590.592718515&l=c9d622f77b

PENNSYLVANIA

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

c/o Earl Bennett, Earlisat@verizon.net
856/261-8032 (h), 215/698-2600 (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: May 6th, June 12th

Our next meeting will be at **The New Jersey State Museum, Trenton, New Jersey, on May 6.** This is **the Super Science** event also**. Our June meeting will be on the 12th**, at Liberty One, on the second floor.

April Meeting report: Mitch came through for us with the last needed document for The Philadelphia Science Festival via his working with The National Space Society. They are our flagship organization and cover us with an insurance coverage as a chapter. This made it possible for us to be part of this fun event. Thank you N.S.S. for the chance, and Mitch for making this happen! (and: Chapters Coordinator Dennis Pearson for taking a hand in getting me moving too). In addition: Mitch got us a large number of Ad Astras for hand outs and printed up our flyers to bring in new members. Much talk on what we could do for the public.

Dotty brought material on The Franklin Institutes movies, the Da Vinci exhibit (ending May 22), and the ongoing Space Command exhibit by Lockheed Martin. Some of the films are now 3D, but not on space (yet). Dotty, and Larry regretted not being able to be with us, but almost where: they where going to Washington and would have stayed here if the shut down had happened.

Larry told us of the increased number of hits on our website, now 525 per month, and says that material added by Dennis is part of the reason. He again mentioned the "flash page (which is the RSS feed for quick updates) on our websites first page. He brought a print out to show us what we had. He also gave examples of our Facebook, twitter and other representations including our reports and calendar. We can post events there via Larry.

Earl brought material on a number of things, but also talked on the report he was working on to keep us a chapter of N.S.S.: to do this I had to send material on our activities, our finances, membership, and reports on our regular meetings. Due to contacts with Dennis, as Chapters Coordinator, and Veronica Zabala, the Chapters Projects and Events Coordinator, I stopped procrastinating and got most of the material in, but was befuddled

by the I.R.S. reporting requirements. Mitch and a member of N.S.S. staff straightened this out. Yeah! Now that's teamwork. On other pre event talk: I reminded our members that Frank O'Brien would join us, and possibly, bring an Apollo guidance computer to exhibit (he did, with great results!). I also discussed work on a new hand outs on various prizes, including the Google Lunar X-Prize, and the N-Prize primarily, and what I thought would be a neat giveaway: balloons in the colors of the Moon, Mars, and Titan. This did not actually happen, but see below. We made our plans and, even though rain was predicted, where good to go.

The Festival: we got our paperwork in and waited for the event planners decision on holding it or not. Mitch and Earl got together and drove to the marshalling area outside of The Franklin Institute, a major sponsor. After working with the logistics volunteers from the Institute we found our space and the other group that had been given half of our tent: The Rittenhouse Astronomical Society. Due to the foreboding weather they where moved in with us. This made for interesting conditions for doing outreach for both of us! Mitch set the Space Bricks out front and this was great. The children came to play, and Mitch, and then Hank (Smith) and Dennis arrived and also talked to the young people and adults.

Filling in the rest of our team was Frank, who set up a chair to put the guidance computer on! You would be amazed and delighted to see the young peoples faces when they realized that that thing on the chair was a real part of an Apollo spacecraft! One fan who really liked it even talked to Frank about coming over sometime and talking to people at a nearby venue: The Franklin Institute. Derrick (Pitts) and Frank talked for some time. Great networking! The rain did come, and the Rittenhouse Astronomy group had to go, but we talked of working together again, as we had at the festival. We had a very synergistic relationship with our outreach: we talked of wanting to go and live on some of those places that the astronomers where investigating and theorizing about in our solar system. And they talked of the vast reaches of the cosmos and the chance to do observations with tools we could set up on the Moon or deep in space (like the L-1 location for the Webb and other instru-ments). And finally: Dennis brought a tool to compliment Gary Fishers' Mars Globe: a Rover model based on the Spirit and Opportunity designs. And, due to questions from some young people, our guest Frank explained the practical points of trying to pack the rover and its' platform into the launch fairing that would cover it on its' long journey. Go team! Submitted by Earl Bennett

File photo of a previous PASA Exhibit

CALIFORNIA

SDSPACE.org

San Diego Space Society

http://sandiegospace.org/

info@sandiegospace.org

Meeting the 2nd Sunday monthly: 2:30-4:30 pm
Next Meetings: May 8th, June12th, July 10th
Serra Mesa Branch Library 9005 Aero Dr, San Diego

Sat. May 14th, 11 am-4:15 pm **Sally Ride Science Festival, USSC La Jolla**

Sat. May 28th, 10 am -2 pm 8th annual **Space Day at San Diego Air & Space Museum**

Sat. June 25th, SD Space Directors and key members will attend the **annual Strategic Planning Retreat** in the beautiful countryside outside of Julian. The Retreat will continue to lay the framework for a 10-year growth plan starting with goals and plans for the next year.

CALIFORNIA

OASIS

OASIS: Organization for the Advancement of Space Industrialization and Settlement
Greater Los Angeles Chapter of NSS
P.O. Box 1231, Redondo Beach, CA 90278

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

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

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

Regular Meeting 3 pm 3rd Sat. each month

May 14th * - June 18th - July 16th

* one week early because of ISDC

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

Saturday, May 14, 3 pm - OASIS Board Meeting, Home of Lisa Kaspin, 3206 Summertime Lane Unit 206, Culver City, CA 90230

Saturday, June 18, 3 pm - OASIS Board Meeting, Home of Greg Slaughter

Saturday, July 16, noon Anniversary Potluck Picnic Polliwog Park, Manhattan Beach

Saturday, August 20, 3 pm - OASIS Board Meeting. Home of Craig and Karin Ward, 1914 Condon Avenue Redondo Beach, CA

Saturday, Sept. 17, 1 pm - OASIS Board Meeting, Home of Steve Bartlett and Tina Beychok, 7108 East Peabody, Long Beach, CA

Saturday, Sept. 17, 3:30 pm - OASIS LECTURE SERIES: Cassini Lecture by Trina Rey, Location TBD

Saturday, Oct. 7, 3:30 pm - OASIS LECTURE SERIES: Not Just a Rocket Scientist, Location TBD

Moon Miners' MANIFESTO

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

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Hardcopy MMM: U.S. & Canada **$35** – Elsewhere: **$60**
P.O. Box 940825, Plano, TX 75094-0825, USA

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

=> *For those outside participating chapter areas* <=

- **$12 USA** MMM Subscriptions; • US **$25** Canada;
- US **$55** 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)
- $15 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