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

Moon Miners' Manifesto

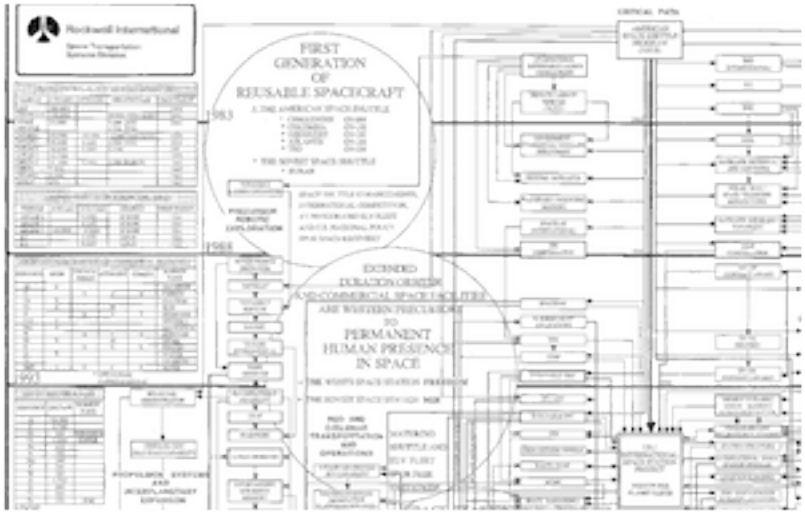
& The Moon Society Journal www.MMM-MoonMinersManifesto.com

Which raw barren world would you rather pioneer? The Moon, or Mars? Both have plusses and minuses!

Feature Articles:

The Integrated Space Plan of 1983

See page 10



After 31 years time to rethink the plan from scratch

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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/**
- **MMM THEME Issues:** 14 collections of articles according to themes: **..../publications/mmm_themes/**
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● **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.

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● **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, there is a daily RSS feed space news section on http://www.moonsociety.org. You can also read **Ad Astra** magazine mailed to **National Space Society** members. ●

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 membership organization, with 10,000 members and 50 chapters, dedicated to the creation of a spacefaring civilization.

National Space Society 1155 15th Street NW, Suite 500 Washington, DC 20005 (202) 429-1600 – www.NSS.org

● **The Moon Society** seeks to overcome the business, financial, and technological challenges to the establishment of a permanent, self-sustaining human presence on the Moon." – Contact info p. 9.

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

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

● **Submissions 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 Fifty Years ago, July 31st, 1964 – a Mind-Blowing Experience

By Peter Kokh – http://www.**youtube**.com/watch?v=i9y5d0l_O3Y

On July 31st, 1964, NASA's **Ranger 7** became the first U.S. probe to deliver up-close images of the surface of the moon, right up until the moment of impact. It returned 4300 photos during its 3 day mission.

I was 26, and glued to the television set. This was a most remarkable moment in history, at least for those of us old enough to appreciate this watershed moment in many thousands of years of human history. Until recently, the best views we had of the Moon were from telescopes here on Earth, and they could only show us close up views of what anyone could see with the naked eye: the side of the Moon permanently turned towards Earth.

Then, on October 7, 2013 the Soviet spacecraft **Luna 3** succeeded in looping the Moon and returned a **first low resolution photo of the Moon's far side**, hidden in mystery and sometimes wild speculation for all the thousands of years of human history up to that time.

But Ranger 4 was directed to impact on the Moon, and as it got nearer and nearer, in the last eye-riveting minutes before impact, we got to see live images of the Moon's surface in increasingly higher resolution until the last few seconds when we got to see individual rocks and the grainy moondust being blasted away. Then impact!

For those of us watching, it was a most unforgettable experience! We had touched the Moon! PK

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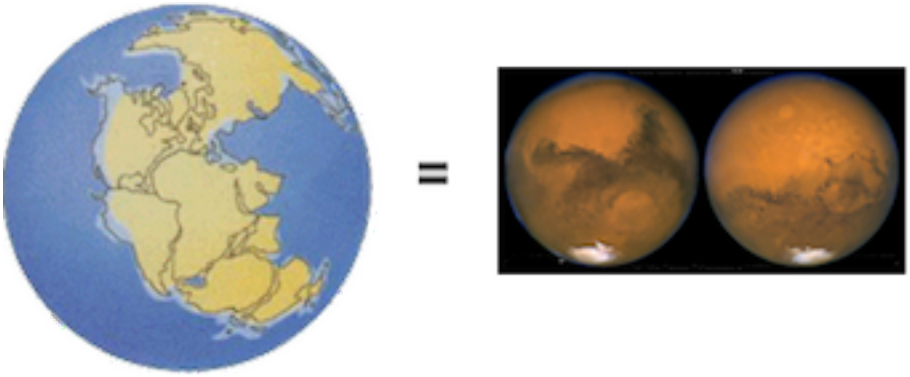
Which World would You rather Pioneer? Moon or Mars?

By Peter Kokh (There is no wrong answer)

Amount of Land Space

There are many significant differences between the Moon and Mars, besides their size (see the graphic on page 1 this issue. But let's start with the size of **Mars**:

- Earth's surface is 71% ocean. Subtract that and **Mars is comparable to all Earth's continents put together**.



- **The Moon**, obviously smaller, has a surface of **37,930,000** km2 (14.6 million square miles)

Land area comparisons – in order of similarity – closest at top:

1. **Africa + Australia = 37,936,000 sq km (only 6,000 sq km larger than the Moon)**
2. **United States + Canada + China + Brazil = 37,837,000 sq km (93,000 sq km smaller than the Moon)**

Unfortunately, we all too often see the comparison with Africa alone = 30,244,049 sq km (way too small) – that comparison is substantially inaccurate and should never be repeated.
North and South America together would be a little less than 5% too big (drop Greenland).
Both worlds are quite ample in size and room enough for a spreading civilization

Conditions that are the same:

1. Both worlds are awash in Cosmic Rays

Both the Moon and Mars lack one key thing that makes life on Earth's surface possible: the Van Allen Belts, part of the strong magnetic field generated by currents of molten iron in Earth's core. Not having such a field, the surfaces of both Moon and Mars are washed by cosmic rays and other forms of radiation. That Mars has a thin atmosphere and a relatively bright sky changes nothing.

Settlers on both worlds must "dig themselves in,"covering their living spaces with about 5 m (16 ft) of loose rock powder soil, or make use of lava tubes, networks of which are common on both worlds. That does not mean that they have to live like moles! **There are ways to bring "down inside" both sunlight & views:** (www.moonsociety.org/images/changing/underground_sun_view.gif)

2. The need to create and maintain minibiospheres

For the very same reason, there can be no plant life on the surface. Agriculture as well as plants to refresh the air and water, and just for beauty's sake, must be "down under" within the common spaces such as pedestrian tubes, streets, and parks – a system that connects all the settlement homes and workplaces in what we have dubbed the "Middoors." Black water treatment and air purification methods will be common challenges. More, they will be living "downwind and downstream of themselves." Careless pollution would quickly doom them all!

Yes, Mars has relatively bright skies, though not nearly as bright as Earth's, Earth getting twice the sunlight per square meter as does Mars. Yes, Mars has gentle breezes, sunrises and sunsets, and dust storms, etc. But that doesn't change the basic commonality of two-layered indoor/middoor architecture shared by Lunans and Martians. However, given Mars' thin atmosphere of Nitrogen and Carbon Dioxide – both needed for biospheres large or minimal, that gives Martian settlements the "green edge." Settlement biospheres on the Moon will be minimal in volume, though most of the savings could come in height, e.g. allowing bushes and dwarf trees.

3. Both worlds have water ice reserves concentrated in specific areas

That will work to concentrate settlements in areas with relatively easy access to water supplies:

a. On the Moon, craters as far as 30° from the poles are likely to have some ice. Highland/Mare border zones will offer the all-around best choices

b. On Mars, there seem to be buried glaciers in areas even at the equator, under the flanks of debris slides of the great shield volcanoes and below the rim of the vast impact basin, Hellas Planitia

4. Both worlds offer extensive lava tube networks

When it comes to settling lavatubes, found on both worlds, technologies needed to explore and utilize these vast networks will again be largely similar, both situations in contrast to Earth where we live out on the relatively unprotected surface. Tricks and system protecting habits learned on one world can be shared with settlers on other worlds.

5. Neither world offers concentrated metal ores

This will make production of preferred metal alloys difficult, and at least initially, settlers may have to work with "second rate" alloys or iron/steel, aluminum, titanium, and magnesium – the four "engineering metals." Their "settlement systems" and metal alloy production systems will be largely similar, if not identical. That means that Lunans and Martians will have a mutual interest in sharing improved technologies and ideas and that this will be a foundation of cooperation and trade. It is regrettable that here on Earth, Moon fans and Mars fans do not see this and choose to battle each other for funds and government priorities when they should be working together.

Climate and Temperature Range and Mean

The Moon's surface temperatures, **not counting the perpetually shaded north and south polar craters** lies between 250°F (120 °C) and -200°F (-130°Ç). This swing occurs over the lunar month (or sunth) which is 29.53 days long, half in darkness, half in sunlight.

As extreme as these temperatures seem to be, a comfortable medium in the room temperature range can be maintained inside living spaces shielded with a 5 meter or 16 foot overburden of moondust.

This short cycle lends itself to **geothermal heating systems that would use surplus water to absorb excess dayspan heat for use when needed for nightspan heating, and vice versa**

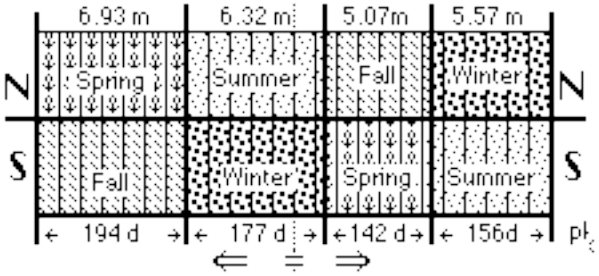
On Mars, the mean temperature is substantially lower, rarely reaching comfortable "room temperatures," and with the winter summer thermal cycle being over two Earth years long, **geothermal heating will not be an option.** Heating will be needed throughout the very long Martian year, with thermometers rarely reaching "room temperature." Without coal, oil, or gas reserves, and with **solar power unavailable during months-long dust storms, Mars' heating fuel options would seem to be reduced to nuclear power only**.

Mars might **look like Arizona**, but it **feels like Antarctica,** which, snow and ice apart, "enjoys" a temperature range very similar to Mars. If you wouldn't want to settle Antarctica (not even in its ice-free Dry Valleys), even in Mars' equatorial "tropics," perhaps you should stay home, or settle for the Moon. **The Moon wins this one.**

Mars Seasons

Because Mars' orbit around the Sun is much more eccentric than Earth's, the season pattern in the Northern Hemisphere differs quite a bit from that in the Southern hemisphere. And don't forget that Mars' Seasons average about twice as long as ours.

24 months of
28 Mars days each



If you prefer a 7 month spring and 6.5 month summer and a shorter 5 month fall and 5.5 month winter, you will do best to settle in the Northern Hemisphere, and leave those who would enjoy a longer Fall and Winter and shorter Spring and Summer to settle in the Southern Hemisphere.

The change of seasons will seem to take forever. Not much we can do about that.

The "Day" on the Moon vs. on Mars

On the Moon the solar day and night cycle is some 29.53 of our days long, with 14 plus days of sunshine, and an equal length of night. Settlers are free to set their clocks to standard hours and 24 hour days. During the "Dayspan" they will occupy themselves with energy-intensive chores: mining, manufacturing, and storing up energy in various ways for use during the following "nightspan" when Lunans will shift gears to tackle energy-light, labor-intensive chores such as inventory, packaging, repairs, etc. They might like such a "bi-sunthly" change of pace.

A bimonthly calendar that repeats through the year, with 3 weekends out of every 8 having a 3rd day off may be quite popular. http://www.moonsociety.org/images/changing/lunarcalend.gif

On Mars, schedules will be at a more familiar pace as the Martian day is only 39 minutes longer than ours. But whoa! Wait a minute! **If you are a night person**, and like to "sleep in" every morning you can, that extra 37 minutes will be just up your alley. But I strongly suspect, that **if you are a morning person** like myself, and can't wait to get the day started and tend to wake up the same time every day, you may be doomed to a lifetime of perpetual jet-lag. It will be hard to for you to stay up 37 minutes later every night, forever. A crew at the Flashline Mars Arctic Station lived on Mars Time for a few months and had no problems. I suspect that none of them were day persons. On the other hand, after Curiosity landed on Mars, the crew at JPL set their clocks back every night and after a month demanded to go back on Earth time.

Thirty-nine minutes may not seem like much, but day after day? Be careful of what you ask for.

The Moon and "Black Sky Blues" vs. Mars' Salmon Colored Skies

We are used to our bright skies. Even periods of prolonged cloudiness bother those of us who don't "make their own sunshine." **On the Moon**, the skies are "forever black." But there is significant compensation! Those living on the Earth-facing side will enjoy the constant treat of a very colorful Earth, much larger than the Moon is to us down here, and some 80 times as bright. When it is dark on the nearside, Earth will be at its brightest, lit up by the Sun coming from behind the Moon. And when the Sun is shining down on us, we will enjoy the fascinating sight of Earth's city lights between the clouds.

For those living or working on the farside, from which Earth is never visible, there will be the compensation of seeing the stars and the Milky Way with such intensity and brightness that magnitude 8 stars may be visible. In several articles in MMM we have suggested ways to treat the "Black Sky Blues," with vehicle and roadway design etc.

On Mars, yes we will have "relatively" bright skies, but with the Sun so much further away and smaller in the sky, "daylight" will not be as bright as it is on Earth. And given that we do not have really accurate photos of Martian skies, much less of sunrises and sunsets, settlers on will miss the "bright blue skies of Earth" almost as much as lunar pioneers will. And then there are the seasonal dust storms that might cut visibility down to a light fog level, storms that can last for several months, and be a nuisance. Mars does have dust devils, but other than that, will not have the life-threatening storms we are used to here on Earth.

Martians will appreciate man-made objects in complementary colors, such as blues and greens, reds, purples, etc. **Lunans and Martians alike will surround themselves with green vegetation and colored flowers!**

Location, location, location and time

Do you want to be within range of easy resupply? Easy rescue? Easy return home? From Earth to the Moon, it is a couple of days at most, in time less than a day. **The Moon is always "within quick reach" of Earth and the "window" is always open** – if arriving at a certain local time of the Moon's 29.53 day-night cycle is not an issue.

More, the time delay in a conversation between someone on Earth and someone on the Moon is no longer than a television relay from one side of Earth to the other by a pair of relays in geocentric orbit. We are used to that. In effect, **the Moon is Earth's "suborb."** In comparison, Mars is in the boondocks**.**

Mars on the other hand, is in "the sticks." **Not only does it take months to get from Earth to Mars and from Mars to Earth, (future Vasimir or nuclear rockets could one day cut that in long journey in half), but you can't just go from one to the other any time you like.** While Earth and the Moon are orbitally locked, Earth and Mars revolve around the Sun in very different lengths of time, and unless you don't care how much fuel it takes, the two will line up for an "economical" trip only once every twenty-five months plus – yes, once every two years plus. Miss a connection and that will delay you another two years plus.

Obviously, at this stage of the game, a trip to Mars is not a weekend jaunt. While you can take a month off and do the Moon, "doing Mars" could take a few years. Lunans can look for visits from relatives. Those leaving Earth to settle Mars can pretty much kiss friends and relatives goodbye. For some few, that might be an incentive!

You can sign up as a Moon settler and then after a few weeks or months decide it's not for you and take a ride back home to Mother Earth. But you would do best to be very, very sure that settling Mars is what you want to do, and that leaving family and friends, possibly forever, is something you can handle.

The Moon will get 99.9% of the tourist traffic. Going to Mars for a visit will take a chunk out of your life, much of it spent in transit. (However, you might be able to complete a few college courses both coming and going with very little by way of "distraction." Traffic to Mars will be strongly one-way. Yet it cannot be challenged that Mars has, along with vast areas best described as boring, some of the most scenic features in the Solar System. Yet given the time involved, **the tourist market for Mars will be largely the wealthy and the retired**.

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

Not to forget, that if on the Moon, you develop an illness that only a specialist can handle, that is not a problem. In a similar situation on Mars, it might take over two years for such a specialist to arrive, at astronomical cost. And conducting a complicated and risky procedure by radio/internet with time delays up to 40 minutes does not seem to be a promising workaround. We'll need to have "all" the specialists on location on Mars.

Students can go to the Moon on field trips between semesters. To go to Mars for a field trip or special course will take years out of their lives.

Yet we can expect both worlds to be settled in time. But don't be surprised if the "prize" settlers on Mars will be hardy pioneers who have already spent time on the Moon. Lunans, will find Mars "a walk in the park."

Location, Trade, and Economics

The Moon orbits Earth at a distance convenient for ever growing steady trade. Now the Moon might need a lot of things made on Earth that cannot yet be made on the Moon. These "upports" will climb up Earth's gravity well to the Moon. But there will be little besides souvenirs that the Moon can ship down the gravity well to Earth at a profit. No, **the Moon's major market will be GeoSynchronous Earth orbit**. While "GEO" is only one tenth the distance from Earth as the Moon, it takes 20-some times as much energy (think rocket fuel) to get things "uphill" from Earth's nearby surface to GEO as it does to get functional equivalents "down the gravity hill" from the Moon to GEO. That gives the Moon a secure market. GEO is already responsible for over $300 billion US dollars of economic activity, enough, if it were a country, to get a seat in the G-20.

Now GEO is limited by treaty to only 180 "stations" 2° apart. If its economy is going to continue to grow, it may be necessary to build large platforms, one at each station, each platform able to host hundreds or more satellites, providing station-keeping, power, robotic repair, etc. The cheapest way to build such platforms is with materials brought down from the Moon at far less fuel cost than launching them up from Earth. Distance is not a factor: 'uphill" vs. "downhill" is the decider.

But obviously, Earth can make complex advanced items that will be difficult to manufacture on the Moon. We've coined a composite word to describe the two-way trade. Read the "M.U.S./c.l.e." Strategy for Lunar Industrial Diversification: http://www.**moonsociety.org/publications/mmm_papers/muscle_paper**.htm

> You will have noticed that our "muscle" was spelled as a two part acronym, "M.U.S. - c.l.e.". For our strategy calls for the M.U.S (Massive, **U**nitary, **S**imple) parts to be made by the settlements and the c.l.e. (**C**omplex, **L**ightweight, and **E**lectronic) components to be made on Earth for upport and assembly on the Moon or in soace. Here then is the logical formula for giving industrial muscle to the early settlement still too small to diversify into a maze of subcontracting establishments. It is a path that has been trod before. It plays on the strengths of the lunar situation and relies on the early basic industries: lunacrete, iron-steel, ceramic, and glass-glass composites (glax). [we have since added basalt, basalt fiber, and basalt composites.]

The point is that the Moon is a "suborb" of Earth, easily and regularly reached, with definite shipping advantages. And thus the Moon will be relatively quickly settled and industrialized. Unfortunately, Mars enjoys no such advantage.

Mars' biggest market is likely to be the Moon, since, when time is not of the essence, Mars could ship items to the Moon at lower fuel cost than they could be supplied from Earth. On the other hand, no one has come up with a product that Mars could market to Earth except travel and exploration experiences. Mars has to survive on its own, with some helpful trade with the Moon. http://www.moonsociety.org/mars/**TradeRoutes.gif**

If Mars' two mini-moons turn out to be carbonaceous chondrites, as has long been the leading theory of their origin, **liquid methane and liquid oxygen** produced on Phobos and/or Deimos could become a crucial export to the Moon, where carbon and nitrogen are relatively scarce. But this origin scenarion has a rival theory that makes the PhD pair "offspring of Mars," having coalesced from Mars debris cast into orbit by a major impactor.

Anything produced principally from hydrogen, carbon, and nitrogen, could be shipped more economically from Mars to the Moon than from Earth to the Moon - if time is not a factor - simply because Mars' gravity well is shallower than that of Earth.

Earnings from Mars-Moon trade will let Mars buy needed goods not made on the Moon, from Earth.

The upshot? **Without the Moon, Mars does not have a chance!** All the same, both worlds will be settled. **Both Mars and the Moon will thrive better economically as trading partners than either will by itself. Yet, paradoxically, Mars may declare its (very dependent) "independence" first.**

Attracting Settlers to a "Hard" Frontier

But settlers <u>will</u> come to Mars. It would not be surprising if recruiting for Mars met with greater success in northern arctic populations of Inuit, Samoyed, and other inhabitants of cold barren desert areas, far outnumbering those from Mars-fascinated ranks of the American southwest. The screening will take place on Earth.

If Mars needs more settlers than it can attract, incentives could always be offered such as debt forgiveness, parole from prisons, etc. A once in a lifetime opportunity to start over fresh could become a powerful magnet. It has worked before.

Future Metropolises on Moon and Mars

Domed cities?

Many artists have given us visions of great "domed" cities on both worlds. The internal pressure within such domes, vs. the vacuum or very low pressure outside and above, would blow the domes off their foundations, instantly killing citizens below. A sphere, part below the neighboring surface level, would look like a dome from above, but be functional. However, a dome remains a single point of failure. One small space rock hit and everyone within will quickly die if they do not take shelter immediately.

And on the Moon, there is another problem: Nitrogen which contributes 79% of Earth's atmosphere, is rare on the Moon, rarer than any other element needed for life, in comparison to how much we will need. Low ceilings will be the rule, perhaps a little higher in public places to allow for smaller trees etc.

On Mars, nitrogen is abundant, and we will see higher ceilings.

Pressurized lavatube complexes on Moon and Mars?

Lavatubes on Earth, Moon, and Mars come in different size range: the smallest on Earth where gravity is highest. The largest on the Moon where gravity is lowest. The lower the gravity, the less pressure from sides and above that constrain the tube's size. As the magma rivers which create these tubes as a process of their spreading cool, cracks and fractures may appear. If we pressuized the with atmospheres containing some water moisture, and if we allowed the temperatures inside to vary, even a bit, the point within each crack where the water alternately froze and thawed would lead to "spallation" – rock breaking away from sides and roof and falling below.

And as noted, the tremendous amounts of Nitrogen needed for breathable air inside immense lunar lavatubes would require major imports from Earth or asteroids or comets. So artistic depictions of atmosphere fllled lavatube settlements bearing great resemblance to artistic depictions of space settlements, is a fairytale.

Regolith shielded growing urban complexes

In both worlds, settlements constructed of regolith shielded modules – residential, commercial, industrial, recreational, etc. and the modular "middoors" halls and streets which link them – a construct that can grow naturally from hamlet to town to city to metropolis, as do cities on Earth, will be the way we will live. On the Moon, such a settlement architecture will allow the most frugal use of Nitrogen. On Mars, ceiling height can be more generous.

Reaching out Beyond: Astronomy on the Moon and on Mars

One activity, pursued from time immemorial on Earth, that will transfer with pioneers to both worlds, is astronomy. Both worlds offer assets. The Moon's Farside is the only place in the solar system and quite further out, where radio and other electronic noise from Earth is blocked.

Astronomy is pursued wherever man has settled. I is a core instinct of intelligent creatures to wonder what is out there beyond our physical reach.

On Mars, the best spots will be on the crater rims of the giant shield volcanoes" Mons Olympus, Arsia Mons, Pavonis Mons, and Ascreus Mons.

Gateway to the Asteroid Belt?

Mars is closer to the Asteroid Belt, Right? Well yes, but that is not an asset. The closer two bodies are in their orbits, the less frequent is the opportunity to coast from one to the other and the longer that journey will take. Paradox? Yes. True, Yes. Because it orbits the sun much faster than Mars, the opportunities to coast from the Moon to any main belt asteroid will come more often than opportunities to get there from Mars.

Indeed, if propulsion power and fuel are less important than speed and frequency, Mercury is the best place in the solar system to launch to anywhere! But in practice, t**he Moon will be the jumping off place to the asteroids for some time –not Mars.**

Terraforming

This is not a word I like. Consider that our human experience to date is in "**de-terraforming Earth**!"

Mars may well have been "more Earthlike" in its distant path. It most likely had a thicker atmosphere, and running water – lakes, rivers, even seas, and some think, an ocean. A more fitting goal, is the "**Rejuvenation"** of Mars, restoration of its once thicker atmosphere, allowing a somewhat warmer climate, and perhaps vegetation.

Our goal should not be the unrealistic one of making Mars a smaller Earth.

Our goal should be to meet Mars halfway, to "rejuvenate" Mars

1. Increase Mars temperature to the point that atmospheric carbon dioxide does not freeze out over the polar water ice caps, thickening the remaining atmosphere significantly in Northern Winter=Southern Summer and Southern Winter = Northern Summer. If we can boost temperatures year around to the higher spring/fall levels, that will be a good start
2. Find ways to keep increasing the air pressure. Top prize? Year around, aviation transport of people and cargo.
3. Starting here on Earth we can try to breed plants in Mars type atmosphere at Earth air pressures ("**redhousing**") and evolve them to be hardier and hardier at reduced pressures until we get them to the point where they will

take root and prosper on Mars itself, first at very low altitudes such as in the Hellas Basin, then elsewhere. (Redhousing: see MMM Classics #10 pp. 25-27 www.moonsociety/publications/classics/mmmc10_Jan006.pdf

4. Increase the "Mars Air" air pressure to the point where Martian settlers need only an oxygen breathing mask to go outdoors, instead of a spacesuit, at least under "open-air" but shielded walkway canopies.

On the Moon, such a parallel program does not seem feasible. Any attempt to give the Moon an atmosphere would turn it into a permanent dust bowl. Add water, and we get mudville.

Red, (Muddy), Green, Blue Mars: http://www.moonsociety.org/images/changing/muddymars.gif

So if your personal goal is to live on a planet becoming Earthlike bit by bit on a path that may take centuries or millennia, and you don't mind mud, Mars is where you should head.

If your goal is to accept a world as it is and learn to live rich fulfilling lives there all the same, the Moon is just your ticket.

There is no "right" choice **between** Moon and Mars.

But there is a right choice in common: Settle both Moon and Mars. They will complement one another, and **we will have become more fully human in the process**. Moon vs. Mars "wars" are counterproductive and could lead to the failure of both frontiers. **Mars and the Moon need each other as industrial and trade partners.**

But that's not the end! **PK**

Next Month: Venus and Mercury, (maybe Asteroids too)

We encourage readers to support a Research and Development policy that favors all three: Moon, Mars, Asteroids – http://www.moonsociety.org/images/changing/space_triway.gif

Read: "The Triway to Space" by Peter Kokh and Al Anzaldua Published in Space Review. May 7, 2012 – http://www.thespacereview.com/article/2078/1

Biowaste Recycling on the Moon

By Dave Dietzler

On the Moon, we will need to recycle all wastes or fail, even perish. Green plants will cycle CO2 back to oxygen, so we will need illumination during the long lunar night. Power will be stored up for crop lighting during the dayspan and crop lighting will have first priority. Urine and feces from humans and livestock, kitchen waste and chaff from the gardens will be put in a chamber with slow moving agitators to keep the compost stirred up. So the bathroom toilet drains and kitchen drains with garbage disposals will empty into the compost chamber. Air will be blown in thru one way valves because compost bacteria need oxygen...here we face the problem Biosphere did...we can't predict how the soil bacteria will effect air quality, so more CELSS research needs to be done unless it has already and I am unaware of it.

Air containing noxious gases coming out of the compost chamber will be piped into soil beds where microbes will decompose some of the noxious gases and the plants in this chamber detox some of the gases and then the remaining gases will be decomposed to CO2 and H2O by systems similar to catalytic convertors...We might need to inoculate the compost with good soil bacteria and fungi. Since animal digestive systems are not 100% efficient undigested carbohydrates will pass in our excrement...but microbial fungi which do not need light, just nutrients, water and oxygen, will convert those undigested carbs to CO2 and H2O which the green plants can use. Very few people seem to think that's important...but undigested food in our feces must be decomposed to useful plant nutrients.

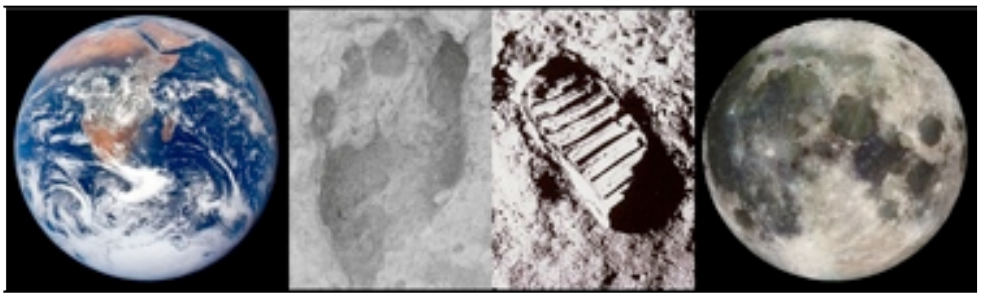
Another way to do things is to put all waste thru Zimmerman processors also called wet oxidation or super critical water oxidation. The waste goes into a metal chamber with water and high pressure oxygen is pumped in. Then it is heated up and the waste and oxygen actually burn under water. The output is sterile. It consists of steam, CO2, fixed nitrates and a fine mineral rich ash. This could be used for hydroponic plant food.

Hydroponics will not present unpredictable problems with soil bacteria, but will it be as productive as organic farming with compost? Only research could tell use for sure.

After all my years of thinking out space, the only conclusions that I have reached are that there is far more to do!!!! I think Aristotle said,"the more you know the more you know that you don't know." The High Frontier presents endless possibilities. Dietz

THE MOON SOCIETY — LUNAR FRONTIER SETTLEMENT — 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 industrialization 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: 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

From Moon Society President Ken Murphy

In the last few years we have seen a growing current in Moon interest around the world. The Moon may not be official policy in U.S. government circles, but The Moon Society has never been limited to being a NASA space supporter.

Along with increasing interest in our Moon is a growing awareness of the Moon as more than just flags and footprints, but also a place to include directly in the human story. As a place of science, as a place of commerce, and as a place of culture.

As president of The Moon Society, I will continue working to spread the message of the Moon as a place for human endeavor. I will also work to complete a number of projects we have have in the works, including the migration of content to our new website, and the transition to a new editorial team for Moon Miners Manifesto. It is my goal to position The Moon Society as the go-to source for Moon information and content, and to find ways to engage the next generation to participate in the next great chapter in human history – the expansion to the Moon as our stepping stone to the solar system. Our opportunity to shape that story lies before us, and I hope the membership will return me to the presidency to continue that work. KM

Moon Society supports the Integrated Space Plan

From Ken Murphy, President

There are any number of plans for the exploration of space out there in the marketplace of ideas. In the absence of much real-world progress, there is an inclination to plan for when there might be progress in the future. This often becomes a competition in the marketplace of ideas as agendas come into play, and some aspects of space exploration (and maybe development) are highlighted to the detriment of others as personal goals come into play. One effort to address this was the **Integrated Space Plan,** which tried to take a meta- approach to looking at our space efforts and determine which activities and technologies fed into what aspects of humanity's move out into the Solar System. Which aspects of exploration and development should be highlighted? How might they connect? What can help enable what else? Where are the synergies?

www.spacesafetymagazine.com/wp-content/uploads/2012/10/**Rockwell-Integrated-Space-Plan-landscape.jpg**

Above: Original Integrated Space Plan Poster

Below: A later version of the Integrated Space Plan can be seen at:
http://makezine.com/2013/07/06/the-rockwell-integrated-space-plan-vector-redux-version/

The Integrated Space Plan (ISP) was created in the 1980s as a "wall-sized poster" that ended up in universities and aerospace offices across the country and around the world. [MMM has a copy] Its voluminous content encouraged exploration of how different goals could be achieved, almost like the technology tree structure of many civilization-type video games. It also encouraged many systems engineers, who thrive on complexity.

Now it's time to revisit the Integrated Space Plan for a new generation of future space explorers, and update it for the new companies, new technologies, and new ideas in regards to things like the cislunar economy, interplanetary superhighways, and relevant resources.

The Kickstarter project to update the ISP can be found on the web at:

https://www.kickstarter.com/projects/486671231/integrated-space-plan-envisioning-humanitys-future (Video)

This project, with a goal of $18,000, was successfully funded as of Monday, July 28th at $32,583 - a smashing success for the Kickstarter movement.

[Full Disclosure: Moon Society President Ken Murphy is a partner in a company invested in Integrated Space Analytics, which is running the Kickstarter campaign project.] KM

Oops! What Happened to the 2014 Moon Society Officer/Director Elections?

By former President and one time director, Peter Kokh

The Moon Society Board has had its hands full converting the old website into something new and easier to use, as well as other time consuming issues. But the blame for this oversight is accepted fully by myself as editor. I know full well that in early spring, the call for nominees should be published in MMM. But when one is busy, things like this are easily forgotten.

Here we are, finishing the August issue, which should include the election results be tabulated on August 1st per the Society's bylaws. Call it oversight, call it preoccupation with MMM and now with the To The Stars International Quarterly, call it oncoming senility and characteristic forgetfulness, (we are 76+), call it what you want. We take the blame for not being up on the matter and for not calling this annual ritual and its calendar dates to the attention of our busy board.

Yes, no director or officer reminded us, but they have been preoccupied with other things.

What to do about the situation? Two Options:

1. **Call elections late**
2. **Instead, extend all present terms by one year**. There is no precedent. While this is not the first time, we have been late, this is the first time we have completely forgotten about the annual ritual. We think that it is best that the present board and officers are not interrupted in their current major projects, and have advised them to take this advice and **continue in office for one more year**.

From now on, the call for each year's elections should come early, in the February issue, (MMM #282). As there is no January issue and the February issue thus starts each new year, It will easy to remember to put the Call for nominees out in that issue.

We hereby request that the ByLaws of the Society be modified to reflect this timing. PK

By press time, the response was 2 in favor, none opposed (the rest no opinion? or not caring?)

Chapter Outreach Opportunity Ahead: October 7th, 57th Anniversary of the launching of Sputnik: the first Satellite

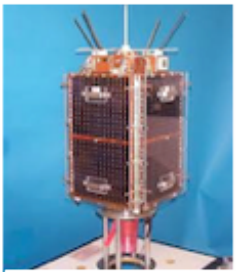
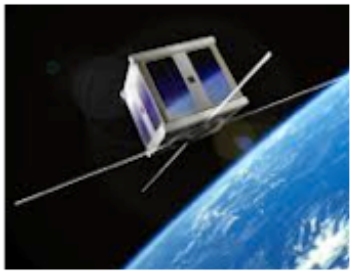
By Peter Kokh, Moon Society Chapters Co-ordinator

Since Sputnik, satellites have gotten bigger and heavier, some weighting several tons, in order to carry more instruments and accomplish more challenging goals.

Now a new revolution is underway, miniaturization, in the form of "cubesats" – one or more module just 10 cm (4 in) on a side, containing miniaturized instrumentation. Cubesats can be launched piggyback style for a fraction of the cost, allowing universities and corporations to enter a field monopolized until now by government space agencies. Indeed, cubesats have been, and are being built by university students around the world. For a growing number of smaller countries, one or more cubesats are their only contribution to the space age. Many of them doing valuable work in space especially in the area of Earth observation.

As yet, very few cubesats or cubeprobes have ventured beyond low Earth orbit.

Opportunities for further exploration of the Moon, Mars and other bodies

The Challenge: Design Cubesats or "Cubeprobes" that can be sent to the Moon and Mars, either in orbit or landing, to contribute valuable new science in areas of investigation previously not tackled by larger satellites or probes.

The Purpose: Involve university students in further, valuable research on the Moon and Mars. Also involve corporations as sponsors and funding contributors. Publicize the results to amaze and inspire other students.

Check out: http://www.space.com/17273-**tiny-lunarcubes-spacecraft-moon-exploration.**html
https://www.kickstarter.com/projects/aresinstituteinc/**lunarsail-the-worlds-first-crowdsourced-solar-sail**
http://www.hou.usra.edu/meetings/leag2013/pdf/7015.pdf

August Chapters & Outposts 2014

OUTPOSTS (2 or more local members in search of more)

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

JOINT TMS/NSS CHAPTERS

Milwaukee Lunar Reclamation Society – **www.MilwaukeeLunarReclamation.org**
http://www.meetup.com/Milwaukee-Space-Exploration-Meetup/ – **http://www.space-Mlwaukee.com**
Contact: Peter Kokh – kokhmmm@aol.com – Meetings, 2nd Saturday 1-4 pm monthly except July, August, at Mayfair Mall lower level room G110 – **MEETINGs – SEP 13 – OCT 11 – NOV 8**

Saturday, July 19th Field Trip to Bong Recreational Area for Tripoli Rocket Club launchings was attended by five of us. It was an enjoyable event. We did no "recruiting activity" this time as that would have called for a $50 permit-license. But we might want to attend this event next year, wearing apparel that advertises subtly for us. Its a fun opportunity that could be made to work as a recruiting event for us, using Meetup and other means. In short, this experience gives us an idea of how to plan a better event next year.

If we wanted to pay the license next year, we could have information on space tourism, commercial launch companies, commercial space stations, in-orbit refueling, reusable stages, etc.,as weil as information on the Moon and Mars, new vehicles that could get us to Mars sooner, and so on.e

Our annual Christmas/Holidays banquet celebration is still up in the air. We are looking for a place and a date, preferably the 1st or 3rd Saturday afternoons in December. **Suggestions welcome**. ##

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

The Moon Society – Lunar Frontier Settlement – www.moonsociety.org p. 4

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 – Meetings 2nd Wed monthly at Buder Branch Library, 4401 S. Hampton, in the basement conference room – **June, July Activities Report By Robert Perry**

On June 7 & 8 the Museum of Air and Space at Parks School of Aviation, a branch of St. Louis University, hosted Fun Days @ Downtown Airport. We had a three table display.

On June 28 Chesterfield Mall had many organizations have table dispalys for "non-profit days." We had a two table display. Chesterfield Mall allowed us to have another display on the 19th of July in honor of the 45th anniversary of the Apollo Moon landing. We had a four table display and a guest greeter, Joe Rausch, from the D. C. Chapter of NSS who was visiting relatives in the St. Louis area. For photos of the displays, visit https://www.facebook.com/pages/St-Louis-Space-Frontier/566953720051188 and our Meetup site above


Left: Judy and Jim **Right:** Joe, Bob, Chris, and Jim Merriman's rocket

The St Louis chapters are planning a Regional Space Development Conference NOV 7-9, 2014 to gain experience for a bid for an upcoming International Space Development Conference > p.16

NSS/Moon Society Phoenix Chapter - http://nssphoenix.wordpress.com/ – c/o Mike Mackowski.
http://www.meetup.com/NSSPhoenix/events/161939572/
Meeting **3rd Saturdays monthly at Humanist Community Center, Mesa**, 627 W. Rio Salado Parkway.
Meeting Report: The Phoenix chapters of the National Space Society and the Moon Society held their joint monthly meeting on Sat. July 19 in Tempe, AZ. In honor of the Apollo 11 anniversary, the meeting had a lunar theme. Chuck Lesher, a local member, gave a presentation on the latest developments in the Google Lunar X-Prize competition. There are five teams still in the running to place a lander and a rover on the Moon and beam back high definition video. It would seem that Moon Express and Astrobotics have the best chance of success. Chuck noted that most of the competing teams offer on-line information in the form of short videos, so we were treated to some nice visualizations of several of the projects: an excellent presentation on this exciting development in space exploration.

We had a small turnout of eleven people, including a couple of new folks. The presentation was recorded and links to them can be found on our MeetUp event page: www.meetup.com/NSSPhoenix/events/190464812/

Mike Clark is back with his Epic Future Space video newscasts. We missed his energy and enthusiasm. We encourage everyone to promote Mike's YouTube channel as it is oriented towards younger members (folks in their 20s and 30s) and is very well done. Search for Epic Future Space on YouTube.

The chapter leadership decided that the idea for a local Mars-themed symposium was still valid, but there are some other similar events coming up this fall so the project is on hold. We may consider it for late spring of next year, but we need more enthusiastic help to pull it off. A SpaceUp un-conference is still under serious consideration for February. The August meeting will be a barbecue at Chuck Lesher's home and the September meeting will feature secondary school educator Tracey Dodrill speaking about the MAVEN Mars mission.

On Sept. 20 we return to our usual location at the Humanist Center in Tempe. Our speaker, Tracey Dodrill, a science teacher who was recently named to be a NASA Educator Ambassador for the MAVEN program. The MAVEN enters Mars orbit Sept. 21 and Ms. Dodrill will give us a briefing this exciting mission. Our meetings start at 11 am.

Tucson L5 Space Society – http://www.tucsonspacesociety.org/ – Monthly, every 2nd Saturday, 6:30 PM
http://www.meetup.com/NSSPhoenix/events/161939572/ Now serving Moon Society Members

Clear Lake NSS/Moon Society Chapter (Houston) – Contact: Eric Bowen eric@streamlinerschedules.com – **Meeting 7 pm** in the conference room of the Bay Area Community Center at Clear Lake Park – Even # months

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

GREAT BROWSING LINKS

SPACE STATIONS + COMMERCIAL SPACE

http://www.space.com/26076-**united-kingdom-commercial-spaceflight-spaceport-2018**.html
http://blog.chron.com/sciguy/2014/05/**spacex-gets-federal-clearance-for-south-texas-launch-site**/
http://www.space.com/26144-**nasa-orion-spacecraft-giant-heat-shield**.html
http://www.space.com/26267-**china-lunar-palace-space-research-mission**.html
http://www.esa.int/Our_Activities/Human_Spaceflight/**Caves/Dry_runs_preparing_for_underground_astronauts**
http://www.space.com/26529-**experimental-military-space-plane-designs**.html
http://www.space.com/26493-l**ightsail-solar-sail-launch-2016**.html

MOON

http://www.space.com/26142-**moon-formation-giant-impact-theory-suppor**t.html
www.space-travel.com/reports/**Misleading_mineral_may_have_resulted_in_overestimate_of_water_in_moon_99**9.html
http://www.space.com/26236-**moon-far-side-mystery-maria**.html
http://www.space.com/26265-**russia-soyuz-spacecraft-moon-mission**.html
http://www.space.com/26161-**nasa-space-tech-advanced-technology**.html
http://www.space-travel.com/reports/**Moon_to_see_first_tourists_by_2017_single_roundtrip_ticket_costs_150_mln_**999.html
www.spacedaily.com/reports/**Chinese_scientists_prepare_for_lunar_base_life_support_system_**999.html

MARS

http://www.space.com/26140-**spacex-mars-colony-human-species**.html
http://www.space.com/15243-**spacex-quest-rocketry-holy-grail-space-exclusive-video**.html
www.space-travel.com/reports/**Elon_Musk_plans_to_take_people_to_Mars_within_10_years_**999.html
http://www.space.com/26072-**mars-volcano-oasis-life**.html
http://www.space.com/13599-**photos-mars-volcanoes-volcanic-red-planet.**html
http://www.space.com/26149-**nasa-makerbot-3d-printing-mars-base**.html
http://www.space.com/26149-**nasa-makerbot-3d-printing-mars-base**.html
http://www.space.com/26255-**private-mars-sample-return-mission-2020**.html
http://www.space.com/26356-**time-capsule-mars-ion-propulsion-system**.html
http://www.nasa.gov/press/2014/july/nasa-spacecraft-observes-further-evidence-of-dry-ice-gullies-on-mars/
http://www.space.com/26454-**mars-map-highlands-liquid-water**.html
http://www.space.com/26533-**curiosity-mars-rover-meteorite-photos**.html
http://www.space.com/26472-mars-rover-curiosity-wheel-damage.html

ASTEROIDS + COMETS

http://www.space.com/26349-**asteroid-zoo-zooniverse-planetary-resources**.html
www.aol.com/article/2014/06/19/**atseroid-that-whizzed-by-earth-may-be-grabbed-by-nasa**/20916325/
http://www.space.com/26264-**asteroids-comets-earth-impact-risks**.html
http://www.nasa.gov/content/**comet-hitchhiker-harvesting-kinetic-energy-from-small-bodies-to-enable-fast-and-low-cost**
www.spacepolitics.com/2014/07/10/**legislation-seeks-to-promote-use-of-asteroid-resources**/
www.space.com/26433-**rosetta-probe-snaps-spinning-comet-nucleus-video**.html

OTHER PLANETS + MOONS

www.spacedaily.com/reports/**NASA_considers_sending_quadcopter_drone_to_look_for_life_on_Titan_**999.html
http://www.space.com/26325-**cassini-titan-waves-magic-island**.html
http://www.space.com/26345-**pluto-ice-telescope-data**.html
http://www.space.com/26250-**pluto-moon-charon-subsurface-ocean**.html
http://www.nasa.gov/press/2014/june/**nasa-hubble-to-begin-search-beyond-pluto-for-a-new-horizons-mission-target**/
http://www.space.com/26447-**mercury-composition-giant-impact.html**
https://plus.google.com/events/cp2jh8gs5t0geuq9ap0hqeujg2c (How to surf Venus' atmosphere)
http://www.space.com/26419-**jupiter-radio-waves-alien-life**.html
www.nasa.gov/press/2014/july/**nasa-seeks-proposals-for-europa-mission-science-instruments**/
http://www.space.com/26409-**nasa-cassini-grand-finale-saturn**.html
http://www.space.com/26444-s**aturn-moon-titan-salty-ocean**.html

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

After Russia Leaves the International Space Station

By Dave Dunlop

1. The International Space Station is testimony that it has been quite awhile since the Soviet Union Collapsed (12/26/1991) and the MIR space station was dumped into the ocean (3/21/2001). A greatly weakened Russia signed on to the ISS partnership. Deals were worked on the disposal of nuclear materials at the end of the cold war and the US provided economic assistance to keep the Russian space program and scientific and technical community engaged when their personnel might have been less productively engaged elsewhere. When the Challenger was lost, the Russians kept the ISS functioning during the extended stand down of the Shuttle program. But those were actions taken under circumstances of economic necessity and desperation.
2. Now we see Russia asserting itself to protect what it sees as its vital political interests in Crimea and Ukraine much to the chagrin of the United States and the European Union. The Russians have looked at the ISS bargain and said they are willing to walk away and intend to do so in 2020 in part in response to US-EU sanctions applied to them.
3. After almost two decades of collaboration on the ISS, it somehow surprises us that Russia would want to reassert its independence in Space. Yet the role of the Soviet Union as "the other superpower" has not been forgotten in Russia. Now that Russia has undergone a transformation in it economy in the last twenty years it seem ready to assert itself in space once again as an independent force.
   - Russia has just approved a 6 billion ruble budget through 2020.
   - Russia is pressing forward to complete a new modern rocket facility, Vostochny, in Siberia

   - Russia has developed a launch facility at the European Space Agency's spaceport in Kourou (French Guiana, South America) (for launching into equatorial orbits)
   - Russia has indicated it will still make active use of Baikonur in Kazakstan.
   - Russia has been developing a new Angara rocket family to replace the vintage Soyuz-Progress systems that it has relied on for decades. The Angara will not use the old toxic propellants.
   - The ISS Russian components could form the core of a self sufficient Russian space station which could be further expanded with new modules, already in the works.
     A. A Multi-purpose Lab Module (MLM) scheduled for launch in this year (2014)
     B. A Node module with a large Russian airlock would follow the MLM in about a year
     C. A pair of planned Science and Power modules is also in development would provide an independent source of power for a Russian space station.
     D. Russia has announced an ambitious lunar program with five lunar missions planned, Lunar 25 through 29 including four landers and one orbiter. Three of the landers will be sample return missions.
     E. Russia has announced its intention to place humans in a permanent base on the Moon.
     F. Russia is also expanding it Glonass positioning satellite system.
     G. Russia is also planning Mars missions.
     H. A next generation outpost OPSEK project would use the newest modules brought up to ISS.
     I. Russia's RKK Energia is studying an experimental inflatable module which could attach to the Russian station
     J. A man-tended platform at an Earth-Moon Lagrange point.

The Point: By 2022 the ISS may have seen its Russian sponsors leave to establish their own station. The Chinese may have their Tianggong space station under way as well.

I suspect that there will be three International Space Stations each of which serves the economic and political interests of its main economic sponsors. The ISS may also evolve under a variety of scenarios with commercial components. DD

2015 International Space Development Conference
May 20th – 25th, 2015 in midtown **Toronto**, Ontario, Canada
At the **Hyatt Regency Hotel,** 370 King Street West
Save the date!
Hosted by the **Canadian Space Commerce Association** & the **National Space Society**
http://isdc2015.nss.org/wordpress/ – Sign up now for low advance rates
(The MMM Editor has signed up – 1st ISDC since 2010 Chicago)

Hyatt Regency  **Toronto**

Can't go because you don't have (or can't afford) a passport?
IF you are driving by car or entering by ship, (that is, not by airplane!)
there are two other less expensive options:
(1) a **US Passcard** with microchip, available anywhere,
(2) an **EDL - Enhanced Drivers License** available now in
Washington State, Vermont, New York, and Michigan
(and "soon" in Arizona, Texas, and California)
http://www.dmv.org/driving-abroad/passport-license.php
See you in Toronto!

St. Louis NSS/TMS Chapter to host Regional Space Development Conf.. Nov 7-9

"explore, discover, settle...creating a spacefaring civilization" – **GatewayToSpace.org**

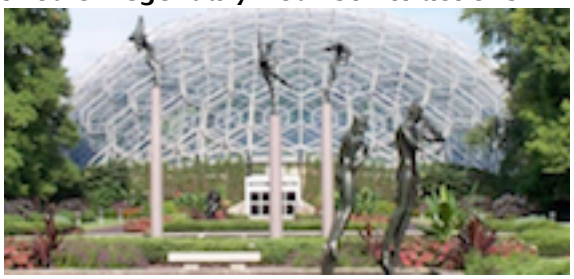
Crown Plaza Hotel Downtown: Room Rates $119 – register soon as St Louis hotels will be busy.
200 N. Fourth Street St. Louis, Missouri 63102 Reservations 1-314-621-8200

http://www.ihg.com/crowneplaza/hotels/us/en/st.-louis/stlrf/hoteldetail

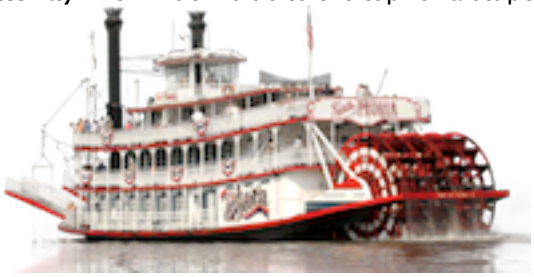
Calling all space enthusiasts, aerospace professionals, planetary investigators, rocket scientists, science fiction buffs, educators, dreamers makers... Are you interested in exploring the cosmos? Do you dream of living and working beyond Earth? Do you have an eye on asteroids for mining or deflection? Do you want to learn about and **participate** in space science? If so, join us! **TMS members AND MMM readers get 10% discount – code MOON**

While you are in "the Gateway City" visit some of St Louis' Legendary Tourist Attractions

Gateway Arch: ride inside to the top for a stupendous view



The sprawling Botanical Gardens and Dome



Mississippi paddlewheel tourist boats

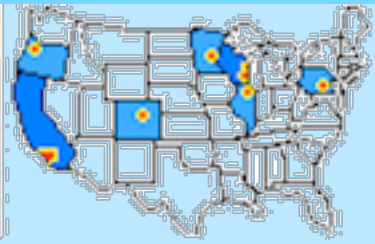
St. Louis Science Center

Boeing-St Louis Prologue Room

(and Busch Stadium (Cardinals), the Zoo, Washington University, a vibrant night life & much much more)

E**Online registration** is planned to launch September 2, after Labor Day. **$100 for the weekend**. If you are only able to attend for just one day, registration fees are **$75 for Saturday** and **$35 for Sunday**. Saturday registration includes a boxed networking luncheon and Cosmic Celebration. Sunday's registration includes brunch.

Moon Miners' Manifesto



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

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WISCONSIN

MLRS – Milwaukee Lunar Reclamation Society

PO Box 2101, Milwaukee, WI 53201 – www.moonsociety.org/chapters/milwaukee/
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
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• James Schroeter (414) 333-3679 – james_schroeter@yahoo.com
TREASURER/Database – **• Robert Bialecki** (414) 372-9613 – bobriverwest@yahoo.com
(• Current Members of the MLRS Board of Directors)

Meeting place Mayfair Mall Garden Suites East G110 **Note: this room** will be unavailable for our annual anniversary banquet meeting December 13th – We are looking for a substitute location. Suggestions welcome.

WISCONSIN

SSS – Sheboygan Space Society

728 Center St. Kiel, WI 54042-1034 – www.sheboyganspacesociety.org

c/o Will Foerster 920-894-1344 (h) astrowill@frontier.com
SSS Sec./Tres. c/o B.Pat Knier dcnpatknier@gmail.org
DUES: "SSS" c/o B. P. Knier, 22608 County Line Rd, Elkhart Lake WI 53020
Meetings are at The Stoelting House, 309 Indian Hill, Kiel WI 53042 - 3rd Thurs even # months
NEXT MEETINGS: APR 18 - JUN 20 - AUG 15 - OCT 17 - NOV 8

NOTE: We regularly join the Milwaukee Chapter for their annual holiday Banquet,but this year, a date and place has not yet been set, as they applied for their usual spot in Mayfair Mall too late and that room was already spoken for. If there is a party at another location and date, we will let our members know.

ILLINOIS

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

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 90278

Events Hotline/Answering Machine: 310-364-2290 – **Odyssey** Ed: Kat Tanaka odyssey_editor@yahoo.com
http://www.oasis-nss.org/wordpress/ - oasis@oasis-nss.org – **Odyssey** Newsletter www.oasis-nss.org/articles.html

Regular Meeting 3 pm 3rd SAT monthly – AUG 16 – SEP 20 – OCT 18 – NOV 15

REPORTS

SAT July 26th, OASIS enjoyed a day at the California Science Center, with a tour around the Shuttle **Endeavour**.

Fridays July 25th and August 1st, there was a "Mars Exploration Update" at the John Drescher Planetarium, Santa Monica College, 1900 Pico Blvd Santa Monica

OASIS NEWS & COMING EVENTS

SAT AUG 16, 1 pm BOARD Meeting Home of Steve Bartlet/Tina Beychok 7108 E. Peaboy, Long Beach

SAT AUG 16, 3:30 pm OASIS Lecture Seres: Space Elevators, Speaker Peter Swan, Long Beach Public Library, El Dorado Park Branch, 2900 Studebaker Road – not library sponsored

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

COLORADO

DSS: Denver Space Society fka Front Range L5
1 Cherry Hills Farm Drive, Englewood, CO 80133

Eric Boethin 303-781-0800 eric@boethin.com - **Monthly Meetings 6:00 PM on 3rd Thursdays, 7 pm**
Englewood Public Library, Englewood, CO 80110 - 1000 Englewood Parkway, First Floor Civic Center
NEXT MEETINGS: AUG 21 - SEP 18 - OCT 16 - NOV 20 - DEC 18

MINNESOTA

MSFS: Minnesota Space Frontier Society - http://www.mnsfs.org
ec/o Dave Buth, 433 South 7th St. #1808, Minneapolis, MN 55415

OREGON

ORL5 - Oregon L5 Society - http://www.OregonL5.org
PO Box 86, Oregon City, OR 97045

(LBRT - Oregon Moonbase) moonbase@comcast.net - Charles Radley: cfrjlr@gmail.com

Shari's in Oregon City on 99E (sharis.com) 1926 SE McLoughlin Blvd Oregon City, OR
The Third Saturday of the Month at 2:00 PM **AUG 16 - SEP 20 - OCT 18 - NOV 15**

PENNSYLVANIA

NSS-PASA: NSS Philadelphia Area Space Alliance - 928 Clinton Street, Philadephia, PA, 19107
c/o Earl Bennett, Earlisat@verizon.net - 856/261-8032 (h), 215/698-2600 (w)
http://pasa01.tripod.com/ - http://phillypasa.blogspot.com

Combined June and July 2014 NSSPASA Report

Meeting location and times: We meet at the Liberty One Food Court on the second floor of the building . Go towards the seventieth street side of the building and look for our table display. Next meeting: August 10, a Sunday, September on the thirteenth.

There where a number of transient events that did not last as long as the time between these reports. However: in the Fall there will be the Make Faire at the Queens Hall of Science. Michelle and I intend to go to this great event. And, sometime in August, we plan to go to the Wallops' Island Space Launch Facility to see this regional operation. Dorothy and Larry have plans to go to the Udvar Hazey Smithsonian Air and Space Museum extension in Virginia. Check the respective websites for your summer visits!

Reports: Larry has given two reports on Sun Spot activity and repeated the minima information: current counts are 71 (both months) and the low will be in 2022. He brought business cards but we did not need more this month. His reports also where on our Facebook versus website activity: Facebook has many more "likes" (visits) than our webpage. I noticed in the statistics my cousin in Tennessee had visited several times! High resolution data! In July Larry brought the six month compilation of activity on the site and more on the present and projected Sun Spot activity. One point he mentioned that may be important in our future: after a Coronal Mass Ejection, in 2010, the summer was unusually hot. The ejecta had struck us and this caused an effect that raised our average temperature temporarily. This is not mentioned, as a danger, in the documentaries on the threat to us of these events.

Dorothy reported on Franklin Institute and other Museum events: most this past June and July, including the Intrepid celebration of the 45th anniversary of the Apollo landing, but other events are ongoing or will happen before this is printed: Frank O'Brien will be at the New Jersey Astronomical Associates September 27 the event as the speaker. His presentation will be: "Roving on Mars: the Journey of Curiosity". This starts at 8:30 p.m. and reservations are not required. Contact the group at there Northern New Jersey location at 908-638-8500. also see the groups website for directions etc. (Frank is an author on space exploration and an NSSPASA member). Dorothy also mentioned the September Make Faire at the Hall of Science in Queens.

If last year is any guide there will be a very good NASA display of some of the work researchers are doing for it with 3D printers and C.N.C. systems and printed models of spacecraft and objects they have, or will, explore. In July she reported on Franklin Institute exhibits which include "101 Inventions That Changed the World" (which Michelle and I have seen), and which may come to your area after September, and "the Brain," a new permanent Franklin Institute exhibit with its own wing. Knowledge of ourselves is necessary if we are to go forth as a people into the solar system and beyond. See the F.I. website and Dorothy's Facebook site for more on various events and Dorothy's Dimensions newsletter information.

Mitch came in June but went to the sore in July. At the June meeting he talked of pubic outreach at the University City Barnes and Noble and discussed a possible outdoor location next to the store. He brought a new book, sold as a "coffee table book", titled: Tour of the Universe. At the cost of $20.00 he has added this to his table topics collection. We also talked about contacting NSS (via Larry Ahearn) and supplying material in the form of commentary and photos of our outreach events to NSS.

Hank, who attended the June meeting, gave us flyers for the November 2014 Philcon. There where two principal speakers listed: Sharon Lee and Steve Miller who have authored "the Liaden Universe" series of stories. Also noted is something called Cutting Edge Programming. This has included new manufacturing techniques and space applications. Hank has been promoting us on Meet-Up and Yahoo Groups. More in August.

Janice has noted that several reports in Science gave two vastly different rates for sea level rise in issues separated by six months; one report gave about .5 m.m. per year, from a simulation, and 2.5 cm from measured data. Just a little difference! She pointed out that some of this is from global warming as it applies to the oceans.

Rich Bowers contributed to both meetings and pointed out several movies that where scientifically accurate for the time they where created: The first is the classic " The Girl in the Moon" by Fritz Lang (includes the countdown to launch!) and, from George Pal, "Destination Moon" from 1950. Go to Net Flix to check availability.

Michael Stewart, who does educational outreach, came to discuss his ongoing efforts in the S.T.E.M. area of education: The Conference on Private/ Public School Partnerships and S.T.E.M., and: S.T.E.M. and its Importance in International Relations. He is also contacting colleges and universities about small satellites and education (ie: Cubesats as educational tools in science and engineering and more).

Dennis Pearson, Region 7 & 8 Coordinator for NSS, came in July to give us our Chapter in Good Standing Certificate and to point out that as such we can get lots of help with outreach material and publicity. I talked to Larry Ahearn, Chapters Vice President, on this also and he pointed out a number of events that NSS activities where being planned: a table at the North American Science Fiction Convention in Detroit (see NSS website), Mars Society Conference in August, and, in October, the World Space Week events (a U.N. space celebration) in which we could participate (if we had an event sponsor or location). Dennis is working on getting chapters rejuvenated, but, it's a tough struggle.

Earl has brought in material on several space, and related topics for the June & July period and will highlight a few: In June, from Science News, was a report on the properties of Vesta: this small body has actually formed into a sphere. This implies that the object may have melted during its' early history and could have differentiated layers of material that could be mined for our systems civilization. The resultant cavities might be developed as shielded habitat space as well. In the July 12 issue are two reports that bear on the search for exo-planets: the first is from the data gathered by Kepler about the discover of another Super Earth that is stranger than some of the other candidates: it is at 564 light years from Earth and is called Kepler10C. "Overweight Planet Shakes up Theory". It has a mass of 17 earths and is rocky and not a gas ball but is a stony body. In the same issue is 'To Find Other Earths, Just Block Starlight". There are two new exo-planet hunting telescope designs described: one uses a special sunshade that rides tens of thousands of kilometers in front of the relatively small telescope with a sophisticated analytical tool set. These would do chemical analysis of the atmospheric components of the targets and look for possible organically derived constituents.

There is much more but I will confine myself to the two interesting reports on the near and slightly distant future: the last page of Science News is a report on "A Suit Fit for Mars" on the ongoing work on a new suit design from designer Amy Ross of the Johnson Space Center in Houston. This is not a study: NASA plans to have the suit ready for use in 2018. I wonder if Dennis Tito has plans to get these? The other report is from Analog Science Fiction/Fact: Alien AWOLs: The Great Silence by Edward M. Lerner. There are lots of reasons why we should have firm evidence for detection of extra terrestrial civilizations, and about as many possible reasons why this hasn't happened yet, or may not at all, and Mr Lerner (doctor?) has a number of scenarios (and references on the subjects) that may explain the lack of an answer to Enrico Fermis' question:" where is everyone?". This is from the October of 2014 issue. Submitted by Earl Bennett

And: Thank you, Peter, for adding the clarifying picture/graphic of the Lava Tube Tower. EB

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- US **$55** Surface Mail Outside North America – **Payable to "LRS",** PO Box 2102, Milwaukee, WI 53201

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