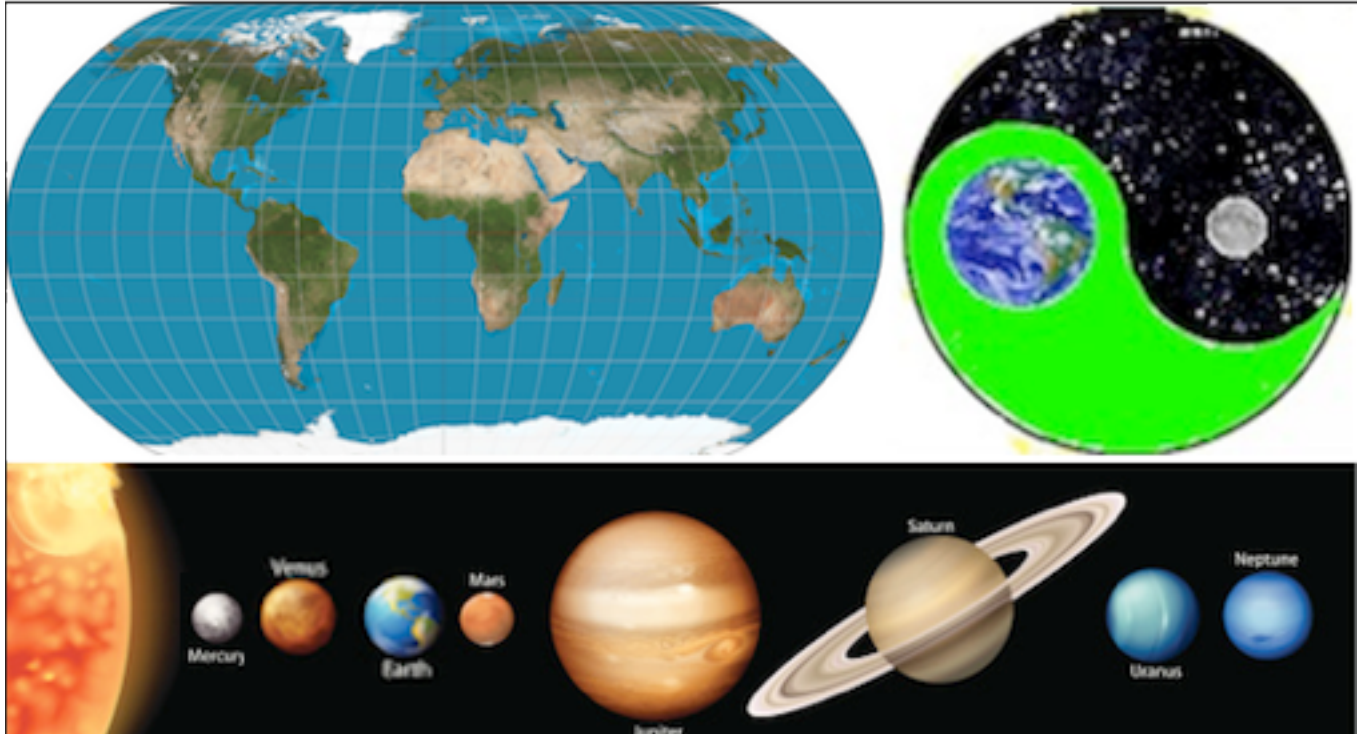


“Towards an Earth-Moon Economy – Developing Off-Planet Resources”

# Moon Miners’ Manifesto

& The Moon Society Journal

www.MMM-MoonMinersManifesto.com



Our “Mother World” will expand to include “Father Sky” and eventually, our Birth Solar System

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Musical Instruments that could be made on the Moon: L>R: Steel drum pan, glass marimba, glass harmonica

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## About Moon Miners' Manifesto – “*The Moon - it's not Earth, but it's Earth's!*”

- **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.
  - **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 23 PDF format volumes, for free downloading from this location: [http://www.MoonSociety.org/publications/mmm\\_classics/](http://www.MoonSociety.org/publications/mmm_classics/)
  - **MMM THEME Issues:** 14 collections of articles according to themes: [.../publications/mmm\\_themes/](http://www.moonsociety.org/publications/mmm_themes/)
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- 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 (202) 429-1600 – [www.NSS.org](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](mailto:KokhMMM@aol.com) – Email message body text or MS Word, Open Office 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 The Steady Watering Down of the “Earthday” Mission

By Peter Kokh

**What does Earthday have to do with the spread of civilization to the Moon, Mars, and beyond? Plenty.** On worlds beyond not blessed with oceans and a breathable atmosphere, we will have to learn fast how to “**live downwind and downstream of ourselves.**”

Here on Earth, despite some token regulations, we are a long long ways from doing that. And politically, we are divided into two camps: those who see the need to clean up our act, and those who downplay or deny the way we are polluting our planet. Those of us who would like stricter regulations for the sake of our children, are held in contempt by those who see regulations as imposing financial burdens on our children. Of course, it is not our children's financial burden that concerns them, but their own financial profits.

Earthday got its start in 1970 and for a while, its annual celebration concentrated on fighting pollution and preserving habitats. Here in Milwaukee, however, all that is left of the annual celebration, is an effort to get kids to help pick up trash along the banks of the city's rivers.

We had hoped to have a table and display somewhere, in connection with the event, about how we must learn to live downwind and downstream of ourselves not just on the Moon and Mars, but here on Earth.

Alas, there is nothing planned anywhere in our city beyond trash pickups. It's sad. ##

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## Using the Challenges of Living in Space to Rescue Mother Earth

Many, if not most cities, towns, and rural homesteads here on Earth, are thoughtless of neighbors downwind and downstream, with our adequately cleansing the air and water we have polluted and are passing on downwind and downstream. Ever tighter regulations aim to reduce this problem, but not quite adequately, and certainly not worldwide, and with a lot of “cheating.”

### Here on Earth what goes around comes around.

**Earth has three Commons: ✓ Ocean (Hydrosphere), ✓ Atmosphere, ✓ Orbitsphere (Earth orbits)**

#### ✓ The Ocean (see article that follows)

- **Satellite monitoring of frequent offshore trash dumping areas** reporting to special international authorities with power to seize boats, ships, or barges involved, fine owners, revoke licenses, etc.
- **Reshaping National and International Policies** that affect conditions on Earth for the better, rather than for the worse, and covering **international lands and waters**.
- **Incentives** (prizes, awards) to **produce products from trash found off shore and in illegal dumps**.

#### ✓ The Atmosphere

- Like the oceans, Earth's **atmosphere is a “commons”**
- **The right of downstream and downwind communities and nations to sue for damages.**

#### ✓ The Orbitsphere

- Tackling the **Space Debris** problem with determination and effectiveness: #1, prevention, #2, fines.
- **Showcasing Earth from above**, so that we all see the sores and scars, as well as the few areas improving
- **International conferences in orbit** that affect the environment. ##

### On the Moon (and Mars)

The Moon does not provide us with a global atmosphere and hydrosphere. Our reserves of air and water must be built up with great effort. We will have to breathe our own used air and drink our own used water.

Mars has a thin unbreathable atmosphere. Our settlements will be closed, each maintaining its own atmosphere. Thus, on both the Moon and Mars, we must live “downwind and downstream of ourselves.”

We cannot do this with a fixed sized one unit CELSS (closed Ecological Life Support System) Why? We expect our first outpost to grow and grow into a settlement. We must design every module, be it for living space, work space, recreational space, or just passageways, so that the complex naturally recycles our waste water and exhaled and exhausted air. We must design every module so that the settlement's capacity to do so grows automatically with each new module added.

#### Keys to success

- **Water systems:** We must abandon “monotreme” plumbing (all types of waste water into one sewer system). Every habitat & activity module must have reengineered toilets. Every Hallway section could host “Living (Green) Walls.” Plants must provide food: fruit, nuts, grains, vegetables, tubers, etc.
- **Atmosphere systems:** Every module must contribute to the biosphere. The outpost/settlement layout must contribute to a “circulation pattern.” Air and water must both be handled in circulation loops.
- **On the Moon, Power and Energy:** Solar power is available for use during the two-week long “Dayspan” with excess solar power which can be stored in several ways, including hydroelectric loops, geothermal, and other systems) to be tapped during the two week long “Nightspan.”
- **On the Moon** there will be a “Dayspan/Nightspan” division of duties and chores: energy intensive / manpower light tasks must be tackled during the dayspan while energy light/manpower intensive tasks can be saved for nightspan. This means that the pace of life and what one does will change every two weeks providing interesting life styles.

#### “Reclamation” and the concept of “Polders” – “taking wasteland and making it fertile”

**The Moon and Mars are barren and lifeless:** Settlers will find ways to “reclaim” both, settlement by settlement. <http://www.moonsociety.org/chapters/milwaukee/reclamation.html>

- Adequate shielding – 5–6 meters (c. 20 ft) of moondust for protection from cosmic radiation and insulation against dayspan heat and nightspan cold and keeping out the vacuum and radiation
- Geothermal systems in use on Earth can be adapted for the Moon: storing excess dayspan heat during the dayspan for use during the nightspan using technologies well developed here on Earth

#### “Mother Earth and Father Sky” – What would Earth be like without the Sun and the Moon?

As individuals and as organizations, we owe it both to future pioneers of Moon and Mars, and to our children who remain on Earth, to change public awareness and expectations. Pioneering the “Sky” will help preserve the beauty and richness of Mother Earth. As individuals and chapters, we need to provide this new, rich, promising dedication to Mother Earth and Father Sky. We owe it to our children and generations to follow. ##

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## “Internationalization” and the Inevitable “Tragedy of the Commons”



By Peter Kokh

**Personal Comment:** I crossed the Atlantic from New York City to Southampton, England in late August 1961 aboard the steamship SS, United States.. The seas were calm, and the water **clean**. I returned 15 months later, Liverpool to St John’s New Brunswick aboard the Empress of Britain.. This time the waters were anything but calm, 20 m (60 ft) waves all the way, [I was one of 35 who did not get sea sick.] And the water was still clean. Today, 55 years later, it is full of trash as the photo above shows, because, beyond a certain limit, it “belongs to everyone.” **“Everyone” has no way to exert responsibility and enforce antidumping laws. #**

### **The Internationalization Trap and Space Debris**

We already see the same phenomenon in space: **Space Debris**. No country owns space and inter-national organizations such as the United Nations and its derivatives, have no effective authority over anything. In the ocean, beyond 320 km/200 miles from continental shores, no nation can exert authority. The oceans belong to everyone (i.e, to no one.) Well intended regulations are totally toothless.

The same is true with space beyond Earth’s atmosphere. It is international territory, and that effectively means, that like the oceans, it is becoming a dumping ground for satellites and parts of satellites no longer operational. And as they crash into one another, Low Earth Orbit space is becoming a mine field. Another case where “International, er, to every country” means to no one.

What is happening to near Earth space – THE SPACE DEBRIS PROBLEM (capitalized to the last letter) threatens to reach a point where it could imprison us on Earth’s surface, ending the Space Age.

### **Will not the same fate befall opening of the Moon and to Mars to human communities?**

**On worlds beyond Earth, there must be an effective regime of responsibility – self govern-ment responsible to settlers. Settlers must be able to assert sovereignty, and take respon-sibility for yet unsettled areas of these worlds. There must be no “International Turf.”**

We need autonomous Lunar and Martian governments, responsible to the settlers, not in some well intended but unpoliceable vague and toothless way “responsible” to Earth or “Humanity” at large.

We do not intend here to suggest how to rewrite “the Moon Treaty” – but only to point out that there is an urgent need to avoid this vacuum of responsibility for all of us who wish to see mankind spread throughout Earth’s consollar hinterspace in some responsible way.

We will not succeed in spreading mankind throughout the Solar System and its fringes, unless we all come to realize that “International”, however well-meant, is a dirty word as presently meant. ##

[[ If you haven’t yet, DO read Garret Hardin’s novel, **The Voyage of the Spaceship Beagle and the Tragedy of the Commons.** That it is now decades old, does not mean it has become irrelevant! ]

**Some of many books and articles about this monumental novel and its significance.**

[http://www.garretthardinsociety.org/articles/art\\_tragedy\\_of\\_the\\_commons.html](http://www.garretthardinsociety.org/articles/art_tragedy_of_the_commons.html)

[https://en.wikipedia.org/wiki/Tragedy\\_of\\_the\\_commons](https://en.wikipedia.org/wiki/Tragedy_of_the_commons)

<http://web.mnstate.edu/gracyk/courses/phil%20115/Hardin-on-lifeboat.htm>

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## Metal Massive, Unitary, Simple Things

By Dave Dietzler

It is not always necessary to melt and cast metals. That requires lots of energy, time and labor by men and machines. Cold metals can be shaped by rolling, extrusion and spinning. This work hardens the metal. When this is not wanted, metals can be hot worked. That takes more energy but not as much as melting does.

**Metal ingots, slabs and billets** can be rolled into flat or curved plates of varying thickness, sheets and foils. Plates can be cut into different sizes and shapes with computer guided lasers on cutting tables outside in the vacuum. Extruders can make rods, rails, bars, beams and tubes with different cross sectional shapes and dimensions by fitting the extruders with different dies. Rods can be drawn into wires. Rails, rods, bars, beams and pipes can also be rolled. Domes can be spun from circular plates on large lathes. Enormous presses to make domes are not needed. Many things can be made from these simple objects by welding or bolting things together.

**Flat Plates:** slusher buckets or scrapers, excavator buckets, bulldozer and road scraper blades, ground vehicle parts, spacecraft frames, metal floors, fluidized beds (with some tubes and other parts), appliance parts and casings, even pots and pans by stamping small circular thin metal plates.

**Curved Plates and Spun Domes:** rocket propellant tanks, fuel cell reactant tanks, water tanks, oxygen (and other gases) tanks, pressurized ground and space vehicle cabins, solar trough reflectors, spun domes for radio and solar concentrator dishes.

**Rails, Bars, Beams:** ground vehicle and earth moving equipment frames as well as other parts, building support structures, railroad tracks.

**Rods:** axels, "tent" or canopy poles, radio antennas, rebar, "telephone" poles for power lines and phone lines.

**Wires:** power lines, phone lines, electrical wiring, motor coils, steel cables for earth moving equipment.

Aluminum, pure iron, meteoric iron-nickel and steel will be most useful. Magnesium is soft but not very ductile unless it's hot. Titanium is hard to cold work but can be hot worked. Many titanium parts could be made from powder by electron beam fusing or sintering, a kind of 3D printing, outside in the vacuum.

## Brakes, Batteries, and Other Automotive Needs on the Moon

By Dave Dietzler

There is no asbestos on the Moon, but plenty of basalt, and in Russia they have used basalt for brake pads. Now why brakes for electric motored lunar vehicles??? Why not just reverse the voltage and current on the electric motors???

**A)** Throwing all that juice for a quick stop might overload and overheat the motors

**B)** But even more important, reversing the juice will drain the batteries....with brakes, the motors can become generators and recover some energy to recharge the batteries and extend range...this is how hybrid cars work. Regenerative Braking.

So, we've got to have brakes and we have brake pads from basalt....

**As for batteries,** there is sulfur and sodium for **sodium/sulfur batteries** which run real hot like 900 F. and nickel and hydrogen for **nickel hydride batteries**....

**Magnesium** for wheels, **steel** for frames, **aluminum** alloy (add Mg, Si, Mn and/or Cr...no copper or lithium) for vehicle cabins. Some vehicles will be open cockpit like the Apollo Moon rover. Motors will have aluminum windings....pure aluminum is the best conductor we have....alloys are less conductive.

Aluminum, like silicon, can be zone refined to very high purity. and in the pristine vacuum and low gravity zone refining will work real good....

## Space Manufacturing: Old Meets New

By Dave Dietzler

Additive manufacturing or 3D printing is all the rage. While plastic is usually used in these machines, metals, glass and ceramics can also be used. There is even large scale printing of buildings with concrete. In an earlier issue of MMM (Feb. 2016) I suggested printing with abundant lunar basalt and making everything from habitat modules down to paper weights and door knobs. This is all great. Newfangled 3D printing is a frontier enabling technology, but there are other things to consider.

Printing with metal requires powdered metals. Metals can be powdered in at least two ways. Molten metal can be sprayed out of a nozzle into streams of cool inert gas or spinning rods can be hit with an electric spark. The spark melts the rod and particles of molten metal are spun off. Many of us agree that powdered metals will be the

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lunar sourced rocket fuel of choice. It looks like we will have the necessary devices and the capacity to produce tons and tons of powdered metals. Hydrogen from polar ice will still be desirable. It could be combined with plentiful silicon to make liquid silane ( $\text{SiH}_4$  bp minus 112 C) and that could be used as a powder carrier fluid for bipropellant rockets that burn powdered metals and liquid oxygen. This would greatly extend our hydrogen supplies.

Getting back to 3D printing, this new technology threatens to disrupt conventional manufacturing. However, I think there is a time and a place for everything. It would make very little sense to print bricks, blocks and slabs of basalt when all we have to do is melt some mare regolith and pour it into sand molds dug in the ground. Printing can be slow. Parts are built up microns thick layer by layer, although habitat might be printed in layers inches thick. We don't need to do that for bricks, blocks and slabs! Simple casting will probably be much faster than printing of these items. Basalt pipes can be cranked out with centrifugal casting machines. These pipes of various sizes could be used for water, sewage, air, electrical conduits and abrasion resistant chutes for powdered materials including raw regolith.

Ingots and billets of metal fresh from the smelters can be squashed into plates, sheets and foils in rolling mills and extruded into rods, rails, bars, pipes and wires. Soft aluminum and pure iron will be easy to work in rolling mills and extruders. It would defy common sense to take ingots and billets of metal, powder them and then print up massive, unitary and simple objects like the aforementioned. I cannot see 3D printing replacing the drawing of wires and fibers either. We will need lots of those. Electric motors will require miles of pure aluminum wires and basalt fibers will be used for insulation, sound deadener in walls, cushion stuffing, outerwear, curtains, rugs, cloth bags and cloth sacks.

Permanent mold casting is a great way to mass produce things. Perhaps there will be a fusion of the old and the new with 3D printers making permanent molds from steel of any desired shape and size and these will be fitted onto machines that pressure feed molten metal, glass or basalt into the molds. By changing molds or dies we can use these machines to mass produce a wide variety of things.

Sand casting with wet sand in pressurized modules might be done with precise 3D printed basalt forms of any shape and size pressed into the sand to make a cavity that is then filled with molten metal to cast large parts without the time delay of printing microns thick layer by layer. This might put the die and mold makers out of business so we will have to retrain them to become 3D CAD-CAM operators. They can work on sculptures in their spare time for the sake of art! A finely made handcrafted object like a carved basalt scarab will still have value. Human hands and tungsten carbide tipped chisels will be needed to carve basalt on the Moon.

Casting is not used for all making. Power forging hammers can quickly stamp out pots, pans, electric motor casings, piston type compressor rods and crankshafts, tools, hardware and many other things, even jewelry, from sheets, plates and cold or hot metal blanks. The hammers can mass produce different items by switching the dies and the hard steel dies could be printed up on the Moon.

Basalt furniture might be printed up. We could also use AAC (Autoclaved Areated Cement) made in a printed basalt autoclave printed with a machine similar to the ones used for habitat modules. AAC can be sawed, nailed, screws sunk in it, glued, machined, carved etc. like wood. Then we can have furniture that resembles the wooden furniture of Earth. A rocking chair to sit on in front of a large periscope window would be one of the little luxuries of the Moon. Let the carpenters work with AAC and let the machines print titanium rocket engine turbopumps!

Machinery and other products including furniture will require thousands of small parts--fasteners like nuts, bolts, screws and rivets. We will need something faster than 3D printing to keep up with growing industry on the Moon. We will need lathes to cut screws and bolt rolling machines. The 3D printers could make dies for the bolt rollers and parts for the lathes.

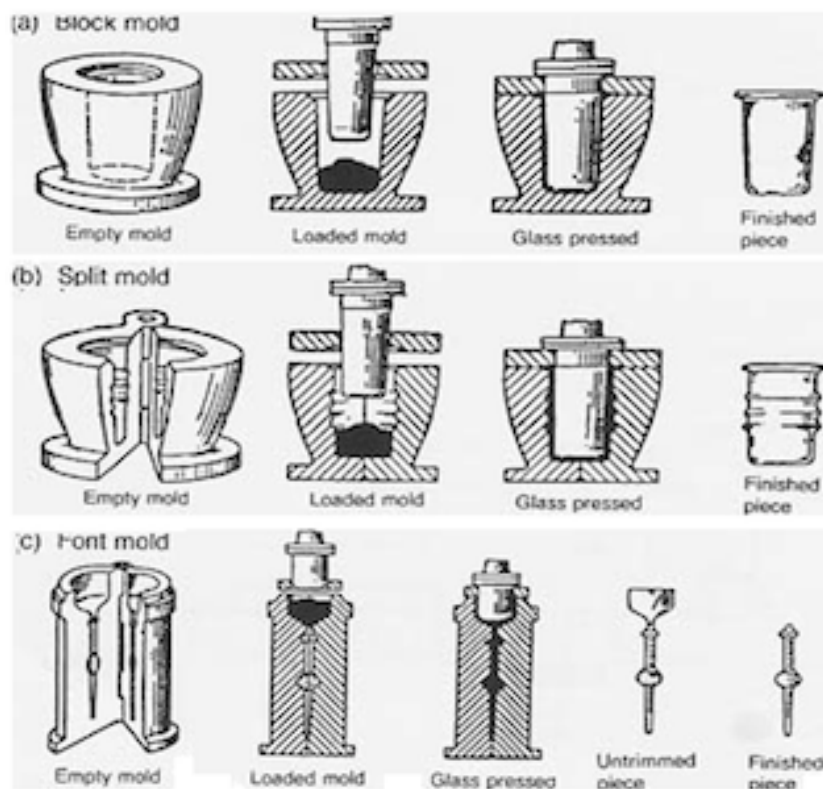
You can't spin thread, weave cloth, sew up clothing or cook meals with 3D printers. Garment workers and chefs are safe from the disrupting effects of this technology! A 3D printer can make all the parts for a sewing machine or a stove, so the new and old meet again. You can't paint things with a 3D printer either. We will want to paint things and that will require imported paint when lunar sources of organic chemicals or sodium silicate based paints are insufficient.

Before 3D printing I envisioned crews of skilled workers on the Moon making molds of all sorts and/or importation of smaller molds and large cargo modules filled with numerous plastic forms to make sand molds for casting metal parts including dies for other machines. Things now appear differently, but in no way do I foresee a 100% automated and de-humanized industrial base on the Moon or Mars. Building, maintaining and repairing machines can require surgical skill. Making fine furniture and remodeling interiors is no job for robots either unless we create sentient androids in the near future. Perish the thought! There will be a demand for humans on the High Frontier because teleoperation is limited by the speed of electromagnetic waves.

It becomes clear then that old manufacturing processes will co-exist with new manufacturing processes on the Moon, in orbital space stations and on Mars. It becomes possible to make any kind of master mold with 3D printers and do any kind of casting job in sand molds or permanent molds. Finally, all this just gets us lots of parts. Humans will be needed to assemble all the parts into complete and finished products. The combination of old and new permits a synergy that makes space manufacturing, ISRU and bootstrapping far more probable in the future.

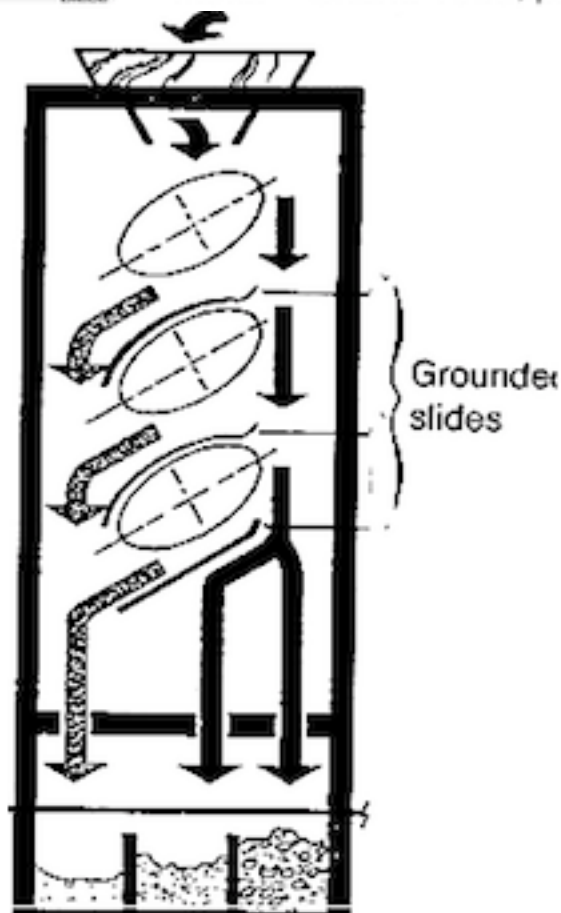
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### Glass Forming

The material on the lunar surface has a high silicate content. Some of those silicate materials could be the constituents or transparent glasses, which could have a variety of uses at a lunar base. Various processes are available for fabricating objects from glass. Here, molds are used for glass pressing. The liquid glass is lured into the mold which is then compressed. When the glass has cooled, the object is extracted from the mold. -- Shand 1958, p. 154



## Making Music Instruments on Moon and Mars

By Peter Kokh

### Spring & Sumer 1986 – Steel Drums and Marimbas

I had joined the National Space Institute (before it was renamed NSS) since 1974 as a life member, and the L5 Society a couple of years later. I had never gone to an International Space Development Conference and there was one slated for late May in Seattle, Washington. I wanted to go. But my sister and her husband who lived in Port Angeles, WA out on the Olympic Peninsula, wanted me to wait until August so I could join them at the Worlds Fair in Vancouver, British Columbia not too far away. Vancouver is a wonderful city, as I had discovered for myself three years earlier, so I agreed to this change of plans.

It was at the fair that I stumbled on someone playing a steel drum, and I was thoroughly captivated. I loved the music, And it was an eureka moment. There will be no wood or brass on the Moon, but pioneers could take the end of a steel drum used to ship needed liquids to the lunar settlement, and fashion one end into sections, each one when hit with a baton of some kind, had a distinct note.



The shape and size of the several sections produce characteristic notes

[https://www.youtube.com/watch?v=bJd\\_ym6c0ks](https://www.youtube.com/watch?v=bJd_ym6c0ks)

<http://www.steelpan-steeldrums-information.com/make-steel-pans.html>

Since then, how pioneers might make music on the Moon has captivated me' I wrote about it in MMM #4 [www.asi.org/adb/06/09/03/02/003/moonmusic.html](http://www.asi.org/adb/06/09/03/02/003/moonmusic.html)



A marimba made on the Moon might have glass pipes

### More options

Just the other day, I happened to stumble on a video of someone who made a fantastically complex musical instruments that made wonderful music with 2000 "marbles." [www.youtube.com/watch?v=lvUU8joBb1Q](http://www.youtube.com/watch?v=lvUU8joBb1Q)

I am not suggesting we can do this on Moon and/or Mars – although perhaps we could. Rather I was captivated by this example of inventive ingenuity. The junk pile may include many items brought from Earth with copper wire and brass components. The pioneers may start with steel drums and marimbas, but their inventive ingenuity – "what can we do with all this surplus junk?" will surely lead to a limits-shattering variety of music makers, enriching and distinguishing pioneer culture.

And the unique sounds of music made on the Moon may well captivate potential settlers.

### Some options using salvaged electronics and other discarded items

#### Glass (H)armonicas

[https://en.wikipedia.org/wiki/Glass\\_harmonica](https://en.wikipedia.org/wiki/Glass_harmonica) <https://www.youtube.com/watch?v=eQemvyyj--g>

**Ceramic Musical Instruments** <http://www.ninestones.com/burntearth/terracotta/>

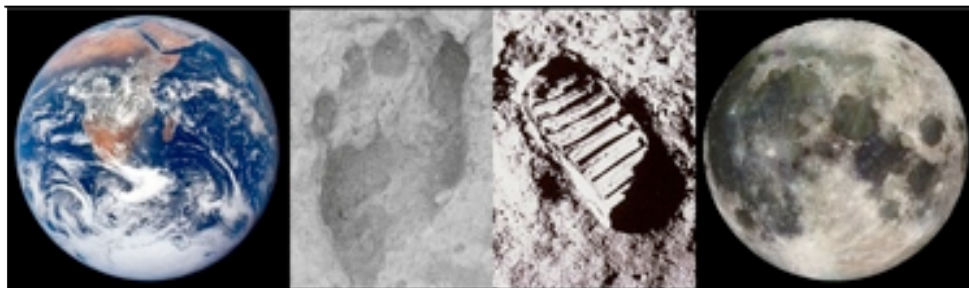
<http://www.ninestones.com/burntearth.shtml> – <http://www.ninestones.com/begallery.html> ##

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THE MOON SOCIETY – LUNAR FRONTIER SETTLEMENT – [WWW.MOONSOCIETY.ORG](http://WWW.MOONSOCIETY.ORG)

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](http://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:** to inspire and involve people everywhere, from all walks of life, to create an expanded Earth–Moon economy that contributes solutions to the major problems that 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](mailto:president@moonsociety.org)

## From Moon Society President Ken Murphy

The Moon continues to come into focus as it becomes increasingly evident that operations in cislunar space is the next step in developing our space capabilities. It's where the bulk of our space assets are found, and it is a place where we can test out new capabilities while close enough to home to come back in an emergency.

The common sense nature of Lunar efforts that The Moon Society has long espoused are increasingly recognized by governments, institutions, and others around the world. It was recently announced in the Sunday Times that venture capital investor Steve Jurvetson would be teaming up with SpaceX and PlanetLabs to develop a base at the North Pole of the Moon in the next decade. While little has been noted beyond the article, it is interesting to note that none of the proposed participants has any particular Moon focus, and the choice of a North Pole location, when everyone else is looking at the South Pole/Aitken Basin region as more interesting, is a bit of a curveball. Advantages to the location include a generally less rugged terrain and some good everdark craters for potential water resources. The book "MoonRush" by Dennis Wingo advocated a North Lunar Pole focus.

Speaking of Moon books, "The Value of the Moon" by Dr. Paul Spudis will be in bookstores in April. From the Smithsonian Press, the book will likely elaborate on many of the cislunar economy ideas espoused by Dr. Spudis and which he has been developing since his book "The Once and Future Moon". I've got a review copy on the way, and will have a review up at our website shortly.

For past articles, Visit [http://www.moonsociety.org/publications/mmm\\_classics/](http://www.moonsociety.org/publications/mmm_classics/) or [mmm\\_themes/](http://www.moonsociety.org/publications/mmm_themes/)

## The Moon Society – Lunar Frontier Settlement – [www.moonsociety.org](http://www.moonsociety.org) p.2

Also on the topic of books, author Stuart Gibbs has released the second novel in his juvenile Moon Base Alpha series, entitled "Spaced Out". 12-year old Dashiell's family moved to Moon and now he's stuck in a hab the size of a soccer pitch, and somehow the base commander's gone missing. The book is impressive for the many, many things it gets right about living in space and how to survive in a totally alien environment. The deus ex machina is provided by an alien thought projection from another galaxy. No worse I suppose than a computer going AI, enabling a Lunar uprising, and then disappearing. Both books have been surprisingly enjoyable. Members should make sure their local libraries have a copy to help encourage Moon interest in our youngsters.

This helps to highlight one of the many ways that Moon Society members can help bring about "humans living and working on the Moon" – by spreading the idea that living and working in space is okay. Despite the best efforts of many space advocacy organizations, the realm of space activities remains something akin to science fiction, which can be seen in how the topic is treated in the political realm. The last presidential candidate to mention a Moon base was roundly castigated in the media by fellow candidates, relegating the topic to a kind of 'third rail' of politics. Given the resources and energy available to us outside our atmosphere it really shouldn't be that way. Human colonies may still carry a patina of fantasy, and huge orbital constructs are obviously a ways into the future. But a base on the Moon need not be science fiction, nor should it be. The expansion of human activity into cislunar space is reasonable and desirable, and our job as The Moon Society is carry that message far and wide. KM

## Ideas for Rejuvenating the Moon Society and National Space Society Calling all NSS Board Members

By Peter Kokh

### # Relax rules for Chapters: Outposts and Local Contacts

If a chapter's membership sinks below three to two, instead of dropping it from the list, continue to list it under the category: "Outposts."

If only one person is left, and s/he is willing, list that person under "local contacts."

So this requires more web space. That should not be a problem

**It is much harder to start a chapter from scratch  
than to regrow it from a listed core of one or two persons.  
The NSS chapter list has shrunk from near 140 to less than 40,  
in large part to the "three or none" rule.**

**A group of three or more that has not "incorporated" could also be listed as an outpost.**

The desire to look "professional" has been self-destructive, totally out of touch with today's world and younger generations.

### # Non-geographic Chapters should be encouraged

In the past, this was discussed, but some Society leaders wanted to impose "professional" standards of pre-determined models.

Lets make our own model

Chapters whose members are not linked geographically, but by a shared interest:

- **Space art**
- **Realistic Science fiction** (not to be confused with fantasy)
- **Analog facility design, construction, support**
- **Designing equipment needed on the frontier**
- **Pioneering Arts & Crafts with materials available on the Moon, and/or Mars**
- **Space Pioneering-focuses Conventions**

Such non-geographic "chapters" (or other term) could greatly expand the reach and scope of member creativity, expanding the Society's public presence and productive scope.

This had been tried some time in the past, but was neither encouraged nor supported

Such groups could produce a kaleidoscope of concrete projects that expand the Society's public presence and attract members who want to do more than read a glossy quarterly magazine.

The scope of projects such non-geographic groups could undertake is limitless, and will do a lot to attract new members who want to "get involved" on their own terms.

# AS the NSS Board rarely agrees on anything, cannot take this plunge, perhaps the Moon Society can set the example. ##

For past articles, Visit [http://www.moonsociety.org/publications/mmm\\_classics/](http://www.moonsociety.org/publications/mmm_classics/) or [mmm\\_themes/](http://www.moonsociety.org/publications/mmm_themes/)

## The Moon Society – Lunar Frontier Settlement – [www.moonsociety.org](http://www.moonsociety.org) p. 4

March

# Chapters & Outposts

2015

### ORGANIZING “OUTPOSTS”

**Bay Area Moon Society, CA Outpost – South San Francisco Bay –**

<http://www.moonsociety.org/chapters/bams/> Contact: Henry Cates [hcate2@pacbell.net](mailto:hcate2@pacbell.net)

**Moon Society Nashville Outpost –** Contact: Chuck Schlemm - [cschlemm@comcast.net](mailto:cschlemm@comcast.net)

**March 24:** I had the opportunity to present a large space exploration exhibit at Nashville's Adventure Science Center's Engineering Day on 2/20/16 from 10–4pm directly to ~500 of their 1500 guests. As a Moon Society member I wanted to stress our desires to explore and utilize the Moon's resources as soon as possible.

With that in mind, I set up a children's hands on activity called "Build a Moon Base". It is an 8' x 8' sheet painted as the Moon's surface for kids (and parents) to get down on the Moon and use their imagination to put together a wide variety of habitat modules, connector tunnels, solar panels, antennas, Moon rovers and astronauts to make whatever design Moon base they can imagine. Photos show families building together and a very impressive multi module base in the foreground. Looks like a lunar engineer in the making.

I also had 4 tables full of spacecraft models, planetary and Moon globes, NSS AD ASTRAs and brochures and Moon Society literature. I had the MS info next to my model of the Bigelow Aerospace Moon Base, barely seen at the bottom of one of the photos. Our solar system models included globes of Earth, Moon (3), Venus and Mars (2). We also had models of Ceres, Vesta, Jupiter and Galilean moons and a scale poster of Phobos and Deimos orbiting the Mars globe.

I also had 4 tables full of spacecraft models, planetary and Moon globes, NSS AD ASTRAs and brochures and Moon Society literature. I had the MS info next to my model of the Bigelow Aerospace Moon Base, barely seen at the bottom of one of the photos.

Our solar system models included globes of Earth, Moon (3), Venus and Mars (2). We also had models of Ceres, Vesta, Jupiter and Galilean moons and a scale poster of Phobos and Deimos orbiting the Mars globe.

Spacecraft included: Saturn V, LM, Moon Rover, STS Space Shuttle, ISS, Soyuz, Progress, Orbital Science/ATK's Cygnus, SpaceX's Falcon 9 & Dragon, Virgin Galactic's SpaceShip Two & White Knight Two, SLS, Orion, Bigelow Moon base, Mars rovers Sojourner, Opportunity & Curiosity and a proposed manned Mars base.

Lonnie and Karen Puterbaugh, also members of the Middle Tennessee Space Society chapter of the NSS, presented space videos to answer questions, share inspiring space technology and space scientist's and engineer's stories and show space related music videos. His Moon, Mars and 16 pound nickel iron meteorites are very exciting to pick up. Lonnie is pictured next to his full size Buzz Aldrin stand up poster.

We had a great day, lots of interested kids and parents and many compliments and thanks for sharing all this space science with their children. Our hope is that we contribute to our future scientists and engineers by inspiring some of these children.

Chuck Schlemm, Moon Society Outpost Nashville. ##

### ORGANIZED CHAPTERS

**Milwaukee Lunar Reclamation Society –** <http://www.moonsociety.org/chapters/milwaukee/>

<http://www.meetup.com/Milwaukee-Space-Exploration-Meetup/> – <http://www.space-Milwaukee.com>

Contact: Peter Kokh – [kokhmmm@aol.com](mailto:kokhmmm@aol.com) – MEETINGS, 2nd Saturday 1–4 pm monthly except July, August, At Mayfair Mall lower level Community room G150 for all meetings except December, in G110:

**March 14<sup>th</sup> Meeting Report: Peter Upcoming Meetings: APR 11, MAY 9, JUN 29, (JUL-AUG) SEP 12, OCT 10**

**We are looking for a place to bring our Mother-Earth / Father Sky exhibits for Earth Day April 23<sup>rd</sup>**

**The Washington Park Urban Ecology Center**, in walking distance of Peter's Home

<http://urbanecologycenter.org/programs/milwaukee-earth-month.html>

Saturday, April 23<sup>rd</sup> 9 am to 1 p.m.

Peter is trying to secure table display space for this occasion

**“Mother Earth and Father Sky” – What would Earth be like without the Sun and the Moon?”**

For past articles, Visit [http://www.moonsociety.org/publications/mmm\\_classics/](http://www.moonsociety.org/publications/mmm_classics/) or [mmm\\_themes/](http://www.moonsociety.org/publications/mmm_themes/)



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

<http://www.meetup.com/Saint-Louis-Space-Frontier-Meetup/>

Contact: Robert Perry [surfer\\_bob@charter.net](mailto:surfer_bob@charter.net) – Meetings 2nd Wed monthly at Buder Branch Library, 4401 S. Hampton, in the basement conference room. – MAY 8 – JUN 13 – JUL 8 – AUG 12

**NSS/Moon Society Phoenix Chapter** - <http://nssphoenix.wordpress.com/>

– c/o Mike Mackowski [michael.mackowski@gmail.com](mailto:michael.mackowski@gmail.com)

<http://www.meetup.com/NSSPhoenix/events/161939572/>

Meeting 3rd Saturdays monthly at Humanist Community Center, Mesa, 627 W. Rio Salado Parkway.

Our March 19<sup>th</sup> meeting featured a discussion on ISS led by our own Chuck Leshner. Along with a bunch of images gleaned from various websites (mostly NASA), Chuck had put together a presentation showing the construction of the ISS and its present configuration. He showed several short videos including a recent 28-minute tour of the station given by Sunita Williams. He brought along a model of the ISS designed in 2000. Chuck has tried to bring the model more in line with how the ISS actually grew, with modules being rearranged, etc.

Henry Vanderbilt came and gave a pitch on his Space Access Conference which will be held right here in Phoenix on April 7 – 9. **Upcoming meetings:** , APR 18, MAY 16, JUN 20

**Tucson L5 Space Society** – Now serving Moon Society Members [www.tucsonspacesociety.org/](http://www.tucsonspacesociety.org/) (not updated) – [www.meetup.com/NSSPhoenix/events/161939572/](http://www.meetup.com/NSSPhoenix/events/161939572/) (not updated)

Contact: Al Anzaldúa [alanzaldua706@yahoo.com](mailto:alanzaldua706@yahoo.com) – Meets monthly, every 2nd Saturday, 6:30 PM

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

Contact: Eric Bowen [eric@streamlinerschedules.com](mailto:eric@streamlinerschedules.com) – Meeting 7 pm 3<sup>rd</sup> Mondays of even # months in the conference room of the Bay Area Community Center at Clear Lake Park: JUN 15 – AUG 17

## **CHAPTERS OUTSIDE THE UNITED STATES**

**Calgary Space Workers – Our Canadian Affiliate in Calgary, Alberta**

[www.calgaryspaceworkers.com](http://www.calgaryspaceworkers.com)

[www.youtube.com/watch?v=BAP\\_wi0HzJ8&feature=youtu.be](http://www.youtube.com/watch?v=BAP_wi0HzJ8&feature=youtu.be) – <http://www.meetup.com/the-science-club/>

Since we have been having trouble finding space enthusiasts who are specifically interested in building an analog habitat. I discovered it was a thought process in that they didn't realize that all sciences needed to support our life on Earth would also be used if living on another celestial body.

In response to this hypothesis I started an affiliate organization called simply "The Science Club". As a result of this I have had the Space Workers slowly growing as I find interested parties from The Science Club. The (Calgary) Space Workers are about 188 members after 11 years and The Science Club is 511 members after 2 years. – Michael Bakk – [mbakk@shaw.ca](mailto:mbakk@shaw.ca),



## APRIL 2016 SPACE NEWS BROWSTING LINKS

### SPACE STATIONS + ROCKETS + COMMERCIAL SPACE

[www.space.com/32141-draft-bill-proposes-wide-ranging-space-policy-changes.html](http://www.space.com/32141-draft-bill-proposes-wide-ranging-space-policy-changes.html)

[www.space.com/32185-united-states-space-exploration-leadership.html](http://www.space.com/32185-united-states-space-exploration-leadership.html)

[www.space.com/32204-blue-origin-growth-spurt-this-year.html](http://www.space.com/32204-blue-origin-growth-spurt-this-year.html)

[www.space.com/32100-china-next-human-spaceflight-mission.html](http://www.space.com/32100-china-next-human-spaceflight-mission.html)

[www.spacedaily.com/reports/Chinas\\_ambition\\_after\\_space\\_station\\_999.html](http://www.spacedaily.com/reports/Chinas_ambition_after_space_station_999.html)

[http://www.space.com/32373-spaceplane.html](http://http://www.space.com/32373-spaceplane.html)

[www.space.com/31600-magnetic-moonwalker-shoes-ditch-gravity.html](http://www.space.com/31600-magnetic-moonwalker-shoes-ditch-gravity.html)

[www.space.com/32110-x-prize-next-space-competition.html](http://www.space.com/32110-x-prize-next-space-competition.html)

### EARTH + NEAR SPACE

[www.nasa.gov/press-release/nasa-gets-down-to-earth-this-year-with-globe-spanning-expeditions](http://www.nasa.gov/press-release/nasa-gets-down-to-earth-this-year-with-globe-spanning-expeditions)

[www.space.com/32377-microbes-give-clues-about-ancient-life.html](http://www.space.com/32377-microbes-give-clues-about-ancient-life.html)

[www.nasa.gov/press-release/nasa-selects-instruments-to-study-air-pollution-tropical-cyclones](http://www.nasa.gov/press-release/nasa-selects-instruments-to-study-air-pollution-tropical-cyclones)

### MOON

[www.space-travel.com/reports/China\\_to\\_use\\_data\\_relay\\_satellite\\_to\\_explore\\_dark\\_side\\_of\\_moon\\_999.html](http://www.space-travel.com/reports/China_to_use_data_relay_satellite_to_explore_dark_side_of_moon_999.html)

[www.space.com/32237-amazing-moon-photo-tycho-crater.html](http://www.space.com/32237-amazing-moon-photo-tycho-crater.html)

[www.space.com/32354-moon-polar-shift-water-ice.html](http://www.space.com/32354-moon-polar-shift-water-ice.html)

[www.space.com/32353-moon-s-axis-shifted-6-over-1-billion-years-video.html](http://www.space.com/32353-moon-s-axis-shifted-6-over-1-billion-years-video.html)

[www.space-travel.com/reports/Ancient\\_Polar\\_Ice\\_Reveals\\_Tilting\\_of\\_Earths\\_Moon\\_999.html](http://www.space-travel.com/reports/Ancient_Polar_Ice_Reveals_Tilting_of_Earths_Moon_999.html)

[www.space-travel.com/reports/Permanent\\_Lunar\\_Colony\\_Possible\\_in\\_10\\_Years\\_999.html](http://www.space-travel.com/reports/Permanent_Lunar_Colony_Possible_in_10_Years_999.html)

### MARS

[www.space.com/32250-exomars-mars-mission-science.html](http://www.space.com/32250-exomars-mars-mission-science.html)

[www.marsdaily.com/reports/How\\_the\\_ExoMars\\_mission\\_could\\_sniff\\_out\\_life\\_on\\_Mars\\_999.html](http://www.marsdaily.com/reports/How_the_ExoMars_mission_could_sniff_out_life_on_Mars_999.html)

[www.marsdaily.com/reports/Monster\\_volcano\\_gave\\_Mars\\_extreme\\_makeover\\_study\\_999.html](http://www.marsdaily.com/reports/Monster_volcano_gave_Mars_extreme_makeover_study_999.html)

[www.marsdaily.com/reports/Great\\_tilt\\_gave\\_Mars\\_a\\_new\\_face\\_999.html](http://www.marsdaily.com/reports/Great_tilt_gave_Mars_a_new_face_999.html)

[http://www.bangaloremirror.com/bangalore/others/Scientists-get-a-peekinto-Martian-exosphere/articles\\_how/51271897.cms](http://http://www.bangaloremirror.com/bangalore/others/Scientists-get-a-peekinto-Martian-exosphere/articles_how/51271897.cms)

[www.marsdaily.com/reports/MAVEN\\_Observes\\_Mars\\_Moon\\_Phobos\\_in\\_the\\_Mid\\_and\\_Far\\_Ultraviolet\\_999.html](http://www.marsdaily.com/reports/MAVEN_Observes_Mars_Moon_Phobos_in_the_Mid_and_Far_Ultraviolet_999.html)

[www.space.com/32281-comet-flyby-mars-magnetic-field.html](http://www.space.com/32281-comet-flyby-mars-magnetic-field.html)

[www.spacedaily.com/reports/First\\_tomatoes\\_peas\\_harvested\\_from\\_mock\\_Martian\\_farm\\_999.html](http://www.spacedaily.com/reports/First_tomatoes_peas_harvested_from_mock_Martian_farm_999.html)

[www.space.com/32231-exomars-europe-russia-mars-exploration.html](http://www.space.com/32231-exomars-europe-russia-mars-exploration.html)

[www.space.com/32273-the-martian-movie-astronaut-radiation-risk.html](http://www.space.com/32273-the-martian-movie-astronaut-radiation-risk.html)

### ASTEROIDS + COMETS

[www.space.com/32175-ceres-one-year-anniversary-dawn-spacecraft.html](http://www.space.com/32175-ceres-one-year-anniversary-dawn-spacecraft.html)

[www.spacedaily.com/reports/Dawns\\_First\\_Year\\_at\\_Ceres\\_A\\_Mountain\\_Emerges\\_999.html](http://www.spacedaily.com/reports/Dawns_First_Year_at_Ceres_A_Mountain_Emerges_999.html)

[www.space.com/32282-ceres-bright-spots-changes-ground-telescopes-views.html](http://www.space.com/32282-ceres-bright-spots-changes-ground-telescopes-views.html)

[www.esa.int/Our\\_Activities/Space\\_Science/Rosetta/Rosetta\\_finds\\_magnetic\\_field-free\\_bubble\\_at\\_comet](http://www.esa.int/Our_Activities/Space_Science/Rosetta/Rosetta_finds_magnetic_field-free_bubble_at_comet)

### OTHER PLANETS + MOONS

[www.space.com/32179-mercury-carbon-rich-crust-surprisingly-ancient.html](http://www.space.com/32179-mercury-carbon-rich-crust-surprisingly-ancient.html)

[www.space.com/32378-saturn-rings-and-moons-younger-than-dinosaurs.html](http://www.space.com/32378-saturn-rings-and-moons-younger-than-dinosaurs.html)

[www.spacedaily.com/reports/New\\_photos\\_show\\_magic\\_island\\_on\\_Saturns\\_moon\\_999.html](http://www.spacedaily.com/reports/New_photos_show_magic_island_on_Saturns_moon_999.html)

[www.space.com/32370-saturn-moon-titan-tallest-mountain-photo.html](http://www.space.com/32370-saturn-moon-titan-tallest-mountain-photo.html)

[www.spacedaily.com/reports/The\\_Tilted\\_Terminator\\_Of\\_Enceladus\\_999.html](http://www.spacedaily.com/reports/The_Tilted_Terminator_Of_Enceladus_999.html)

[www.space.com/32272-top-5-weird-facts-about-mysterious-uranus-photos.html](http://www.space.com/32272-top-5-weird-facts-about-mysterious-uranus-photos.html)

[www.space.com/32161-rumors-spread-of-nitrogen-clouds-on-pluto.html](http://www.space.com/32161-rumors-spread-of-nitrogen-clouds-on-pluto.html)

[www.space.com/32227-pluto-methane-snow-new-horizons-photo.html](http://www.space.com/32227-pluto-methane-snow-new-horizons-photo.html)

[www.space.com/32269-pluto-snakeskin-terrain-solar-system-birth.html](http://www.space.com/32269-pluto-snakeskin-terrain-solar-system-birth.html)

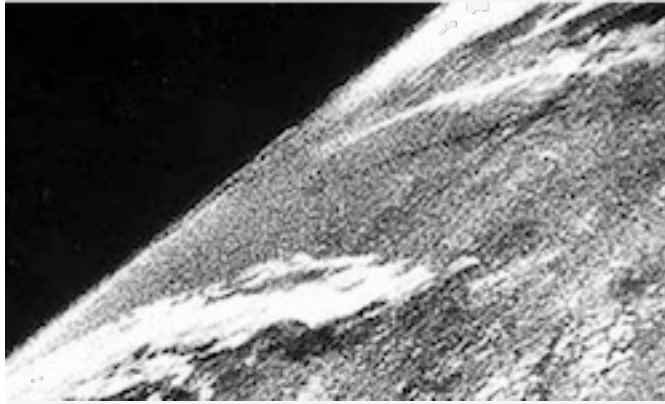
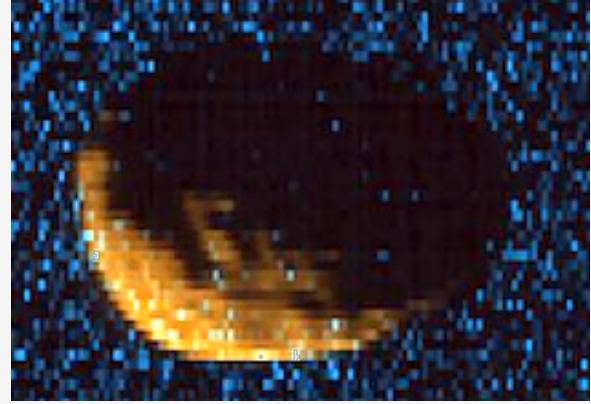
[www.space.com/32301-pluto-surprising-discoveries-new-horizons.html](http://www.space.com/32301-pluto-surprising-discoveries-new-horizons.html)

[www.space.com/32346-pluto-nitrogen-lakes-new-horizons.html](http://www.space.com/32346-pluto-nitrogen-lakes-new-horizons.html)

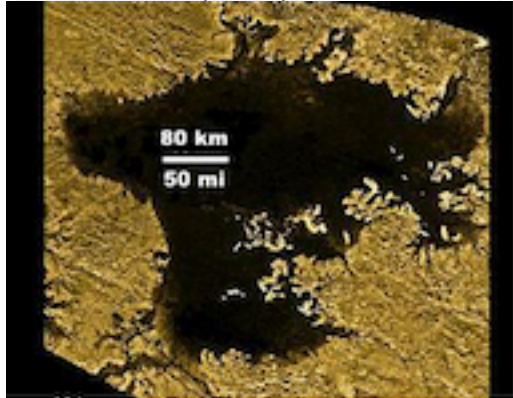
[www.nasa.gov/press-release/nasa-selects-proposals-to-build-better-solar-technologies-for-deep-space-missions](http://www.nasa.gov/press-release/nasa-selects-proposals-to-build-better-solar-technologies-for-deep-space-missions)

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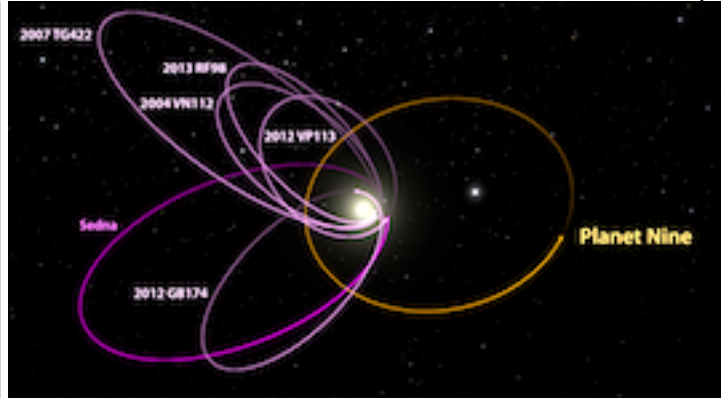
## MMM PHOTO GALLERY

1<sup>st</sup> Photo from space by V-2 rocket #13, 10/24/1946

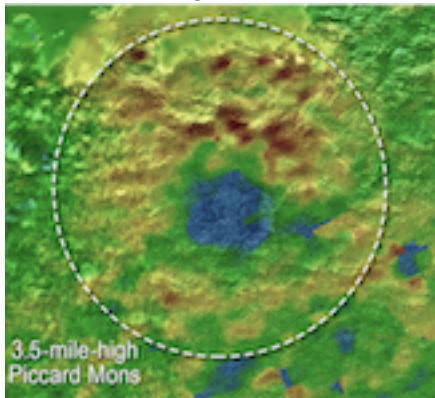
UV Photo of Phobos chemical makeup



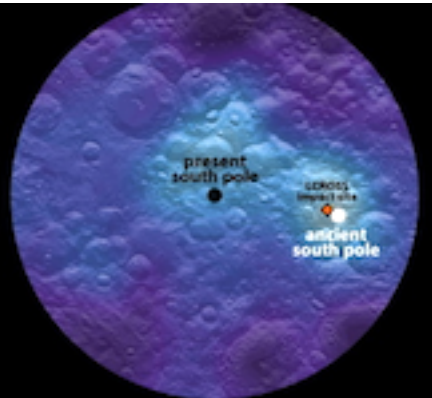
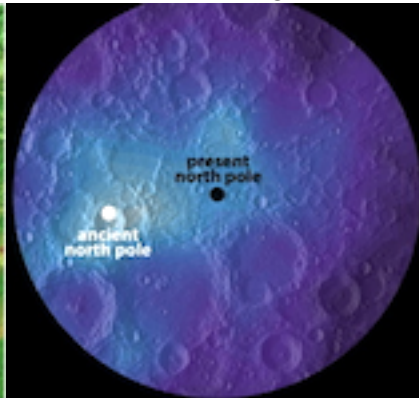
Titan's Ligeia Mare



Evidence grows of a Planet X far beyond Neptune



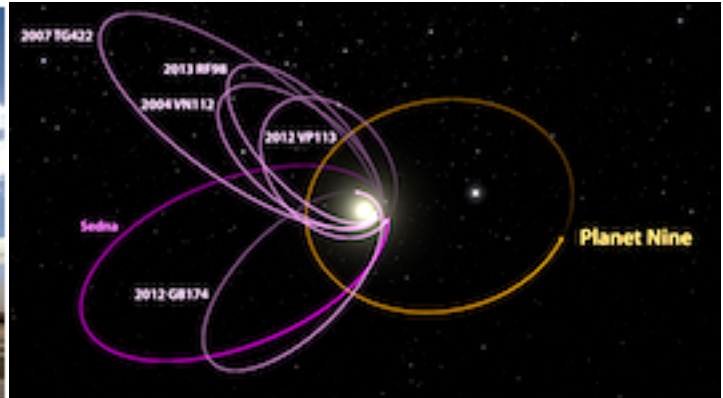
L: Piccard Mons Ice Volcano on Charon



R: The Moon's poles have shifted (old white, now black)



L: Airbus to join Spaceplane bsuiness



R: Trying to calculate position of Planet X

For past articles, Visit [http://www.moonsociety.org/publications/mmm\\_classics/](http://www.moonsociety.org/publications/mmm_classics/) or [mmm\\_themes/](http://www.moonsociety.org/publications/mmm_themes/)



AFD NEWS

## WORLD WATCH

SERVICE


**Tashkent, Uzbekistan and Astana, Kazakhstan: Joint News Release**

Eroded stone and mud patterns found in drying bottom of the Aral Sea seem to be a close match to a complex of overlying crater rims on the farside of the Moon NE of Mare Moscoviens. Could the pattern on the Aral Sea bed have been created by unknown alien visitors tens of thousands of years ago during a previous drying of the Sea? So far, no one has come up with another explanation for the uncanny resemblance. ##



**L:** feature on Moon **C:** Dried mud pattern at bottom of **R**, dry Aral Sea, Kazakhstan/Uzbekistan



A recently released photo of “**The Statue**” at left below was taken by NASA’s Messenger spacecraft towards the end of its mission. The orbiting probe had been exploring Mercury for several years, and towards the end of its mission, skimmed ever closer to the surface. It took this photo on a very low pass over a northern polar area where lavatubes and icefields had been discovered. The statue stands on the lip of a lavatube “skylight.”

The resemblance to monolithic figures found in abundance on Easter Island (Rapa Nui) in the Eastern Pacific off Chile is much too close to be dismissed. Messenger’s data includes no clues as to the date when this statue may have been placed there, but the close resemblance to the similar statues on Earth suggests they may have been erected about the same time, within the last few thousand years. But what’s the real story? It can’t end here!



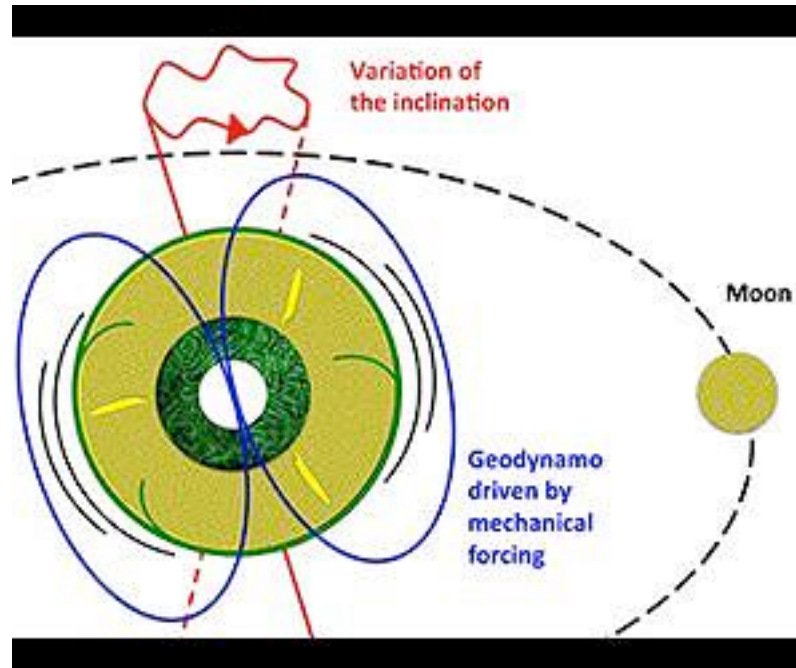
**L:** Stone figure found on Mercury at entrance to lavatube skylight near Mercury’s north pole. **R:** Intriguingly similar but smaller stone figures on Easter Island (Rapa Nui) and, given the location, probably also carved from solid basalt. ##

MMM's 28th Happy April Fools Day News

## BREAKING NEWS: The Moon thought to play a major role in maintaining Earth's magnetic field

**BULLETIN:** 1 April, 2916

[www.space-travel.com/reports/The\\_Moon\\_thought\\_to\\_play\\_a\\_major\\_role\\_in\\_maintaining\\_Earths\\_magnetic\\_field\\_999.html](http://www.space-travel.com/reports/The_Moon_thought_to_play_a_major_role_in_maintaining_Earths_magnetic_field_999.html) -



“The gravitational effects associated with the presence of the Moon and Sun cause cyclical deformation of the Earth's mantle and wobbles in its rotation axis. This mechanical forcing applied to the whole planet causes strong currents in the outer core, which is made up of a liquid iron alloy of very low viscosity.

**Such currents are enough to generate the Earth's magnetic field.”**

Given the protection Earth's magnetic field gives us in the Van Allen Belts – this could mean that otherwise **“Earthlike” planets, i.e. With continents and oceans but without a sizeable moon might not support life as Earth does.**

**Plus, the Moon was originally much closer to Earth, which then had a short 10 hour day. By causing very high tides, Earth's rotation gradually slowed to the present 24 hour day as the Moon got further and further away**

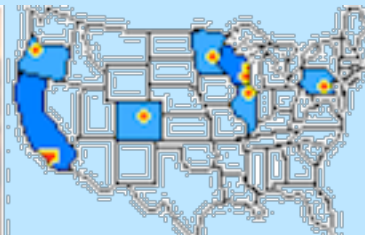
**That might make worlds like ours even more rare and special than previously thought.**

**Perhaps we should be thinking of our home world as a pair:**

**“Earth–Moon” “Terra–Luna” “Gaia–Selene” PK**

For past articles, Visit [http://www.moonsociety.org/publications/mmm\\_classics/](http://www.moonsociety.org/publications/mmm_classics/) or /mmm\_themes/

## NSS Chapters that share Moon Miners' Manifesto



WISCONSIN



### MLRS – Milwaukee Lunar Reclamation Society

PO Box 2101, Milwaukee, WI 53201 – [www.moonsociety.org/chapters/milwaukee/](http://www.moonsociety.org/chapters/milwaukee/)  
[www.Space-Milwaukee.com](http://www.Space-Milwaukee.com) – <http://www.meetup.com/Milwaukee-Space-Exploration-Meetup/>

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

PRESIDENT/MMM EDITOR • Peter Kokh NSS 414-342-0705 - [kokhmmm@aol.com](mailto:kokhmmm@aol.com) VICE-PRESIDENT Doug Armstrong

NSS (414) 273-1126 – SECRETARY – Charlotte Dupree NSS (262) 675-0941 [grdupree@charter.net](mailto:grdupree@charter.net)

- James Schroeter (414) 333-3679 – [james\\_schroeter@yahoo.com](mailto:james_schroeter@yahoo.com) TREASURER/Database • Robert Bialecki (414) 372-9613 – [bobriverwest@yahoo.com](mailto:bobriverwest@yahoo.com) (• Current Members of the MLRS Board of Directors)

Meetings **2016** : APR 9, MAY 14, JUN 11, (summer break), SEP 10, OCT 8, NOV 12, DEC 10

WISCONSIN



### SSS – Sheboygan Space Society

728 Center St. Kiel, WI 54042-1034

[www.sheboyganspacesociety.org](http://www.sheboyganspacesociety.org) c/o Will Foerster 920-894-1344 (h) [astrowill@frontier.com](mailto:astrowill@frontier.com)

SSS Sec./Tres. c/o B. Pat Knier [dcnpatknier@gmail.com](mailto:dcnpatknier@gmail.com)

DUES: "SSS" c/o B. P. Knier, 22608 County Line Rd, Elkhart Lake WI 53020

**2016 MEETINGS**: APR 21, JUN 18, AUG 18, OCT 20, DEC 15– Call for location (920) 894-1344

CALIFORNIA



### OASIS: Organization for the Advancement of Space Industrialization & Settlement

Greater Los Angeles Chapter of the National Space Society

PO Box 1231, Redondo Beach, CA 902

Events Hotline/Answering Machine: 310-364-2290 – Odyssey Ed: Kat Tanaka [odyssey\\_editor@yahoo.com](mailto:odyssey_editor@yahoo.com)

[oasis@oasis-nss.org](mailto:oasis@oasis-nss.org) – Odyssey Newsletter [www.oasis-nss.org/articles.html](http://www.oasis-nss.org/articles.html)

Regular Meeting 3 pm 3<sup>rd</sup> SAT monthly – **2016** Mar 19, Apr 16, May 20, Jun 18, Sep 17, Oct 15, Nov 19

COLORADO



### DSS: Denver Space Society fka Front Range L5

1 Cherry Hills Farm Drive, Englewood, CO 80133

<http://www.denverspacesociety.blogspot.com/>

Eric Boethin 303-781-0800 [eric@boethin.com](mailto:eric@boethin.com) – Monthly Meetings every 3<sup>rd</sup> Thursdays, 7 pm  
 Englewood Public Library, Englewood, CO 80110 – 1000 Englewood Parkway, First Floor Civic Center

**2016 MEETINGS**: APR 21, MAY 19, JUN 16, JUL 21, AUG 18, SEP 15, OCT 20, NOV 17, DEC 1

ILLINOIS



[LDAhean@aol.com](mailto:LDAhean@aol.com)

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



## MINNESOTA



**MSFS: Minnesota Space Frontier Society** – <http://www.mnsfs.org>  
c/o Dave Buth, 433 South 7th St. #1808, Minneapolis, MN 55415

**MNSFS monthly meetings** are held on the first Thursday of each month at the Fairview Community Center (Great Room), 1910 County Road B West, in Roseville, MN 55113 Meetings usually start at 7:00 p.m. and last about two hours. Each meeting features Board member introductions, general announcements,

March 25th – 27th, Easter weekend, 2016, we were at Minicon 51 On Friday evening we showed a film on Space Elevators, a concept first put forward by Arthur C. Clarke – [www.facebook.com/spaceelevatormovie/](http://www.facebook.com/spaceelevatormovie/)

**2016 MEETINGS:** APR 7, MAY 5, JUN 2, JUL 7, AUG 4, SEP 1, OCT 6, NOV 3, DEC 2

## OREGON



**Oregon L5 Society** – <http://www.OregonL5.org>  
PO Box 86, Oregon City, OR 97045

(LBRT – Oregon Moonbase) [moonbase@comcast.net](mailto:moonbase@comcast.net) – Charles Radley: [cfrjlr@gmail.com](mailto:cfrjlr@gmail.com)

We meet 3rd Saturday monthly at 2:00 PM – **2016 Schedule** Apr 16, May 20, Jun 18, Sep 17, Oct 15, Nov 19

## PENNSYLVANIA



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

c/o Earl Bennett, [Earlisa\\_t@verizon.net](mailto:Earlisa_t@verizon.net) – 856/261-8032 (h), 215/698-26

00 (w) <http://pasa01.tripod.com/> - <http://phillypasa.blogspot.com>

**Meetings 3rd Thurs** 2016 MAR 17, APR 21, MAY 19, JUN 16, JUL 21, AUG 18, SEP 15, OCT 20, NOV 17

**Meeting Dates and Times:** Next meeting will be April 16, then we will be part of the Science Festival on April 30 on the Great Plaza on the Delaware. April 16 meeting at our regular location at Liberty One between 1 and 3 p.m..

We were part of the George Washington Carver Science Fair Mid and Senior Competition in early March, and, awarded Alivia Villari The Oscar H. Howard Award for her research project: "Alterations to Martian Soil in Order to Cultivate Human Food". She did a very good job in setting up and performing the research, and explaining what she was doing when interviewed, and documented her successes and failures with some explanation of what caused the one sub experiments failure to support plant survival and growth. We gave her; The Martian (original Andy Weir book), my Mars Society Conference Schedule (with lots of contact information on various projects concerning Mars and the requirements to achieve various goals), and, a book bought at the Maker Fair (September 2015) on setting up your own laboratory (See the Maker Shed website for this and a large number of other useful resources!). And money of course. There were also several other awards and recognitions at this March 11 event. Mr. Thomas Anderson, the primary driver for the Fair for decades, was given an award for his many good works by Senator Hardie Williams and another from the Lieutenant Governors Office, presented by Juvencio Gonzalez, for his encouragement of students to enter careers in what are now called STEM fields. Senator Williams pointed out a number of community related activities that Mr. Anderson has been doing, also for decades, that he has continued to do even after his retirement in 2004. In Addition the Carver Award itself was given to Dr. Madeliene M. Joulie, Prof: Chemistry at The U. of Pennsylvania where she has encouraged women to enter into the sciences where she was a pioneer (first women P.H.D. in her field).

**Meeting notes:** Mitch brought NSS membership forms and collected due for NSSPASA at the meeting. He also gave us the new location for the Science Carnival location noted above, and, discussed the need to apply to the Fair coordinators for a space at the event. Our plan is to do most of what we did for public education and outreach that was done at the earlier venues, and, if possible, add some 3D objects and enhancements to the Lava Tube and other educational exhibits. This may include Mitch updating some of his history of space exploration (past, present and future) display books. Mitch brought extra copies of Ad Astra and pointed out that there were a number of great reports in the Spring 2016 issue: these included multiple editorial comments: Keith Brian Lewiss' Space Colonization, "What are We Waiting For?" to the report on the new Indian chapter: New NSS International Chapter in India Founded in Honor of Dr. Kalam" by Karishma Inamdar, President and Founder of the new chapter. And much more including two reports on techniques to make Mars exploration and colonization possible: the first is by John Logsdon and Casey Drier, and the second by Dale L. Skran. Read!

For past articles, Visit [http://www.moonsociety.org/publications/mmm\\_classics/](http://www.moonsociety.org/publications/mmm_classics/) or [mmm\\_themes/](http://www.mmm_themes/)

Larry found that he had "Time on My Hands" as he put it and so he revamped our website to include a color coded meeting schedule ,and, added a weather condition indicator that varies with the weather. These upgrades have increased the visits to 200 a month on our home page. He has also fixed the site so that Internet Explorer users won't have problems with it. It should be noted that we are continuing to migrate our web presence to the NSS.org/pa/Philadelphia location (on our new card: <http://chapters.nss.org/pa/Philadelphia>).

Dorothy brought material on exhibits at The New York Hall of Science including the film "Robots 3D" by the National Geographic Society which will be on view until June 30. She also brought word on The Mathematics Museum: this would be part of the material found in her blog (Dotty's Dimensions) which she informed us is free of pop-ups and ads. She also has a series of columns which she advises you read before the blog. Dotty and Larry have been our web presence in some sense for a number of years by publicizing our activities in various venues. Dorothy announced that she, and Larry, will be going to Balticon where she will preside over a non denominational service on the Sunday of the convention. Hank will go to Balticon this year (May 27 to the 30th) where he enjoys helping with the event. He will be Liason for Science Programming again this year and he noted a possibility of a "NASFIC" convention in Valley Forge , Pa. next year. This regional event may be held here or in Puerto Rico in 2017. There is a competition for this event (which happens when the World Sci FI convention is not held in the U.S.). If it is this area it might be at The Valley Forge Sheraton near public transportation.

We all enjoyed the coverage of Scott Kelly and his year in space with its' great public interest appeal while also doing good science via the twins study that was a major reason for the ending of Mr. Kelly and the long duration of his stay. There were a number of N.P.R. specials that came out of this event and these are probably going to be available on line. Great job, N.A.S.A. and public television.

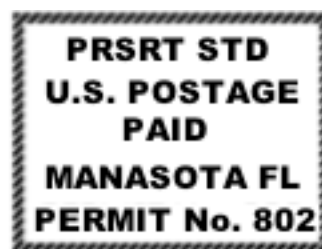
Earl talked about the George Washington Carver Science Fair awards event and the display that Alivia created to show her work. In a post meeting reading of Moon Miners, for March, 2016 (page6), there is a listing of possible activities that could help make Mars habitation feasible by doing things in two directions: In one "we" would send a number of small spacecraft with a Cubesat form factor to Mars both to remotely sense the properties of the planet (and Phobos and Demos?) and to land on the surface to do ground truth checks. The CubeSats and the various exploration devices that they could release would have a favorite tool for many of us: cameras! Since "simple" cameras can be one millimeter square this would not impact the space available for other equipment. But I digress: the article, by Peter Kokh included a recommendation to do "Redhouse" experiments to see which plant species would be viable under various Mars soil and amendments conditions (including a simulated Mars, or concentrated Mars, atmosphere). Sounds like Alivia should check out Moon Miners as a resource! And maybe a number of senior level science projects could come of reading Peter's body of work as well as the other work by space oriented authors over the decades.

**From Science News:** there are several articles relating to the discovery of gravity waves from the collision of two black holes on September 14, 2015. You should check out this issue for a lot of material on this event and the instrumentation (and how long it took to get to the right instruments) that where created to do it. See "Physicists detect gravitational waves" by Andrew Grant, Physics editor for S.N., "Cosmic shake-up", by Christopher Crockett, Astronomy editor for S.N."Listening for gravity waves" by Dr. Marcia Bartusiak of MIT. Much interesting material, including mention by Dr. Bartusiak of the possibility of an ultra long wavelength detector to operate in space. And much more on space exploration in this issue.

**From NASA Tech Briefs for March:** in the Photonics special issue a report: "Advanced Infrared Cameras Maps Methane "Hot Spots" by researchers David Bastviken and Magnus Galfalk. They devised a sensing system for the gas using a narrow band filter and imaging system they designed. The device performs an Imaging Fourier Transform to look for Methane absorption lines. The researchers are from Linkoping University and Stockholm University in Sweden. The device was built by Telops, a manufacturer of infrared imagers. This looks to be an application of space related technology for terrestrial environmental use. Lots of other interesting material and a note on page 17 on Tech Briefs T.V. which can be accessed at [www.techbriefs.tv](http://www.techbriefs.tv). This is sponsored by Edmund Optics (who still produce optical products and systems). There is also Medical Design Briefs which covers technologies related to human health and biotechnological applications. In the R&D Roundup section there are a number of short reports: "Snake Study Adds Twist to Bio-Inspired Robotics" on how different snakes are built to be able to travel and climb. In particular, the researchers have found that the "keel" of the snake and its shape are designed to aid in climbing and other locomotion. University of Cincinnati professor Bruce Jayne, Professor of Biology, is one of the chief researchers. There are a number of good articles and short reports here, both on manufacturing improvement, like the use of Nitrogen instead of "air" for the atmosphere surrounding assemblies being soldered, to the application of a new surgical technique that allows a better attachment of prosthetic devices using a permanent socket integrated into an amputees body. See pages 8 and 40 respectively. This material only shows a small range of what public and private organizations are doing from pure research to applications we may use or benefit from without knowing it is there. And lastly: J.J. Abrams has worked on a film about the teams working on The Lunar X-Prize. Go to the X-Prize website and look for this series of interviews. Maybe somebody could visit Jade Rabbit!

Submitted by Earl Bennett, President, NSSPASA, KD2CYA.

**Moon Miners' MANIFESTO**  
**Milwaukee Lunar Reclamation Society, Inc.**  
**PO Box 2102, Milwaukee, WI 53201-2102**



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