

“Towards an Earth-Moon Economy – Developing Off-Planet Resources”

Moon Miners’ Manifesto

& The Moon Society Journal



www.MoonMinersManifesto.com



The **Devonian Gardens** is a large indoor park and botanical garden located in the downtown core of Calgary, Alberta, Canada. It is completely enclosed with glass and covers 2.5 acres (10,000 m²) (one full city block) on top of The Core Shopping Centre complex, (formerly TD Square). It is maintained by The City of Calgary Parks. The editor had the pleasure of visiting this gem in 2007. “Middoor” common spaces in lunar settlements could look like this.

Feature Articles:

- 2 **In Focus:** ISS International Partners prefer the Moon as next manned goal
- 3 **The Critical Path to "Pioneering the Moon":** The Situation
5. (cont.) Building and Manufacturing Materials from Moondust
6. (cont.) Incorporating an Earth-like "Outdoors" in Middoor Spaces;
The Role of Indigenous Arts & Crafts; The Role of "Lee-Vac" and "Out-Vac" Activities



“Commercial Space flight makes its debut in grand style. A Space-X Dragon capsule docks with ISS and delivers the first commercial cargo load, then safely lands on Earth, good for several more missions. Meanwhile Sierra Nevada’s “Dream Chaser” space plane is undergoing flight tests, and other commercial firms continue to make progress. This is the dawn of a new era of less expensive yet reliable space access. After 55 years, the true, sustainable space age has begun. The pace will increase as price barriers fall, and competition delivers improved hardware and technologies.

About Moon Miners' Manifesto

- **Moon Miners' Manifesto CLASSICS:** The non-time-sensitive articles and editorials of MMM's first twenty years plus have been re-edited, reillustrated, and republished in 22 PDF format volumes, for free downloading from this location: http://www.MoonSociety.org/publications/mmm_classics/
 - **MMM Glossary: new terms, old terms with new meanings:**
<http://www.moonsociety.org/publications/m3glossary.html>
 - **MMM's VISION:** "expanding the human economy through off-planet resources"; early heavy reliance on Lunar materials; early use of Mars system and asteroid resources; and 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** and serves many groups, each with its own philosophy, agenda, and programs. Sharing MMM may suggest overall satisfaction with themes and treatment, requires no other litmus test. **Opinions expressed herein**, including editorials, are those of individual writers and may not reflect positions or policies of the **National Space Society**, **Milwaukee Lunar Reclamation Society**, or **The Moon Society**. **Copyrights** remain with the individual writers. Reproduction rights, with credit, are granted to NSS & TMS chapter newsletters.
 - **MMM color online downloadable PDF file version option for Moon Society Members** using their username and password – do write secretary@moonsociety.org if you need help with your password.
 - **For additional space news** and near-term developments, read **Ad Astra** magazine mailed to **National Space Society** members. There is a daily RSS feed space news section on <http://www.moonsociety.org>
 - **Milwaukee Lunar Reclamation Society** is an independently incorporated nonprofit membership organization engaged in public outreach, freely associated with the National Space Society, insofar as LRS goals include those in NSS vision statement. MLRS serves as the Milwaukee chapter of both **The National Space Society** and **The Moon Society**: – <http://www.moonsociety.org/chapters/milwaukee/>
 - **The National Space Society** is a grassroots pro-space member-ship organization, with 10,000 members and 50 chapters, dedicated to the creation of a spacefaring civilization.
National Space Society, 1155 15th Street NW, Suite 500
Washington, DC 20005 -- Ph: (202) 429-1600 – <http://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.
 - **NSS chapters** and **Other Societies** with a compatible focus are welcome to join the MMM family. For special chapter/group rates, write the Editor, or call (414)-342-0705.
 - **Publication Deadline:** Final draft is prepared ASAP after the 20th of each month. Articles needing to be keyed in or edited are due on the 15th, Sooner is better! – **No compensation is paid.**
 - **Submissions by email** to KokhMMM@aol.com – Email message body text or MS Word, Text files, and pdf file attachments or mailed CDs, DVDs, or typed hard copy [short pieces only, less than 1,000 words] to:
Moon Miners' Manifesto, c/o Peter Kokh,
1630 N. 32nd Street, Milwaukee, WI 53208-2040
-

In Focus ISS International Partners prefer the Moon as next manned goal

While narrowly focused enthusiast groups, prematurely bored with our ever more fascinating Moon, continue to parrot the shallow "been there, done that" mantra, the ISS International Partners, without whom the current elaborate International Space Station would never have been built, all prefer that if the next manned goal is to be pursued on a similar international partnership basis, be the Moon, not Mars or the Asteroids: it is nearer, takes much less time to reach (and therefore the "radiation issue" is not a problem, nor is resupply or rescue) and we can mount missions much more frequently without long no-fly periods between launch windows.

Should we care what the International Partners think? Absolutely, if we want a much more functionally complete outpost than any one nation could build, even the US, supporting much more scientific research and exploration, as well as much more research in utilization of local resources: learning to make building and manufacturing materials from the lunar regolith, along with fuels. The "end result" will be a much more rapid advancement to a higher level of outpost self-reliance and a quicker path to permanent settlement.

At the same time, we continue to call for NASA-focused efforts to follow the “Triway” strategy, concentrating on development of those technologies needed to pursue all three “space expansion vectors: “the Moon, Mars, and the Asteroids. Sustainability and continued progress are the policy goals here. We have had enough of the false starts, followed by doldrums of standing still, doing nothing. We need a program philosophy that is built on logic and sustainability as well as on collaboration, not only with “International Partners” but with private commercial space technology companies, and the introduction of “profit” as a powerful driver, immune to legislative and administrative indifference, uncertainty, and indifference.

This is why the Moon Society has been promoting the concept, and now the initial analog dry runs on Hawaii Island, of an International Lunar Research Park, with the insistence, however, that it not only be international, but include private enterprises as essential partners.

Headline story: <http://www.thespacereview.com/article/2094/1>

That the International ISS partners have expressed their views and long term interests is very encouraging. International efforts are much less prone to cancellation, or to derailments on sidetracks going nowhere fast. **PK**

The Critical Path to “Pioneering the Moon” – 1. The Situation

By Peter Kokh

Currently, some of us in the Moon Society and in the National Space Society are working hard to get more people aboard a path that will break the current log jam – the logs being different visions of our future in space, each with its own set of horse-blinders.

To this end, Board member Al Anzaldúa and I have spent many hours working on a plan to promote priority development of the technologies needed in common to return to the Moon, to mount a manned mission to Mars, and to prospect the asteroids. This is the “**Triway to Space**” plan and Declaration, published in MMM #256 and online, in **Space Review**; <http://www.thespacereview.com/article/2078/1>

Also to this end, a number of us are working with John Strickland of NSS–Austin to mature a **Cis–Lunar Transport Plan** that will better, and more economically work to open the Moon, Mars, and Asteroids.

We all recognize the shortcomings in NASA’s vision and goals, encumbered as they are by the inanities of the political process. But these efforts, as timely and revolutionary as they are, are not enough to those of us who share the core vision of the Moon Society,

“accelerating the day when there will be civilian settlements on the Moon, making use of local resources through private enterprise both to support the pioneers themselves and to help alleviate Earth’s stubborn energy and environmental problems.”

From: http://www.moonsociety.org/about/vision_mission.html – a document worth reading in full!

It is not enough to return to the Moon “to stay.” “Stay” to do what? Build an outpost that overtime will be as busy with exploration activities as McMurdo Sound station in Antarctica? Many would settle for that several decades out. Yes we want to fully explore the Moon, deploy telescopes that can better explore the universe, including radio telescopes on the farside – the only place in our solar system where we can be shielded from the growing radio noise cacophony that comes from Earth. Yes to build a fuel production station at one of the Moon’s poles to fuel our ships to go anywhere and do anything, especially to build the “Cis–Lunar Economy.”

But to some of us, that is not enough. Our goal is to extend the human frontier to the “8th continent”, not in the manner in which we have been doing on the 7th continent, Antarctica, but as we have done on the five other “new continents” since humanity’s “Out of Africa” Epic began before our current memories and legends. Our goal is to transform the Moon into a “human world.” Sorry, but fuel stations in the polar icefields, does not quite do that.

The Moon Society is pushing this first opening of course, as it must, as it should. But we should not kid ourselves that or mission stops here.

What is needed to “Settle” the Moon

Because of the high cost of imports – even with transports burning liquid oxygen and hydrogen produced from lunar polar ice and brought up to fuel stations at L1 and in Low Earth Orbit – to expand operations on the Moon, we must be able to produce the great mass of items we need to expand our habitats and operations from materials produced on the Moon. In Situ Resource Utilization or ISRU (“on location” for those who do not need to show how erudite we are by using Latin phrases) has to concern itself with more than producing liquid oxygen and liquid hydrogen and drinking water.

We have to learn how to build and manufacture the heaviest in gross mass (number of items times mass each) that we will need – i.e building and manufacturing materials – from the elements in moon dust or regolith. More on that below.

Now anything lunar pioneers make for themselves, can be exported elsewhere “in space” at less cost than similar items made on Earth. Products manufactured on the Moon will furnish space hotels and other stations in

Low Earth Orbit, Geosynchronous Earth Orbit and elsewhere in cis-lunar space, earning income for the lunar settlements. Read more: http://www.moonsociety.org/publications/mmm_papers/muscle_paper.htm

In the next article, we will discuss what building and manufacturing materials are most realistic and most promising. "ISRU" research has to prioritize those materials if we are serious about making settlements in which pioneers can feel "at home" on the Moon. These materials will also build more outposts used just for science and exploration. So if you are one who feels anything more is unrealistic, you still owe it to yourself to see that these ISRU goals are prioritized.

Where to live on the Moon:

Most serious (not science-fantasy) habitat/outpost designs circulated through recent decades confine personnel to cramped interiors very much as submarines and sea-floor outposts do. That is tolerable for short tours of duty. Submariners commonly spend six months under water, totally withdrawn from the "world" as they have always known and experienced it.

But if we are talking not just about persons on temporary tours of duty, but about "pioneer settlers" who intend to stick it out long term, and if things go well, live out the rest of their lives on this new world, even raising families, complexes of habitat modules do not do it. Rather, we must learn in various ways, approaching the daunting task from both ends, how to marry our frontier settlements with the barren, airless, radiation-washed Moon itself. And those who can't see how we could ever do that are part of the problem.

Now many readers may be familiar with Robert A. Heinlein's classic science fiction novel, "The Moon is a Harsh Mistress." Heinlein envisioned cities on the Moon, housed in complexes of tunnels carved out of the bedrock. That was the most realistic vision for some time.

Now that we know that the lava sheets of the lunar maria (the dark blotches on the side of the Moon that always faces Earth) must be laced with networks of lava tubes of considerable size, we know that at least in those areas, our "tunnels" are waiting for us. We have now discovered a number of lavatube skylights, and may in time learn how to read surface clues well enough to map some of these networks.

But there are no lavatubes in the highlands, and it is important to keep in mind that both lune poles are in highland areas. In fact, the closest mare areas to the south pole are 1,400 miles or so to the north (Humorum, Nectaris, Australe, etc.) The north pole is more blessed, with the northern "shore" of Mare Frigoris some 600 miles distant. Now some imagine pressurizing and "terraforming" these vast subsurface tubes, but that again, is a flight of science-fancy. The Moon is rich in oxygen but very, very stingy in Nitrogen, which is the very important buffer gas that makes up 4/5th of Earth's atmosphere. In short, pressurizing a sub surface lavatube is for now "science fiction" of the "way-off" kind. We will settle lavatubes but in the same general type of pressurized modular structures that we would elsewhere cover with a blanket of moondust out on the surface.

Some envision large cities on the surface, very much like cities on Earth, but protected from the life-squelching lunar environment by immense transparent domes made of "unobtainium." We say that, because while small domes of a few yards or meters in diameter might work (but fail to protect dwellers from radiation), much larger domes would be blown off the surface by the pressures they were trying to contain. The dome city would work only on a world with an atmosphere not too different than in pressure, from the Earth-like atmosphere inside, but of unbreathable composition. For example on Mars – if Mars atmosphere could be thickened substantially.

But how do we make our settlements any more livable than submarines! That is the challenge, and happily, there are lots of ways to meet that challenge and then some.

Explorers and scientist are paid. How will Settlers earn their keep?

We've already given the major part of the answer: anything settlers make for themselves, big or small, simple or complex, be it building materials, modules, machine parts, – or even food! – they will be able to market in LEO, GEO, stations at L1, and other cis-lunar locations – at a cost advantage over items made or produced on the Earth's surface. Why? Because it takes only 1/23rd the amount of fuel to ship something "down the gravity well" than "up the gravity well" from Earth's surface. The Moon's 1/6th gravity is perhaps its greatest asset. And it will be some time, if ever, before fuel costs are too low to make a difference.

All articles in past issues of Moon Miners' Manifesto (the first 25 years) which have a direct or indirect bearing on the Lunar Economy have now been released in an MMM Theme Issue: the Lunar Economy, available as a free download PDF file: http://www.moonsociety.org/publications/mmm_themes/mmmt_LunarEconomy.pdf

So How will Pioneers come to "feel at home" on the Moon?

We have pointed out that they must live underground to be shielded from cosmic radiation and solar flares. But this can be in tunnels, lavatubes or out on the surface but covered with a blanket of moondust on the order of 5–6 yards~meters thick. If you stop and think, that is how we on Earth are protected from radiation. Yes, we live under the shield of the Van Allen Belts created by Earth's strong magnetosphere. But our tick atmosphere protects us as well. If it were to get cold enough here on Earth to freeze the oxygen and nitrogen in the atmosphere, everything would be covered by an "analogous blanket" of nitrogen-oxygen snow!

Now this does not answer question of getting to feel at home, becoming comfortable with the forbidding lunar environment as a friend, not an enemy. That we will take up in the third article.

Note that we have already talked about making building materials and other products out of the elements present in moon dust. That in itself is part of the answer! That the Moon furnishes us with these materials already makes this barren world “friendly!”

2. Building and Manufacturing Materials from Moon dust

Glass–Glass Composites

When I launched Moon Miners’ Manifesto, seminal initial experiments with “glass–glass composites” was underway under the aegis of the Space Studies Institute, then headquartered in Princeton, New Jersey. The holy grail was to see if we could produce glass fibers with a high melting point to imbed in a matrix of a glass with a much lower melting point. Experiments funded in part by SSI using lead as a dopant to lower the matrix glass melting point produced promising results. That was in 1937, and not much progress has been made since, for lack of funding. We proposed a business plan that might finance continued experiments that would produce a product marketable here on Earth, with the idea that by the time we got to the Moon, we would have plenty of experience with a close analog of the technology needed on the Moon. We suggested replacing lead (which would have to be imported) with lunar sodium and/or potassium, abundant enough.

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

Of course, no one took up on this, and nothing happened. But the feeling was common that glass–glass composites could be used to make many useful things from parts for Solar Power Satellites to lunar homestead furniture and perhaps even pressurizable habitat modules.

Cast Basalt Products

Meanwhile, some time back I had learned about cast basalt products, such as abrasion–resistant tiles and abrasion–resistant pipes: just what we needed to handle moon dust which is very abrasive. Indeed. It seems so very vital that we launch the first industrial complex on the Moon in a basalt–rich mare area for this very reason, that it seemed to be suicide to start setting up shop at the poles, as important as water and its components may be.

Cast basalt pipes and sluices and other objects needed to handle moon dust in an industrial operation would not be the only prize. Cast basalt could be used for floor and wall tiles, for table tops, for watertight planters needed to begin lunar agriculture, and for much much more. A basalt industry seems essential.

Lunar Alloys of Iron, Titanium, Aluminum, and Magnesium

These are the four “engineering metals” all present in sufficient abundance in moon dust, iron fines being everywhere, but more abundant in the maria, along with titanium, and with aluminum and magnesium being more abundant in the highlands. The catch is none of these “engineering metals” in pure form is of much use. We have found ways to alloy all of them to improve their performance. The trick is that the preferred alloy ingredients are not handily abundant on the Moon. We have to test “second best” formulations. Some of these have been tried on Earth but never put in production because we had better alternatives.

My #1 Brainstorming side–kick for some twelve years now, has been Dave Dietzler, of Moon Society St. Louis. Not afraid to go down a blind alley, Dave has found some promising options, such as “maraging steel” and these have been the subject of several recent articles.

Basalt fiber products

Meanwhile, I had stumbled on an article about about a basalt fiber industry in Northwestern India (Gujarat if I remember correctly) and between Dave and I we are learning what a motherlode jackpot of technology this is. Rebar used to strengthen concrete can no longer compete with “rockbar” made out of basalt fibers. The latter are water resistant (won’t rust), stress resistant, less subject to thermal expansion and contraction.

We are now wondering what else this new wonder material could be used for: rails for lunar trains? Shells of habitat modules? This is a simple material abundant in the lunar maria, which can be put to a host of uses: parts for Solar Power arrays included. In contrast, no lunar–glass or lunar–metal alloy seems as “ready to hit the market” as cast basalt and basalt fiber products. Just don’t look for basalt anywhere near the lunar poles! **So here is where ISRU should concentrate: in the Moon’s maria.** Note: If we dig trenches to inset our modules, the basalt at the bottom of the trench will be more concentrated.

Basalt fibers could be used to make “sandbags” for deploying moon dust over a habitat in a “removable manner. It could make tarps and mats and so much more.

At any rate, beyond oxygen production, development of **easily produced and widely useful lunar building and manufacturing materials must have priority** – priority now, not a decade after we return. Cast basalt, glass composite, lunar producible alloys all need attention that they have not been getting. This is what we must mean by “ISRU.” What we now mean by it makes the users of this “secret code” term look shortsighted.

As we suggested in the Glass–Glass Composites paper referenced above, the place to start, with further development of the potential of basalt fiber, for example, is to find as yet unexplored but potentially profitable terrestrial uses, and then develop new products accordingly. The result is a process we have called “**spin–up**” (as opposed to “spin–off”) – **putting a close analog of a technology we will need on the Moon, “on the shelf” ready to use when we get there.** Some could get rich doing this!

For past articles, Visit http://www.moonsociety.org/publications/mmm_classics/

3. Incorporating an Earth-like “Outdoors” in Middoor Spaces

A Eureka Moment

Moon Miners’ Manifesto saw the light of day in December 1986 only because of a “Eureka Moment” I had experienced a year and a half earlier in May 1985. You can/should (if you want to understand) read about this in http://www.moonsociety.org/chapters/milwaukee/mmm/mmm_1.html In short, a visit to a most unique and original underground home 20–some miles NW of Milwaukee convinced me, that though, as Heinlein predicted, we might have to borrow into the Moon to live safely, we could “bring the views and the sunshine down with us.” While we had to be tucked under a moondust blanket one way or the other, that did not mean a disconnect with the best that the lunar surface has to offer: views of the landscape, and sunshine. Sunshine suggested house plants and vegetation–refreshed air, as well as food. Someone will reengineer my “Z-view” periscopic windows and other features, but they are too superior to a TV screen to ignore.

Beyond a network of “indoors only” habitat and activity modules

The first starter outposts will be but a complex of modules some inline, other off T and X junctions. But eventually hallway and even pressurized street networks will arise. And with that comes opportunity. Even individual modules can have “house plants” even “living walls” (Wikipedia “Green Walls”) to refreshen the air and assist in treating toilet wastes. If a modular biospherics plan is adopted to mate with modular architectures, then the capacity to refresh water and air will grow apace with the complex proper, minimizing what part of these processes has to be taken care of by central facilities. Halls can be lined with plants in the form of living walls, for example.

When the complex grow to the point that travel from one part to the other makes electric vehicles most welcome, then “streets” will emerge. These too can contribute to the biomass needed to sustain a self–refreshing atmosphere. While “room temperature” will be maintained in habitat and activity modules, there is no reason not to let temperatures vary – within reason – as the 14.75 day long dayspan with continual sunshine passes and then rotates with the equally long nightspan.

The result is that we have a buffer, temperature– and climate–wise between the “indoors” and the “mid–doors” – an environment more reminiscent of the outdoors back on Earth. Forget about Heinlein’s tunnels! Then if vehicles dock with outpost and settlement docks, so that passage between without spacesuits is possible, we have the start of a “virtual” global lunar pressurized Earthlike environment.

4. The Role of Indigenous Arts & Crafts

The need for people everywhere to express themselves with local materials

Every time pioneers on Earth have left their familiar home country and ventured into places with different sets of easily available materials and plants and animals, they began to feel at more and more at home as they learned to build and adorn their homes out of things locally available. It will be no different on the Moon. Objects of cast and hewn (carved) basalt will be an early choice in much of the Moon’s nearside. But artists also have a keen eye for the hidden possibilities within every bit of “free” material including scavengable scrap and “junk.”

We have personally attempted to pioneer an analog of a lunar painting medium.

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

The pioneers will find them. Hand made or crafted objects in front of a window or on the surface outside will temper the lifeless and life–squenching lunar surface with things made by human hands. Slowly, both from inside and outside, human spaces and settlements will begin to belong to the moonscapes, and vice versa.

5. The Role of “Lee–Vac” and “Out–Vac” Activities

Outside Sports and Hobbies

We’ve all seen paintings of lunar pioneers playing golf on the lunar surface. Some pioneers will love to go foraging for moon rocks that look special, or are of a carvable kind. Other will just like to stroll form time to time in the vast black–skyyed outdoors – the “out–vac” (yes, after Australia’s “outback.”) There will be road rallies. As space suits become lighter and permit more movement, more types of outdoor activities will emerge.

But there is an intermediate environment, the “lee–vac” – moondust shielded but unpressurized hangers and domes and stadiums where lighter suits can b worn because neither radiation nor extreme heat nor extreme cold are a problem. In such lee–vac spaces, pioneers can attempt a lot of things in lunar gravity, in lunar vacuum, without the drawbacks of full–exposure.

Bit by bit, pioneers will adapt to this seemingly hostile world. No place is hostile if you know how to deal with it. Consider for example, how the inuit and Samoyeds have adapted to the extreme exposed coastlands of the Russian, Alaskan, Canadian, Greenland coasts. If we did not know about them, we would have thought such adaptation would be impossible. But it wasn’t, was it. Neither will it be on the Moon. Come back in a century or so and you will find a frontier population as happy and settled in as most of us are here on Earth.

For past articles, Visit http://www.moonsociety.org/publications/mmm_classics/

The Critical Path to “Pioneering the Moon” – Conclusion

A Contrast of Visions: “horse-blinded” verses “eyes wide open”

Perhaps most persons interested in opening the Moon only see small isolated outposts where persons clearly out of their element will do their best to put up with unearthly conditions for a tour of duty or two. The vision we have sketched of a quite more developed and satisfying frontier may seem science-fiction/fantasy to many, but this vision is grounded not only in the realities of the Moon and its features and makeup, but also in the capacities and drives that are characteristic of human pioneers. Were it not so, we’d still be found only in Africa.

The human epic has been an “intercontinental” one. The Moon is another kind of continent (as big as Africa and Australia together) across another kind of sea. This final “intercontinental” colonization will also be the inaugural “interplanetary” one. Do not judge the possibilities from the challenges new lands confront us with. Judge the possibilities from the unlimited capabilities to adapt which are part of the human makeup. We should never doubt that we have it in us. Those who would have us “stay home on Earth” are of the same ilk as those who would not dare leave Africa.

And this is just the beginning. To correct Genesis if I dare, “**Of stardust thou art, and to the Stars thou shalt return.**” We owe it to the Creative Agency behind our existence to realize all the capacities built into us. Not to do so would be the ultimate sin.

PK



Further Recommended Reading

- http://www.moonsociety.org/publications/mmm_papers/muscle_paper.htm
- http://www.moonsociety.org/publications/mmm_papers/outpost_trap.html
- http://www.moonsociety.org/publications/mmm_papers/beyond_moonbase_1.pdf
- http://www.moonsociety.org/publications/mmm_papers/pioneer-mental-health.html
- http://www.moonsociety.org/publications/mmm_themes/mmmEden_on_Luna1.pdf
- http://www.moonsociety.org/publications/mmm_themes/mmmEden_on_Luna2.pdf
- http://www.moonsociety.org/publications/mmm_themes/mmmArts_Crafts.pdf

A Word from Moon Society President, Ken Murphy

With this issue of MMM, we have our new slate of Moon Society officers for as we face a challenging year ahead.

Challenge 1: Publishing our archives of MMM for the Kindle and other e-books. Long-time MMM editor Peter Kokh has taken point on this project, which is focused on publishing our theme issues first, starting with The Lunar Economy. Members are need to help edit and prep past issues for porting to e-book format.

Challenge 2: Our ISDC 2013 track on Lunar Lava Tubes. Our track at this year's ISDC was very well attended, and laid the groundwork for our track at the 2013 ISDC in San Diego on Lunar Lava Tubes. Members are needed to help organize and coordinate this event.

Challenge 3: Updating our website: We need to update and reorganize our website to make it more attractive and usable on modern tools for internet access. This is going to take some significant work, so if you have some web skills consider helping out with this project.

Challenge 4: Bringing the Moon to the people: If you've been paying attention for a while, you've likely noticed that our Moon is getting mentioned a bit more often, and is moving back into the mainstream of space discourse. The Moon Society has several initiatives in the works to further cultivate Lunar interest and support:

–**A set of presentations that members can use** to give Moon talks in their community. If you're a powerpoint ranger consider helping out with this project.

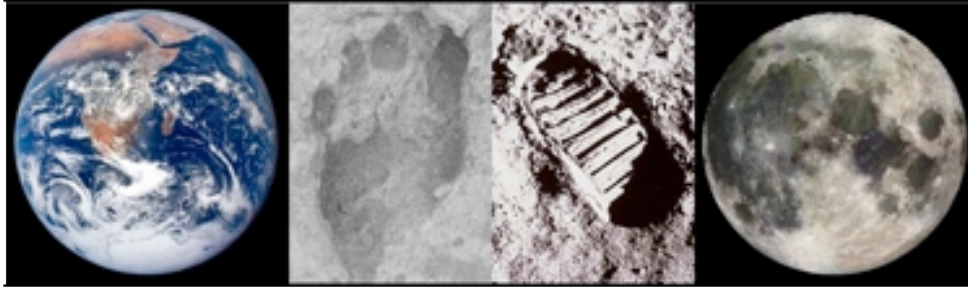
–**Moon Society members are encouraged to give talks and presentations** about the Moon in your communities.

–**Encouraging Moon-themed celebrations in the form of Moon Days** growing around the country. If you can contact local space groups in your area, you can organize a Moon Day event.

The Moon Society is well positioned to be the thought leader on matters Lunar as the general space focus returns to the Moon, as we've already demonstrated with our CisLunar Ecosphere articles and track. We need more sophisticated tools to do be seen as that leader, and I'm calling on you, the membership, to make that happen. All of our members should be involved with meeting at least one of these challenges. Where do you want to see The Moon Society in the next ten years...? **Ken Murphy, President**

For past articles, Visit http://www.moonsociety.org/publications/mmm_classics/

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.

The Moon Society Journal Section (pages 9–12)

About the Moon Society

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 and utilizing the Moon.
- **Informing** the public on matters related to the Moon
- **Provision** of suitable recognition and honor to individuals and organizations that have contributed to the advancement of the exploration, research, development, and habitation of the Moon, as well as scientific and technological developments related thereto.

Our Vision says it all – “Who We Are and What We Do” – www.moonsociety.org/spreadtheword/whowhat.html

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, 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 Election Results – August 1 vote count

Officers: Unopposed:

- President: **Ken Murphy** re-elected for 2 year term ending in 2014
- Secretary: **Peter Kokh** re-elected for 2 year term ending in 2014

Board Members: Contested:

- **Ben Nault** re-elected for 2 year term ending in 2014
- **Alan Steinberg** elected for 2 year term ending in 2014

Note: **Philip Crume**, who came in third, is a very promising addition to the Leadership Committee and has been invited to attend our Management Committee and Board meetings and is welcome to express his views and provide input. Should there be an unexpected opening in the Board, Crume would then be ready to hit the ground running. Thanks to all who participated and voted, This was the largest turnout in many years! Paul Banyai, vice-president

For past articles, Visit http://www.moonsociety.org/publications/mmm_classics/

Moon Day 2012 in Dallas

Report by Moon Society President Kenneth Murphy

Moon Day 2012 turned out to be the biggest and best Moon Day to date in its short, four year history at the Frontiers of Flight Museum at Love Field in Dallas. It is quickly turning into a favorite annual event amongst attendees, and a major STEM outreach and education venue for exhibitors.

This year saw a significant jump in exhibitors, from 12 to 20, in spite of several that couldn't be back this year. New exhibitors included the Boy and Girl Scouts, AMSAT, the Monnig Meteorite Gallery, Fort Worth Noble Planetarium, Citizens in Space, The Nerd Show Online, the Oklahoma Space Alliance, Sci-Tech Discovery Center, and the Dallas Personal Robotics Group, highlighting its increased acceptance as a STEM event. These joined returning exhibitors NSS of North Texas (co-sponsors of the event), The Moon Society, Dallas Mars Society, Dallas Area Rocket Society, Texas Astronomical Society, Fort Worth Astronomical Society, Museum of Nature & Science, the Civil Air Patrol, Solar System Ambassador Kelley Miller, and the UT Dallas Center for Space Sciences.

The main exhibit floor was a buzz of activity as some 1,200 attendees milled about exploring displays, lining up for an inflatable planetarium show (2 to choose from!), popping outside to hear a satellite pass overhead, or to look at sunspots through safe Solar telescopes. Between raffles and door prizes there were ample opportunities to win neat space swag, like a digital telescope at the NSS of North Texas Science Fair Scholarship fundraising raffle, and copies of Homer Hickam's new book "Crater", vials of Lunar and Martian regolith simulant from Orbitec, Great Moonbuggy Race t-shirts, Hugg-a-Moons, Lunar Search & Rescue patches from author Allen Steele, a SpaceX swag bag, and more as door prizes.

To address educational aspects of Moon Day, two programs were created: an adult-oriented Lunar University, and a family-friendly Moon Academy. Classes are scheduled throughout the day, especially in the Lunar University, which saw talks on Space Transportation post-Shuttle, Space Science at UTD, Cislunar Space, Excalibur Almaz, JSC-1a Regolith Simulant, Moon Rock Disks, Lunar Observing Certificates, and Mars Colonization 101. In the Moon Academy, talks were given on Toys in Space, Moon Craters, Comet Building, Moon Rock Disks, Model Rocket Building, Telescopes 101, Orbits 101, and Satellites 101. Clearly there was ample opportunity for attendees of every age to improve their space smarts.

But wait, there's more. The very first year of Moon Day it became evident that folks were going to need some kind of carryall for all of the free handouts they were getting from the exhibitors. In our second year we introduced the Lunar Sample Bags, an over the shoulder messenger bag with a large flap emblazoned with "Moon Day Lunar Sample Bag". These are pre-filled with a variety of space materials, which can then be supplemented by handouts from the exhibitors. A recurring scene at Moon Day is of youngsters lifting up the flap of their Lunar Sample Bags and stuffing in another handful of materials. We get many stories of kids taking the bags home, dumping them out on their bed, and spending hours, if not days, looking everything over.

In the auditorium we screened the independently produced space settlement film "Postcards from the Future", as well as premiered a new planetarium show from the Fiske Planetarium in Boulder, CO, "Max Goes to the Moon". Based on the NSTA award-winning picture book of the same name by Dr. Jeffrey Bennett, it tells the story of a Rottweiler who convinces the world that we need to go back to the Moon, and goes along for the ride.

In the gallery was a show of nearly 150 space-themed LP record covers. Entitled "Musics of the Spheres", it illustrates humanity's fascination with space, from ancient megaliths through the modern space age and into the cosmos. The show will remain on display until September.

In all, a well-rounded event offering a little something for everyone. The feedback has been uniformly positive, and everyone is looking forward to next year's event, which falls on July 20th, the anniversary of the Apollo 11 Moon landing.

One of the key elements of the event is the exhibitors, which are not just showing off for the public and trying to sign up new members but also have an opportunity to meet each other. In this way, new partnerships and projects are formed, as with UTA Planetarium and Texas Astronomical Society partnering for an International Observe the Moon Night (InOMN) event, which Moon Day attendees know about from the InOMN materials in the Lunar Sample Bags and at the NSS of North Texas display. The Girl Scouts are thinking of new ideas for their STEM project. AMSAT is looking into bouncing a signal off the Moon next year if it is in the sky, and there are still more potential exhibitors to add to the line-up.

This year, The Moon Society contributed not only with an exhibit of our Power-Beaming display, but also in underwriting the Lunar Sample Bags in conjunction with OpenLuna. The gravity bricks were a big hit, especially when used in conjunction with the scale Earth/Mars/Moon marbles from Shasta Visions, and drew a steady stream of visitors to the booth.

The Moon Society can help grow this event to other locations across the country through our chapters, outposts and members, and thereby grow interest in our Moon. They're easy to put together – just get in touch with your local space clubs and organizations and arrange a party for next July 20th! -- KM

Moon Society Lavatube “Track” Proposed for ISDC 2013, San Diego

Report by Dave Dunlop, Moon Society “roving ambassador”

[Editor: At ISDC 2012 in Washington, DC, The Moon Society put on an all-day Sunday “Cis-lunar Ecosphere” track which was well-attended and got high marks. In the meantime, Society President Ken Murphy and our “roving ambassador” David Dunlop, and others are already planning a blockbuster “Lavatube” follow-up for ISDC 2013 to be held in San Diego, CA May 23–29, 2013. Below is a list of likely and possible participants and cosponsors.

1. **Dr. David Smith** Deputy PI for the GRAIL mission, in his presentation indicated that the GRAIL extended mission will go a low as 22 km over the lunar surface with an even “higher resolution” mapping capacity than originally planned. Since the first run was so successful they are able to risk the low altitude second mapping run to occur this fall that will take about three months if all goes well and they complete that sequence.
2. One of the “targets of interest” for this **higher resolution GRAIL mission** will be the detection of the difference in mass as a result of the voids of lava pits/lava tubes. So we may have another remote sensing data set.
3. To that can be added to that of the lidar measurements from LRO and the warm and cold differential measurements from the Diviner instruments on LRO that is the work of doctoral student **John Meyer**, at the University of Texas El Paso, whom I met when he had his poster at the LPI LPSC in 2011 and also afterward in El Paso.
4. That would give four independent remote sensing “strands of data” with which to detect lava tubes independent of a fifth strand of potential evidence: visual clues such as “pits” or skylights from **LRO NAC or Kaguya!** The positive coincidence of all four indicators on the same coordinates would be a very powerful indicator that a lava tube lies below. I have encouraged John Meyer to test his technique on some of the farside lava plains such as in Mare Moscoviense (farside) as well as the near side volcanic areas in Procellarum Marius Hills etc..
5. **Dr Paul Spudis** had a recent paper on the identification of Shield Volcanoes on the Moon at the 2011 LPSC conference. So by proximity to the potential source points of lava outpourings, (a sixth source of evidence), it would be interesting to use these independent indicators to see if these data sets “align” to make the case for buried tubes. His involvement from LPI would also be a plus.
6. **Proposed Mapping product:** ISDC participants and the lunar lava tube research community would have a means to produce a lava tube map as a product of these multiple data sets as a justification for funding.
7. Another strand of evidence (helpful in planning surface robotic treks) would be a traditional seismic surface survey. A lunar long duration lunar science lab, (perhaps with a “Mother rover” with a set of “mini me” daughter rovers might profile the near subsurface so that a “seismic sensor field array” could be progressively deployed across the surface. Such a data set could yield a highly confirmed lava tube map before direct attempts for physical penetration are attempted.

This is a feed forward strategy in planning future lunar and Mars missions and developing instrumentation and supporting robotics and a further conference justification on the merits for funding.

We also made forward progress in setting up the conditions for another Moon Track at next year's ISDC in conversations with Dave Dressler, ISDC 2013 Chair, so he is well aware of our Lunar Lava tube ambitions and supportive. Al Anzaldúa has already been in contact with him as the NSS representative for Tucson representing NSS interests in lunar programming and Ken Murphy will represent Moon Society interests so we will again have the same positive bi-organizational synergies. I have already attempted to contact some potential participants:

- At NASA Goddard, **Dr. Pamela Clark** (connected to Flexure Engineering with expertise in cryo measurement and testing Lunar lavatube cryo-environments for possibly preserved frozen volatile from interior venting episodes r.
- At NASA HQ, **Dr. Heather Smith**
- At New Mexico Tech University a few weeks earlier, I left a copy of the Ad Astra article on the work of John Meyer at the office of **Dr. Penelope Boston**, who would be another excellent speaker for this track.
- Ken Murphy has communicated with **Bernard Foing** of ESA with regard to the planned 7-week Reunion island lavatube analog research simulation.
- Bryce Walden, Cheryl York, and Tom Billings of the Oregon L5 Society chapter in Portland should also be included in this proposed program for their investigations of the Bend, Oregon lavatubes.
- **John Strickland** (Austin Space Society) who has a lot of practical experience exploring caves, might well be interested in both the conference and field experience aspects of this.

Other organizations/Individual to contact: We may have support from these NSS Chapters: Tucson, North Texas, Milwaukee Lunar Reclamation Society, Oregon L5, Austin Space Society. And we have a preliminary list of researchers and other experts in the area of lavatubes.

As Mars also has lavatube networks, we hope for Mars Society support as well.

Dave Dunlop


 March **Chapters & Outposts** 2012

Chapters & Outposts Map (North America) - www.moonsociety.org/chapters/chapter_outpost_map.html

• **Chapters & Outposts Events Page** www.moonsociety.org/chapters/chapter_events.html

ORGANIZING “OUTPOSTS”

Bay Area Moon Society, CA Outpost – South San Francisco Bay – <http://www.moonsociety.org/chapters/bams/>

Contact: Henry Cates hcate2@pacbell.net Meeting the 1st Tuesday of the Month at Henry’s home

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

Moon Society Knoxville Outpost – Contact: Jason Tuttle – tuttlepc@gmail.com

Rockford, IL Outpost - Contact: Bryce Johnson – lesausl@sbcglobal.net

Moon Society Milwaukee Outpost (MSMO) – http://www.moonsociety.org/chapters/milwaukee/msmo_aboutus.htm

Contact: Peter Kokh kokhmmm@aol.com – http://www.moonsociety.org/chapters/milwaukee/msmo_output.htm

ORGANIZED CHAPTERS

Moon Society Phoenix Chapter - <http://www.msphx.org> – Contacts: Craig Porter portercd@msn.com Meet-

ing the 3rd Saturdays monthly at Denny's, 4403 South Rural Road, Tempe. We begin at 6 pm, until further notice.

Next meetings – AUG 18 – SEP 15 – OCT 20 – NOV 17 – DEC 15

June 16th Meeting Report:

We had seven members preset at the meeting. Our first item on the agenda Was discussing the progress on solving the interference problems the electronic transmissions of the RC Controllers and the TV feed from the racers to the Monitors. We believe that the signal frequencies are too close together and we need to spread the frequency gap further apart. We hope to validate that at The Challenger Center in a demonstration of the system on Sunday, the 24th of June.

Our second item on our agenda was the Pneumatic Rocket launching of paper rockets built by youth that are participating in the launches. We will also be demonstrating the rocket system for The Challenger Center.

We also talked about CopperCon32 ad the need for volunteers for the Fan Table that we will have, to hand out information on the Moon Society and the Phoenix Chapter. I have asked for suggestions on other activities for the youth that attend the conventions and other venues that we might be part of the Program.

July 21st Meeting Report:

Our monthly meeting was held at Denny's in Tempe Arizona at the corner of US 60 and Rural Road at 6: pm. I arrived at the meeting as a Dust Storm was beginning to blow through, we had five more members and a guest arrive a few minutes later.

Announcements: Due to health reasons, I will be stepping down as the president of the local chapter at the September Chapter Meeting. My arthritic right hip is really giving me problems, partly due to working out at the gym and partly due to the weather. I am also having severe pain in both of my legs due to Diabetic Neuropathy. The two problems are making it hard for me to get around and I'm going to limit my driving for safety's sake.

Old Business:

CopperCon32: I have been notified that I would not be on any of the Conventions Panels and would have to purchase a Convention membership to receive a Fan Table. I was considering not participating again this year but the Chapter members present asked me to go ahead and man the table and recommended that the Chapter pay for the membership. I accepted the offer.

LepreCon39: Plans are in the formulation stages for the convention and we will be revising our Table layout. We will still be using the Lunar Globe and handouts, but are looking at adding other items and dropping some items.

Lunar Racing: We are still having interference problems between the car controller and the Video Signal from the car. And we need some help from an expert in RF transitions to try to sort it out. As a result there will be no Racing Demo at CopperCon32, maybe at LepreCon39 if we get the problems fixed.

Pneumatic Rocket Launching: We were experiencing stability problems at the demonstration launches at the “Challenger Space Center” when we tried to demonstrate the launching inside the facility. We are still working on the stability problems and at this time there will be no rocket launching until the stability problem is solved.

Treasurers report: The report was e-mailed to chapter with the balances of the savings account and checking account both well positioned. The report was accepted by the members present.

New Business: No new business at this time.

For Your Information: One of our members has a new book out. Charles Lee Lesher has a new book about “Space based Solar Power” that is published by “Writer's Cramp Publishing” at <http://www.writerscramp.us/>. ISBN 978-0-9837506-4-2, ©2012

The Moon Society – Lunar Frontier Settlement – www.moonsociety.org p. 5

Moon Society St. Louis Chapter – <http://www.moonsociety.org/chapters/stlouis/>

Contact: Robert Perry surfer_bob@charter.net – Meetings 3rd Wed monthly at Buder Branch Library, 4401 S. Hampton, in the basement conference room – Next meetings – AUG 15 – SEPT 17 – OCT 17 – NOV 21
July 18th Meeting Report: Mark Rode, Dave Dietzler, Karl Strassman, Dabney Tolson, Tom Kullman, Jim Merriman.

Karl gave a short presentation on the K-T boundary layer, created about 65 million years ago, based on a 1993 Encyclopedia Britannica Science Book. He specifically focused on the Iridium concentration and the fact that it could not have been ejected from a volcano, but resulted from a large meteor impact, possibly destroying most life on earth and specifically wiping out the dinosaurs. The possible impact candidates were the Brazos crater in the Gulf of Mexico and the Chicxulub structure, more of a geologic depression in the Yucatan Peninsula, indented on the surface by a long arc of sinkholes – http://en.wikipedia.org/wiki/Chicxulub_crater

The KT layer, and its associated shocked glass spherules, iridium, platinum, osmium, indium, gold, and soot anomalies are prominent in the Gulf region and have been noted at many sites all over the earth. The instance in Italy was the site where Walter Alvarez began the scientific research that led to http://en.wikipedia.org/wiki/Alvarez_hypothesis

That presentation led to a discussion of the Big Splat theory of the great impact sustained by the proto-Earth, leading to the formation of the moon.

<http://en.wikipedia.org/wiki/Moon#Formation> – http://en.wikipedia.org/wiki/Giant_impact_hypothesis

The hypothesis suggests that the early Moon coalesced close to the earth and, over the millennia, tidal interaction with the earth has boosted it to its higher orbit and slowed the rotation of the earth. Also, the early extreme ocean tides, due to the closeness of the moon, would have contributed to early life being forced to adapt to surviving in tidal pools and evolving to live on land.

Discussion of the Moon's evolution moved on to why the near side is so different from the far side. One possibility is <http://www.space.com/12529-earth-2-moons-collision-moon-formation.html>

In a follow-up email exchange, Mark noted that vulcanism has been discovered on the Moon's far side. See <http://news.discovery.com/space/moon-far-side-volcanoes-110725.html>

Bradley Joliff of Washington University using Lunar Reconnaissance orbiter focused on numerous domes , some more than 6 KM high called the Compton-Belkovich Anomaly. http://en.wikipedia.org/wiki/Compton-Belkovich_Thorium_Anomaly
 Report by Bob Perry based on notes taken by Karl Strassman

Clear Lake NSS/Moon Society Chapter (Houston) – <http://www.moonsociety.org/chapters/houston/>

Contact: Eric Bowen eric@streamlinerschedules.com – Meeting 7 pm in the conference room of the Bay Area Community Center at Clear Lake Park – 2nd Mon., Even # months: SEP 17 – NOV 19 (subject to change)

July 16th Meeting Report and September meeting schedule for CLANSS/MS Chapter

The Clear Lake Area (Houston) NSS & Moon Society Chapter met on July 16. Larry Friesen and Marianne Dyson brought us a report on their participation at ApolloCon in June. We also discussed ISDC 2012 in Washington, DC this past May, which was attended by Marianne Dyson, Eryn Andrews, and Eric Bowen.

Another item of interest was advance planning for a social gathering this coming December, which we are looking to tie in with the 40th anniversary of the last mission to the Moon (so far!).

Advance planning items included WorldCon 2013 which is scheduled to be held in San Antonio over Labor Day weekend next year, and the possibility of sponsoring a Chapter presence at that event.

Our next regular Chapter meeting is scheduled for Monday, September 17 at 7:00 p.m. in the conference room of the Bay Area Community Center in Clear Lake Park. Everyone is welcome! – Eric Bowen

Papers given at ISDC 2012 in the Moon Society's CisLunar Track

You will find links to download all these papers here: (8 presentations, 3 videos)

<http://www.moonsociety.org/conference/isdc/2012/CislunarEconosphere/>

01_Murphy_Introduction_to_Cislunar_Space.ppt

02_Cserep_Mining_the_Moon_from_L1.ppt

03_Keravala_Shackleton_SEC_Briefing_ISDC_May_2012_Released.pdf

05_Graham_OpenLuna_Comparative_Advantage.ppt

06_Strickland_An_Integrated_Space_Transport_and_Logistics_System_ISDC_2012.ppt

ARIS_Student_Presentation.pptx

Brandon-ISDC2012.ppt

CONCORDIA_Student_Presentation.pptx

Minotaur-1_NROL-66.jpg

NASA_Wallops_Minotaur_1_launch-1109PM_June_29-YouTube.wmv

Plenidus_Student_Presentation.mp4.wmv

shootthemoon_inertial.mpeg

For past articles, Visit http://www.moonsociety.org/publications/mmm_classics/

GREAT BROWSTING LINKS

SPACE STATIONS / COMMERCIAL SPACE

<http://www.space.com/15681-satellite-repair-robot-spacecraft-technology.html>
<http://www.space.com/15874-private-dragon-capsule-space-station-arrival.html>
<http://www.space.com/15832-spacex-dragon-1st-station-flight-pictures.html>
<http://www.space.com/15885-spacex-dragon-capsule-station-astronauts.html>
<http://www.space.com/15951-spacex-praise-dragon-spacecraft-success.html>
<http://www.space.com/15930-spacex-dragon-capsule-future-spaceflights.html>
<http://www.universetoday.com/95599/a-banner-week-for-commercial-spaceflight/#.T8p7jEoGAvG.facebook>
<http://www.space.com/16056-dream-chaser-space-plane-review.html>
<http://www.space.com/16064-private-spaceflight-nasa-exploration-goals.html>
<http://www.space.com/16340-china-shenzhou-9-spacecraft-undocking.html>
<http://www.space.com/16367-private-moon-missions-excalibur-almaz.html>
<http://www.space.com/16373-private-spaceflight-excalibur-almaz-photos.html>
The space industry grapples with satellite servicing <http://www.thespacereview.com/article/2108/1>

SPACE SETTLEMENTS / SPS

Contemporary Analysis of the O'Neill – Glaser Model for Space-based Solar Power and Habitat Construction
http://www.nss.org/settlement/journal/NSSJOURNAL_AnalysisOfONeill-GlaserModel_2011.pdf

MOON

GRAIL lunar gravity mapping Mission extended, orbiting lower for higher resolution
http://www.nasa.gov/home/hqnews/2012/may/HO_12-175_GRAIL.html

International Partners prefer the Moon as next goal – <http://www.thespacereview.com/article/2094/1>

MARS

<http://www.space.com/15271-nasa-mars-exploration-life-search.html>
<http://www.space.com/15869-nasa-mars-strategy-mission-ideas.html>
<http://www.space.com/16153-mars-impact-crater-map.html>
DragonLab-g: an early step to Mars and beyond <http://www.thespacereview.com/article/2089/1>
Green Mars? Mars soil as a Growing Medium – www.lpi.usra.edu/publications/reports/CB-1063/RedMars2.pdf
Humans to Mars can be relevant to Terrestrial Problems <http://www.thespacereview.com/article/2106/1>
Mars Science Lab (Curiosity) Landing Zone – www.nasa.gov/mission_pages/msl/multimedia/pia15685.html

ASTEROIDS / SATELLITES OF OTHER PLANETS

www.space.com/16105-asteroid-belt.html – www.space.com/16108-jupiter-moon-io-volcano-map.html

ROBOTICS

<http://www.space.com/16146-nasa-contest-unleashes-robots.html>

ASTRONOMY / ASTROBIOLOGICAL SPACE TOURISM

<http://www.space.com/15883-worlds-largest-radio-telescope-ska-array.html>
<http://www.space.com/15949-milkyway-galaxy-crash-andromeda-hubble.html>

SPACE TOURISM

<http://www.space.com/16057-virgin-galactic-spaceship-two-launches-2013.html>
<http://www.space.com/16082-intergalactic-travel-bureau-nyc-arts-festival.html>
www.flightglobal.com/news/articles/excalibur-almaz-details-plans-for-capsule-and-space-station-372347/
<http://www.space.com/16071-xcor-lynx-spacecraft-space-tourism.html>

GREAT SPACE VIDEOS

<http://www.space.com/15687-saturn-oddball-moon-phoebe-planet-video.html>
<http://www.space.com/15878-spacex-dragon-iss-share-berth-time-video.html>
<http://www.space.com/15875-spacex-dragon-grappled-iss-problem-video.html>
<http://www.space.com/15949-milkyway-galaxy-crash-andromeda-hubble.html>
<http://mars-one.com/en/>
<http://www.space.com/16113-red-dwarf-stars-sun-video.html> – less nearby Brown Dwarfs than expected
<http://www.space.com/16405-private-foundation-seeks-to-save-aquarius-underwater-lab-video.html>
<http://www.oneworldocean.org/> (scroll down to “a mission to inner space”
<https://ieeetv.ieee.org/player/html/viewer?gclid=CMXphq3eq7ACFSMDQAoddRxLWQ#inbrooklyn-warehouse-honeybee-robotics-is-developinglunar-excavator-that-may-help-us-colonizemoon->

For past articles, Visit http://www.moonsociety.org/publications/mmm_classics/

MMM PHOTO GALLERY - COMMERCIAL SPACE



Historic First: ISS Canadarm attaches to Space-X Dragon Cargo Capsule to guide it to docking port



DragonLab-g: an early step to Mars and beyond <http://www.thespacereview.com/article/2089/1>



Sierra Nevada's Dream Chaser mini-shuttle takes 1st "captive carry" flight test

<http://www.universetoday.com/95599/a-banner-week-for-commercial-spaceflight/#.T8p7jEoGAvg.facebook>



S-xor's Lynx to begin tourist flights in 20134

<http://www.space.com/16071-xcor-lynx-spacecraft-space-tourism.html>

For past articles, Visit http://www.moonsociety.org/publications/mmm_classics/

NSS' 32nd annual International Space Development Conference

ISDC 2013 – San Diego, California

Thursday–Monday, May 23–27th (Memorial Day Weekend)

“Global Collaboration in the 21st Century Space”

“Where astronauts, scientists, entrepreneurs, government officials, activists and other citizens who look forward to the opening of the ‘final frontier’ gather each year to discover the future of space exploration”

Hyatt Regency La Jolla at Aventine

3777 La Jolla Village Drive, San Diego, CA 92122 - Phone: 402-592-6464 / 888-421-1442

(about 15 miles north of downtown San Diego)

Registration rates start at \$130/night - no further details at this time



Rooms available at ISDC rate **May 21, 2013 - May 28, 2013**

Potential Tours: Space-X, Sierra Nevada Space-Dev, Palomar Observatory, San Diego Air & Space Museum, USS Midway

Hosted by the San Diego Space Society - www.SDSpace.org

ISDC Registration: [https://www.nss.org/cgi-bin/register/tdregister?\\$Origin=ISDC13](https://www.nss.org/cgi-bin/register/tdregister?$Origin=ISDC13)

(The earlier you register, the less you need to pay)

Best Rate for NSS Members - Students under 22 half price - no senior rate

The Moon Society will host a “Lavatube” Track - see pp 8-9

The host city/chapter for ISDC 2014 is yet to be decided

What to do in San Diego - <http://www.sandiego.org/what-to-do.aspx>



CALIFORNIA



OASIS: Organization for the Advancement of Space Industrialization and Settlement
Greater Los Angeles Chapter of NSS
P.O. Box 1231, Redondo Beach, CA 90278
<http://www.oasis-nss.org/wordpress/>

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 www.oasis-nss.org/articles.html

Regular Meeting 3 pm 3rd SAT monthly – MAR 17 – APR 21 – MAR 19 – APR 21 – JUN 16 – JUL 21

Sat., Aug. 18, 3 pm **OASIS Board Meeting**, Home of Lisa Kaspin, 3206 Summertime Lane, Culver City, CA 90230

Sat., Aug. 27, 3pm **Griffith Observatory Tour** Hosted by Space Artist Chris Butler. Details TBD

Tu–Thur, Sept. 11–13 **AIAA SPACE 2012 Conf. & Expo**, Pasadena Conv. Cntr, 300 East Green Street, Pasadena, CA

Sat., Sept. 15, 3 pm **OASIS Board Meeting**, Home of Craig / Karin Ward, 1914 Condon, Redondo Beach, CA

Sat., Oct. 20, 3 pm **OASIS Board Meeting**, Home of Steve Bartlett /Tina Beychok, 7108 East Peabody, Long Beach, CA

Sat., Nov. 17 **OASIS Board Meeting**, Home of Steve Bartlett and Tina Beychok, 7108 East Peabody, Long Beach, CA

Fri.–Sun., Nov. 23–25 **LosCon Science Fiction Convention**, LAX Marriott Hotel – OASIS will have a fan table, run programming (including Build a Spaceship for the kids), and host a room party, Please join us for the fun!

Sat., Dec. 8, 3 pm **OASIS BOARD MEETING & Holiday Party**, Home of Bob Gounley and Paula DeFosse

COLORADO



DSS: Denver Space Society
(FKA The Front Range L5 Society)
1 Cherry Hills Farm Drive, Englewood, CO 80133

Eric Boethin 303-781-0800 eric@boethin.com – **Monthly Meetings 6:00 PM on 1st Thursdays**
Englewood Public Library, Englewood, CO 80110 – 1000 Englewood Parkway, First Floor Civic Center

NEXT MEETINGS – AUG 2 – SEP 6 – OCT 4 – NOV 1 – DEC 6

ILLINOIS



CSFL5: Chicago Space Frontier L5
610 West 47th Place, Chicago, IL 60609

MINNESOTA



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

<http://www.mnsfs.org>

<http://www.mnsfs.org/2011-Review/>

MNSFS Continuing its tradition of putting up 'Current' space displays MN SFS's current space flight ISS-30 is now on public view at :Radio City Inc.,2663 County Road I. Mounds View, MN 55122

MNSFS NEWS – Ben's Pix from recent Convergence Science Fiction Con

<https://www.facebook.com/media/set/?set=a.10151022426128516.454074.592718515&type=3&l=426d43cd8e>

OREGON



OR L5 - Oregon L5 Society
P.O. BOX 86, OR 97045
<http://www.OregonL5.org>

(LBRT – Oregon Moonbase) moonbase@comcast.net

* Meetings 3rd Sat. each month at 2 p.m. - Bourne Plaza, 1441 SE 122nd, Portland, downstairs
* Regular Meeting 3 pm 3rd SAT monthly – Aug 18, Sep 15, Oct 20, Nov 17, Dec 15

For past articles, Visit http://www.moonsociety.org/publications/mmm_classics/

PENNSYLVANIA



NSS-PASA: NSS Philadelphia Area Space Alliance
928 Clinton Street, Philadelphia, PA 19107

<http://pasa01.tripod.com/>

c/o Earl Bennett, Earlisat@verizon.net - 856/261-8032 (h), 215/698-2600 (w)

<http://pasa01.tripod.com/> - <http://phillypasa.blogspot.com>

Meeting location and time: We will meet at the liberty One Food Court, on the second level of the building. We meet from 1 to 3 p.m., this time on July 21, on the west side of the building. Look for our display (or trophy!). Our August meeting will be on the eleventh.

June 16th Meeting notes: We had a large attendance this time, ten members, and had lots to talk about. First off: we are the N.S.S. Chapter of the Year! This was greeted with pleasure by the members in attendance, and, the people who attended the I.S.D.C., which included Ed Johnson of our group. I received the plaque from N.S.S. President Ken Money, and, Larry Ahearn, At Large Director (and Chapter Advisor and Facilitator). We used it as our locating object at the Food Court.

And there was much more: due to the large number of great activities at the event, even with four days to hold them, we could only attend a few. This was an international group with students, and facilitators, from Eastern Europe (Romania was prominently represented), Sri Lanka, The United Kingdom, Japan, and, the U.S.A.. There was one team, whose presentation Michelle and I attended, that had an international cast: someone from India, Japan, and, Russia (I think) as well as non attending partners. What exotic place where they from? Why, New Jersey, of course! And other American schools were well represented in the NASA art competition, the habitat design competition, and the Students for the Exploration and Development of Space track. Many great displays and informed conversations with these young people. Besides habitat design, with a number of tori, there was also consideration of where the raw materials would come from. Our members enjoyed talking about the material from this part of the events and the main lines below.

Space Solar Power: a number of panels including one with John Mankins author of “Space Solar Power and the SPS Alpha Concept” on the materials needed to build the SPS part of the civilization starting with test bed systems. See the kickstarter.com website to see materials for public discussion and background material. Again there was a student presentation on this subject, and, a new design based on a solar sail like structure with a large number of small panels tended by snake like robots. Scientist, and former PASA member, Seth Potter also presented.

There was a lot more, including a Moon series of presentations with Dave Dunlop of The Moon Society (who organized these panels), and, a Mars series that included Dr. Mary Voytek, Lead for Astrobiology and Deputy Program Scientist for the Mars Science Rover (Curiosity). Very interesting talk on the search for life. But the talks were presaged on Friday by an historic event: during NASA administrator, and Marine Corps General, Charles Bolden’s opening remarks we had him talking on public private partnering for space exploration, and, in the background, we saw the docking of the Space-X Dragon capsule in real time with the I.S.S. We loved it! This was a great start for a number of the talks on private investment and development of space resources and manned mission support. If one is happening near you try to go. Next I.S.D.C.: will be in San Diego, California, May 23–27, 2013. See the NSS-PASA website for more.

Larry brought material from the Super Science event: a list of people who want to find out more about space (and us). He also brought a table of Moon orbits listing the current close approach and most distant locations in the next few months, and, an additional listing of sunspot cycles (with the number increasing to 85 next year, only 80 this year). On our site: he will put tracking in place, and, will be putting the “news flashes” updates on our site. More good news: Larry has connected us with the N.S.S. Chapters site and our reports will be available there!

Dorothy brought material on the ongoing, but soon closing, Beyond Planet Earth exhibition at the A.MN.H. in New York. Quite a lot of material. She noted that the MAKE Faire will be coming to The Hall of Science in Queens again in September. And we can find her report on the Balticon convention in her publication “Dotty’s Dimensions.” Check her Facebook site for more details, or Google her publication.

Hank reported that P.S.F.S. has still not had a meeting, and, that the head of that organization had a car accident and so was unable to attend the P.S.F.S. meeting to discuss that groups events and finances. Hopefully, Mark will make a full recovery and the questions Hank has can be resolved.

Dennis talked of the cycling spacecraft and Buzz Aldrin’s comments on using it as a ferry to the Moon. This would be a side business to its’ main job: delivering people & cargo to/from Mars. Discussion of how this could be done legally, with possible private funding and off-shore location to avoid political interference). Singapore?

We talked of the loss of Ray Bradbury and had some remembrances of him and his great fiction, and, his life. Wallace, an associate member, in particular mourned his passing. Wallace also mentioned Richard Gariott’s’ new film: “Man on a Mission” which is coming to theater distribution. Look for it.

I have reported much on the I.S.D.C. and so will close without my, or Mitch’s reports this month, but, will close with Janice’s’ report from Science magazine for May 2012. Organic material, not necessarily of organic origin, has been found in a Mars rock found on Earth. It is the famous ALH84001. See page 70 of the issue. EB

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The NSS–PASA Report for July 2012

Pre-meeting note: we decided to hold our monthly meeting as close as we could to the anniversary of the first human visit to another world. July 20th was the 43rd year since we first went to the Moon. Another commemorative period also noted: the first Chinese woman in space (June 2012). We talked of the possibility of the 50th anniversary of our landing on the Moon being the year when the first Chinese Taikonaut might set foot on another planet (the Moon, it's closer than Mars and seven years makes it doable). When I asked: has anyone seen news on the return of the Chinese space crew?" I got two answers: "I put it on my Facebook page" from Dorothy, and, 'yes, on B.B.C. America on public television" from Janice. The group of ten had not seen any reporting on the major national media. We knew of the launch from several sources (Space.com and other web sources), like public television, but, again not much from the "big media." There was a little forward looking report about the "historic Moon landing," with some talk of Peter Diamondis and his Asteroid Mining venture, but all in all, not much about our future in the solar system.

Meeting notes: Larry reported on the website, as usual, and discussed the update of material we have and the hits. He also brought material on Solar Weather and the Lunar approach events we have been experiencing (very close proximity of the Moon, and the "severe" Coronal Mass Ejection event the week before being.

Dorothy brought material on The Franklin Institute Facebook site (lots of stuff there!), Space.com's site, as well as Geoffrey Landis' (.com)s poem on the Moon Landing and his book of poems: Iron Angels. And the fantastic prize given at ComiCon: a ticket to space! Rick Serfoss, former astronaut, and actor Simon Helberg, "Howard Wolowitz" from Big Bang Theory (TV show). The winner, Mercedes Becerra, was at a panel by members of the show where the surprise award of the ticket, for a seat on the XCOR Aerospace Lynx RLV, was awarded ("look under your seats for an envelope"). This prompted Rich Bowers to bring up the lottery idea for seats and the suggestion from him that other entrepreneurs should create a lottery for trips to the Branson or other resort areas as a package for the grand prize winner(s). Great report!

Hank Smith pointed out that Mark Trebing, whose injury was reported last month, was Treasurer, not President, of P.SFS. The WorldCon is in Chicago this year, and, San Antonio next year he reported. Hank usually does outreach for both the science fiction community and space exploration, but is dealing with several issues and has had to limit what he can do for the moment. Currently, he does mostly local tri state outreach

Dennis Pierson, who does public outreach for us with a number of social organizations, and is an NSS Chapters Organizer, mentioned seeing the ticket award noted above, and that Ad Astra, the flagship publication of NSS may soon have more ads and changes to the chapters information normally printed in each issue.

Mitch brought the Summer issue of Ad Astra. The cover has the Virgin Galactic Space Ship Two during glide tests. There are a number of articles on space transportation systems, the history of L-5/ NSS. and Commercial Human Space Flight (title of report), an interview with XCOR CEO Jeff Greason by Douglas Messier, and, Strato-launching into Space, on a new system being built using a large carrier vehicle (think two 747s connected by gigantic wings and a connecting assembly for the "cargo" carrier giving a full up weight of 1.2 million pounds). The cargo could be over 400,000 pounds. See the issue! And from the July/August Futurist, several articles related to human spaceflight: "Smellovision" anyone? This to help on long term space flight, and, sex in space (again?) And a special issue of US News and World Report on "The Mysteries of Space." Pick this one up if you can!

Janice brought up the upcoming landing of the Curiosity Rover on Mars August 5th and the search for life, and Earl discussed contact from Niraj V. Jayant on behalf of the ExploreMars.org non profit organization. They asked us, NSS–PASA, if we would hold a public event. Due to the timing, about 1:30 a.m Monday morning, I sent the information on to Derrick Pitts of The Franklin Institute since that organization is great at doing public events. Mitch would also send the idea on to his contact at Drexel.

I should mention that long before the Mars Science Lab (now "Curiosity") was built, Geoffrey Landis talked at Phil-con about this system and its ability to analyze mineral formations at a distance using a powerful laser to vaporize samples at a long range.

Other news: Wallace, an associate member, saw the Chinese astronauts story in USA Today, and member Michael Stewart, who does astronomy outreach, was a guest on a local radio show for a half an hour. And much, much more.

Submitted by Earl Bennett.

"All men dream, but not equally.

"Those who dream by night in the dusty recesses of their minds wake in the day to find that their dreams were just vanity.

"But the dreamers of the day are dangerous men, for they may act out their dreams with open eyes ...making what they dream possible."

– T.E. Lawrence

Moon Miners' MANIFESTO
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Please renew promptly so as not to miss an issue

INDEX to MMM #257 AUGUST 2012

1. **In Focus:** ISS International Partners prefer the Moon as Next Manned Goal
- 3 **The Critical Path to "Pioneering the Moon":** The Situation
5. (cont.) Building and Manufacturing Materials from Moondust
6. (cont.) Incorporating an Earth-like "Outdoors" in Middoor Spaces;
The Role of Indigenous Arts & Crafts; The Role of "Lee-Vac" and "Out-Vac" Activities

Moon Society Journal Section

- | | |
|---|----------------------------|
| 8. Moon Society Election Results | 9. Moon Day 2012 in Dallas |
| 10. Moon Society "Lavatube" Track for ISDC 2013 | 11. Chapter & Outpost News |
| 12. Download papers from Moon Society "CisLunar" Track at ISDC 2012 | |
-
- | | |
|----------------------------------|--|
| 13. Browsing Links – Video Links | 14. MMM Photo Gallery – Commercial Space |
| 15. ISDC 2013 in San Diego | 16. NSS–MMM Chapter News |

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