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

Moon Miners' Manifesto

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

MMM #301 (final issue) February, 2017

A design for a home with living quarters (middle), garden space (left), workshops (right)

Why this issue is so late and so short (12 pages instead of 20)

Bach a couple of months: My laptop was snatched out of my hands by a raging "friend" who demanded $600 to get it back. I eventually got a loan for that amount and got it back, all files intact. In the following weeks I was at the computer all day every day. Got out #300, worked on a half dozen issues of **OUTBOUND: The Moon, Mars, and Beyond**, and had MMM #301, the closing issue, completed but waiting on Ken Murphy's monthly "rant."

Vulnerability: I usually worked on the computer in the front room so I could keep an eye on the TV news channels.

Then a "friend" who was staying in an upstairs bedroom temporarily, showed up with a half dozen friends of his, went upstairs, and there was a big racket , I went up to see what was going on and they ran downstairs, grabbed the "loaded" computer and ran out the door.

I borrowed even more money to try to retrieve the computer (later learned that all these funds went for "crack.") **This time, all my non-pdf files were lost.** They had been preserved in the computer the time previous.

I resolved myself to accept that my writing days were over. Then a friend found a Mac Laptop on **Craig's list** for $300, and I hustled up the funds. Turned out that its operating system was too old for me to use the software I was used to in putting together MMM. But a nephew took it to the Apple Store and had it upgraded to usability and I am using it now.

The files for MMM #301 were lost but were still in my head. find them below.

I decided to abbreviate this issue: no Moon Society or National Space Society news, no no chapter news, no space news links, just the main articles: 12 pages ousted of 20 (3 11"x17"sheets instead of 5) for printing purposes. I had lost my storage drive, and not got around to replacing it; It's all in my memory, of course, "sort of."

Lesson learned too late: to avoid another such incident, I am now working in my locked bedroom. If someone comes to the door, I will lock the bedroom **door first.**

Recovery has been much more challenging this time

All previous MMM's and other publications of mine are preserved in pdf files. Not as easy to use as the original print files, but it will have to do.

Three planned books

I should still be able to knock out the three books i want to write:

√ "A Pioneer's Guide to the Moon"

√ "A Pioneer's Guide to Mars"

√ "The Omega Factor: What makes the Universe tick, along with everything inside it (including you and me).

i will turn 80, this coming December 11th, so I am motivated to use time well.

Where on the Moon, I would like to live, had I the chance – by Peter Kokh

I am known for opposition to the South Pole Ice Mining Scenario and for proposal of a 150 degree wide stretch of settlements along the "North Shore" of **Mare Frigoris – Sinus Roris**, Craters whose southern floors are perpetually shaded allowing ice build up are just to the north, just north of the 60° latitude. You can drive ice mining equipment from the sunlit northern part of the crater floors onto the ice to the south. At the poles, equipment must be lowered a mile or two to crater floors in perpetual darkness – a recipe for TROUBLE.

Linked sites along this route would be able to share solar power for 85+% of the time.

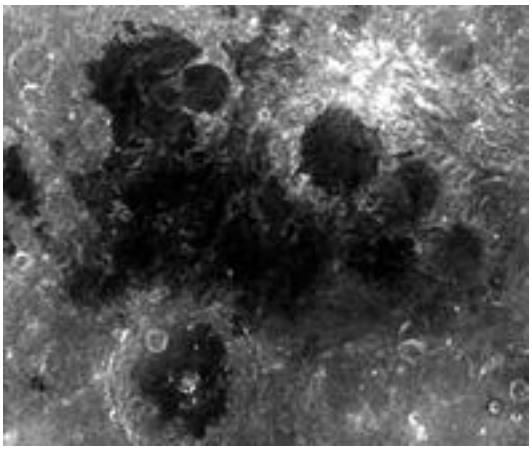
And **the mare floor is basaltic.** Basalt is perhaps the most "ready to use" material on the Moon: carved basalt, cast basalt, basalt/basalt fiber composites will allow much greater industrial self sufficiency than any polar site, north or south.

Better yet, the Mare Frigoris stretch has many chemical provinces with almost all of the useful elements are to be found .in one part or another.

But no, Mare Frigoris is not where I would like my personal dream retreat.

Rather, I would like a spot a bit past the Eastern 90 degree line, and just a bit north of the equator. On the Eastern (or Western) 90° lines, Earth is above the horizon half the time (14+ days, and below the horizon half the time Choosing a site a couple of degrees past the 90° line would put the unimaginably star-studded farside heavens in view most of the time.

I'd like my home to be on the rim of a large crater offering horizons further away, overlooking a crater interior to one side, and a basaltic "mare sea" to the other. Mare Marginis /Crater Neper to the east of the easily spotted round **Mare Crisium** would do. The basaltic soils would allow me to putz around making this or that out of carved, cast, or woven basalt.



LEFT: Above center: Round **Mare Crisium** with **Mare Marginis** to the right
RIGHT: **Mare Marginis** with **Neper** crater just above tright of center.

The cover artwork of this issue shows a 3-dome design which would be perfect.

Keeping busy: A Garden Dome: My experience with gardening leaves mush to be desired. but I'd want gardens planted with vegetables and fruit, and a variety of flowers with fish streams, and a selection of birds, other small animals - (Note: I'm not going anywhere without a dog!)

Keeping busy: A Workshop Dome: I will want what I need to keep everything in good repair. I will also want to create things out of the basaltic moon dust both for decor and for useful purposes/

And of course, a communications corner so I could keep in touch with others on the Moon and with followers back on Earth.

Would visitors be welcome?

Why of course! I'd have so much I'd want to tell them, lead them on local tours of the surroundings, and more. To live alone is not necessarily to be anti-social! ##

What we have meant by "**Manifesto" and** Lunar "**Reclamation**"

by Peter Kokh

"Manifesto" – From "Terra Lux" to "Luna Lux"

In his epic science fiction novel, **"The Moon is a Harsh Mistress," Robert Heinlein** described human settlements on the Moon as necessarily underground, in natural or man-made caves, with no sunlight, living a life of civilized moles.

Some 15 months before the founding of the Milwaukee Lunar Reclamation Society chapter of the National Space Society, we saw an ad in a Milwaukee newspaper about a unique underground home some 25 miles N/NW of my Milwaukee home. I got in my car, drove to the site, and what I saw totally transformed my conception of how humans could live on the Moon.

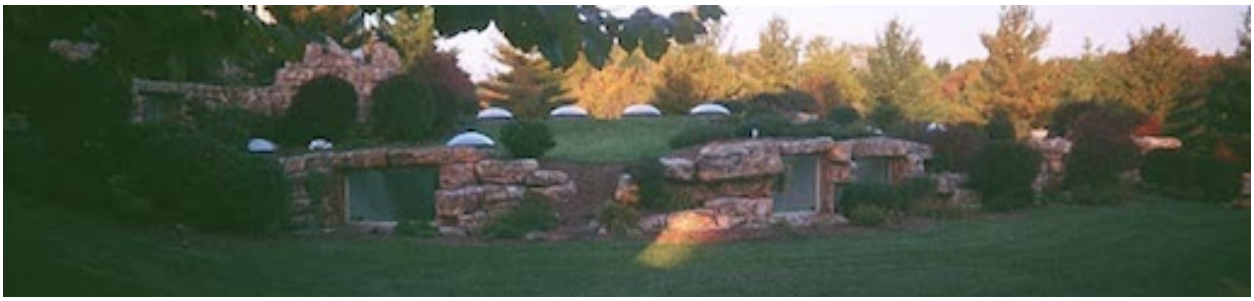
Read "**M is for Mole**" – http://www.moonsociety.org/chapters/milwaukee/mmm/mmm_1.html

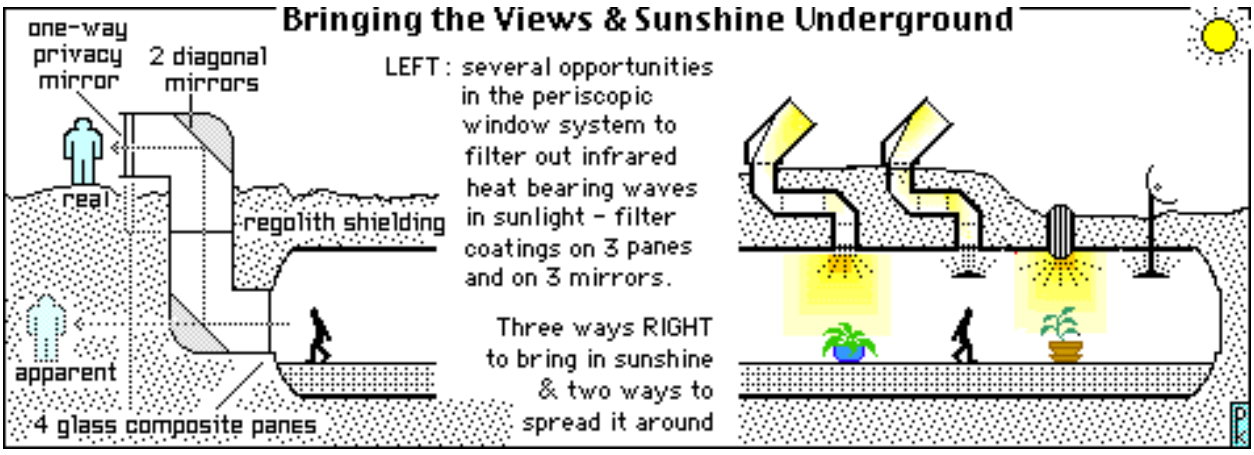
Run-of-the-mill underground homes are covered by earth above and to the west, the north, and the east, while being open and exposed to the sun along the south through a long window wall.

But Mr. Keller's large home (some 8,000 square feet) was totally underground except for the north-facing garage door. Yet the house was absolutely awash in sunlight, more so than any conventional above-ground house I had ever seen. Sunlight poured in through yard wide circular shafts spaced periodically through main room ceilings. These shafts were tiled with one inch wide mirror strips. Above on the surface, an angled cowl, also mirrored on the inside, followed the sun across the sky from sunup to sundown at the bidding of a computer program named "George" (undoubtedly of "let-George-do-it" fame.)

Yes, Mr. Heinlein, we'll have to live underground, but we can take the sun and the views down with us! – that's our "Manifesto!"

Below: the site as it looks today, domes replacing the rotating cowls





”Reclamation”: http://www.moonsociety.org/chapters/milwaukee/reclamation.html

Sone persons have assumed that the use of the word "reclamation" denotes the act of "reclaiming" and although this is true, jump to the conclusion that we are calling for the USA or Humanity to "reclaim" the Moon, or to "reclaim" the heritage of the Apollo Manned Lunar Exploration Program. This is quite wide of the mark. We chose the word "reclamation" not for historical reasons, but because **no other word better describes our mission on the Moon.**

http://en.wikipedia.org/wiki/Reclamation

Reclamation is **the process of reclaiming something from loss or from a less useful condition.** It is generally used of water reclamation, which, a century ago meant damming streams (thus the **US Bureau of Reclamation** owning dams), and now has come to be used to describe wastewater reclamation.

Better example: **Reclamation as practiced by the Dutch in the Netherlands**

The Dutch have, over centuries, reclaimed a considerable amount of low-lying land from the encroaching ocean and seas, particularly in the Zuider Zee. Land lost to the ocean is drained and kept water free and now supports settlements and agriculture.

Following this paradigm, we draw these parallels: **on the Moon we need to reclaim “land washed by vacuum” and the vagaries of cosmic weather**. **The pressure hulls of lunar settlement structures** that will contain breathable atmosphere and become home to humans, plants, and some animals, **are like the Dutch Polder Dikes** that hold back the sea. Land once considered "wasteland" is reclaimed from the domination of raw exposure to space and becomes part of a modular biosphere complex supporting life.

in 1996, for an outreach event opportunity, we composed the following.

“Reclamation”: 1. The transformation of waste, desert, marshy or other barren land for agricultural or other life-supporting use.

COMMENT: Self-supporting communities of people - as part of fresh oases of Earth-life in closed-cycling mini-biospheres - can be established on the Moon, extending the “world” of human horizons to Earth’s natural bound satellite.

“Reclamation”: 2. The process of deriving usable materials from apparent waste.

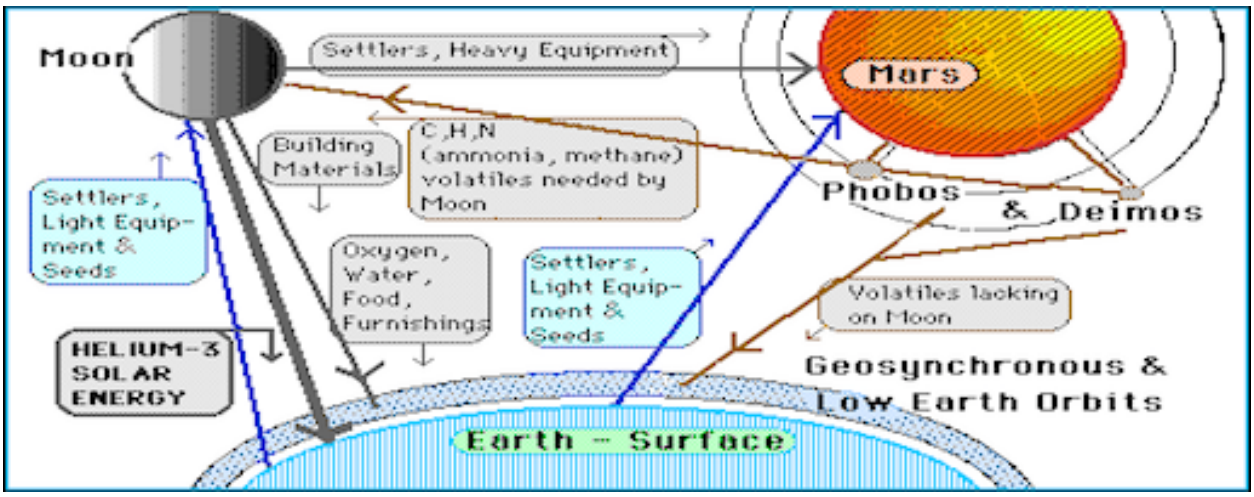
COMMENT: Useful building materials can be processed from the mineral-rich lunar soil to make shelter and furnishings for settlement pioneers, and to export to Earth orbit for the construction in space of large structures.

Helium-3, rare on Earth, but found in abundance in the loose moondust covet covering the Moon to a depth of a few yards, can be extracted simply by heating the soil. Burned in nuclear fusion plants (not fission plants, like we have now), it could supply all Earth’s energy for millennia. He-3 is the cleanest burning and most efficient of fusion fuels. One shuttle external tank full of liquid He-3 would provide a full year’s supply of electricity for the U.S.! ##

Why has "Moon" Miners Manifesto carried so many articles about Mars and other worlds?

By Peter Kokh

MARS = similar construction systems will be appropriate with shielding against cosmic rays washing Mars' surface as it does that of the Moon.;
PRODUCTS made on the Moon can be shipped to Mars at far less fuel cost than from Earth
Lunar thorium could be transformed into **a relatively clean nuclear fuel to power nuclear craft to/frpm Mars shortening trip time, lengthening trip stays** See below.

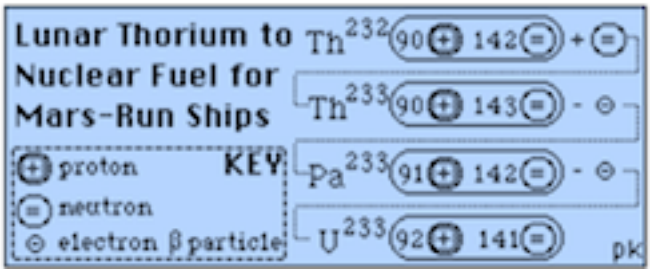


Products made on either or both of Mars' two "mini-moonlets" Phobos and/or Deimos products assumed that the two moonlets were of carbonaceous chondrite origin. In that case, liquid methane (carbon) and ammonia (nitrogen) would be welcome imports on the Moon?

But now the origin of the two moonlets seems to be of material blasted off Mars' surface. Yet it still stands that anything made on either or both mini-moons could be shipped to the Moon at considerably less fuel cost that the sake products shipped up the deep gravity well from Earth's surface, as well as from Mars' surface.

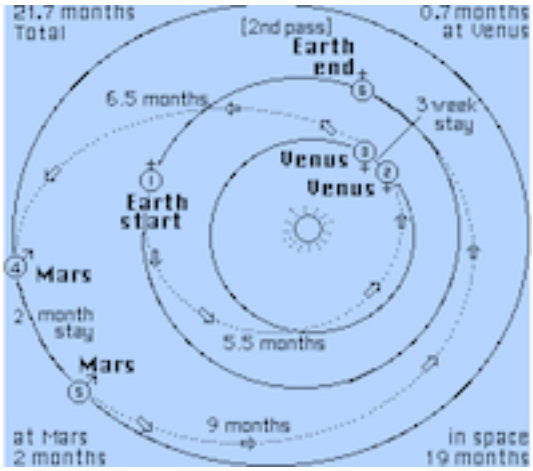
Seasoned Lunar Pioneers who chose to move to Mars, would be "frontier-hardened", ready "to hit the ground running." For them, pioneering Mars would be "a walk in the park."

NUCLEAR REACTORS USING LUNAR THORIUM could fuel ships from the Earth-Moon system to and from Mars, <u>cutting travel times to a fraction</u>, <u>widening launch windows on either end by quite a bit.</u>



http://www.nextbigfuture.com/2006/06/thorium-reactors-for-earth-and-moon.html
http://beyondearthlyskies.blogspot.com/2012/08/nuclear-power-for-lunar-settlements.html
http://moonsociety.org/changing-images/showimage.php?image=14

VENUS – Earth-Venus-Mars and Mars-Venus-Earth trips could double launch windows
MMM #115 Visits to Venus en route to Mars



STANDARD MARS TOURIST ITINERARY windows open every 25+ months
● Spend 8 or 9 months en route to Mars.
• Tour till you've seen enough then
• hibernate for the rest of your 18 month stay until the return launch window opens. • Send 8 or 9 months in space on way back to Earth.
• Total time away from Earth two and a half to three years.
STANDARD VENUS TOURIST ITINERARY windows open every 19 months or so ● Spend 5 or 6 months on route to Mars.
• Spend 11 months on an aerostat, looking at Venus' surface features through telescopes, and work for the science crew there until the eleven month wait for your
• 5 or 6 month return trip to Earth. • Total round trip time two years.
That's the deal using minimum fuel expenditure Hohmann transfer paths to Mars and Venus.
BEHOLD THE TWO FOR LESS THAN ONE DEAL

But if you had to get to Mars in between, there is a way using the so-called "conjunction class" trajec- tory to Mars, First swing in toward Venus for a gravitational boost. It takes about a year in space to get to Mars by way of this detour. You'll get there just two months before it is time to return home the ordinary way.

But leave from Earth a couple of weeks sooner if willing to pop for the fuel to break into Venus orbit, and then launch out again three weeks earlier, and You get nice length stays at both worlds and still get home in under two years, less time than it takes to visit one. A deal which should prove very popular!

MERCURY The intense solar power available in Mercury's orbit could one day make this now dismissed hot rock **the Grand Central Station of the Solar System**. Mars represents the limit of "doability" of the venerable chemical rocket for crewed expeditions. No plausible improve- ments will extend this margin in any practical sense. Chemical rockets cannot carry enough fuel to take expedition-sized payloads much further. More, maximum efficiency travel times in Hohmann transfer orbits (without which chemical rockets could not even take crews to Mars) mean many months in space and unwelcome exposure to solar flares and cosmic radiation.

Nuclear rockets on the drawing boards promise faster trips to Mars, and doable trips to the Main Asteroid Belt. But **rips to outer planets may be unacceptably long, and infrequent.** For any vehicle must await proper planetary orbital alignments - the "window".Some Trip Window Frequencies (bidirectional) and average Hohmann travel times (both in 30 day months)

The quickest way to get from anywhere to anywhere else in the Solar System might be to "detour" via Mercury. What about alignments? So what if you get to Mercury and have

just missed a window to Jupiter. Another will open up in just over 3 months, an insignificant delay parked in Mercury orbit. Yes, Delta V and fuel cost do matter. The point is that much of the extra Delta V needed to detour via Mercury can be managed by free deceleration into orbit around Mercury, and free acceleration into a trans destination trajectory — free courtesy of giant solar lasers in or- bit about Mercury.

Ships going out to any of the moons around any of the Outer System gas giants, can shed that excess momentum free in an aerobrake maneuver through the upper atmosphere of the gas giant (Jupiter, Saturn, Uranus, Neptune). In fact, the only Delta V that need be provided for by fuel carried on board is that for the boost in toward Mercury, and the landing fuel at the destination moon that would be the same in either case. The benefits would be astounding LEAVE ANYTIME and GET THERE MUCH MUCH SOONER.

Building such a giant laser facility near Mercury would be something for a "United Planets" government. It would establish singlehandedly a transportation infrastructure that will open the gates of human expansion into the Outer System, in search of energy (e.g. Helium-3 from Uranus), the ultimate in tourist experiences (Saturn's rings), raw materials for terraforming (water, hydrogen, nitrogen, carbon), and exploratory knowledge.

Because ships arriving at Mercury will have to wait up to 3 plus months for a reboost to their destination, there will be a major service market in orbit about the planet. This will include ship repairs (engines, environmental systems, biosphere systems), warehousing, trading, transshipments, health care, entertainment and diversion, surface excursions and stays, even continuing education courses.

Mercury's Gateway could over time grow to become the nerve center, financial center, trading center, even the political center of the Solar System.

Yes it's hot!, Yes it's dry! Yes it's barren! But so what! Mercury's location deep down the throat of the Sun's gravity well and its location in very bright space (averaging seven times as much light and heat from the Sun as reaches Earth/Moon) — these are the real estate pluses that will make this unsuspected oasis in the solar desert bloom and boom.

Mercury is a detour that makes sense!

JUPITER:

Nuclear rockets, whether traveling directly from the Earth-Moon system of via Venus or Mercury will head first for CALLISTO, a Mercury-sized moon of Jupiter that orbits outside Jupiter's powerful radiation belt. Here, ships bound inward, say to **Europa,** can be jacketed with ice for a safe ride inward.

Europa is too special a world to be trivialized by "orbital missions." We need to set down on this world's ice. jacket, on the brownish streaks that may be organic matter that has seeped up through cracks in this moon's thick ice layer. The discovery of organic matter would be proof that Europa-like worlds, bound to be many times more common than other "Earths" around any type star, even brown dwarfs, pervade the universe. (ice jackets)-EUROPA (Life) NASA's timid plans and what the agency should be planning.

SATURN:

Mercury flyby=boosted rockets could support a permanent orbital science station above Titan, another unique world, likely to be far more rate than "Europids." Tourists may visit the smaller moon IAPETUS for maximum views of Saturn's rings.

Scientists may visit Enceladys, looking for signs of life below its icy surface.

URANUS: (finally) If we succeed in building fusion reactors that can burn Helium-3 Helium-3, Uranus at a level well-below its gassy surface, may have enough of this energy source to rule the Solar System for centuries to come.

The Moon is just the beginning! ##

Moon Time by Paul Swift

We all know the space program is in some odd state of flux at the moment. While NASA continues to design, build, and test its Orion capsule and its accompanying STS (Space Transportation System) launcher, with its merits or lack thereof, and private industry continues on its path to new ventures and various launcher configurations, the community of space enthusiasts watches with bated breath. We hear of a return to the Moon, an initiative to settle the Red Planet, an asteroid capture and return endeavor. In the background are the hounds of change and the moneychangers. What is actually going on, why is it happening this way, and in what order will these three major initiatives be undertaken?

I have no idea. What I do know is that by the mid two thousand and twenties the ISS may be abandoned. The Russians may unbolt their section; the Japanese the same; and other nations will decouple themselves from involvement. I don't like that.

The Chinese may be on the Moon setting up whatever the Chinese would like to set up. The Indians will likely break away from the culture of cooperation and sharing and get into some heavy duty space project themselves. The Europeans and Japanese have their own culture and direction and may surprise us. It won't be hard. With no plan and no torchbearer; no roadmap and befuddled thinking, America, it seems, will be surprised a number of times by its former space partners as the next dozen years unfold, or more likely, unravel.

So I would like to throw a bone to the hungry puppy. It's not new; it's not my idea; I don't know much about the subject of astronomy; and I plead ignorance of several other major disciplines, but I do believe this project is the only one that could be considered to be affordable and of value. It s the concept of **a large observatory on the Far Side of the Moon.** I believe the arguments have already been made about the ideal location, but to recap, the Moon is a relatively heavy planetary body: thus very stable. Heavy of course, relative to nothing at all to lean on, like Hubbell or the up and coming James Webb Telescope, or even in relation to a thousand ton asteroid.

It is a low gravity environment, but not too low. There is no wind or weather. There is no atmosphere to distort optical wavelengths. On its far side, there is no interference from Earth.

The size can exceed anything foreseen for either Earth-based deployment or space based by a factor of many, thus the imagery or patterns detected can be from very long distances. Every school kid knows that, more or less. The thing is: the long distances we are talking about here are incredibly long. I don't know the numbers, or even the multiplication factor, but I do know one thing: This sole project is the one undertaking of all the rest that has true promise and a strong likelihood of immediate and amazing success. It will be funded by astronomers worldwide who want to see the furthest and view what can only be described as the birth of the universe. Whether it is just optical or just radio, either or both will allow scientists to see further into space and time than ever before. No country can afford not to be there. As a follow on to the James Webb Space Telescope and its seven times image capture area of today's Hubbell, it will up the factor by at least another order of magnitude, and the present time is when to initiate this grand endeavor.

Please refrain from wagging on about space elevators and linear launch ramps and such. In a hundred years we might be getting close to those toys, but for now let us use the tools we either have or can refine to make this project real. We need some heavy duty components up there. We need all the infrastructure you can imagine to ensure continued, continuous operation. It needs to be built here on Earth by Earth men and women, and tested here rigorously. Its deployment needs to be cleverly devised and precisely executed. Its operation and maintenance needs to be diligent and of the highest integrity. And whether this calls for a somewhat costly rotating crew to be there and do a good job, or leaving it unmanned and in the safe hands of autonomous programs and devices remains to be seen. Either has its challenges and merits.

The Moon always aims outwards. It took a while for it to do that so we could build this thing. If you had a million million dollars and were tasked with making a platform to hold the Far Side Observatory, you would build the Moon and put it where it is. With 99% of the work done, can we please just get to work and do the rest? —- Paul Swift

Join us at ISDC 2017 in St. Louis, Missouri
May 25-29, 2017 at the St. Louis Union Station

The annual conference of the National Space Society bringing together NSS leaders and members with leading managers, engineers, scientists, educators, and businessmen from civilian, military, commercial, entrepreneurial, and grassroots advocacy space sectors. Below: The famous **Union Station**: Exterior and Interior

17 PROGRAM BREAKOUTS

Asteroids, Integrated Space Plan, Lab Utilization, Back to the Moon, Interplanetary Robotic Exploration, ISS National Lab Utilization, Mars Exploration and Settlement, Space Law, Space Elevator, Space Medicine, Living in Space, Many Roads to Space, Space Business, Space Settlement, Space Solar Power, Next Gen, Space Transportation

NSS negotiated a special room rate at the conference site hotel, St. Louis Union Station Hotel, for May 21 through June 1, 2017. The rate per night is $135.00 USD per room, plus applicable taxes.

St. Louis Union Station Hotel, Curio Collection by Hilton
1820 Market Street, St Louis, Missouri, 63103
TEL: +1-314-231-1234 FAX: +1-314-923-3970

The historic St. Louis Union Station Hotel. Once the largest and busiest passenger rail terminal in the world, St. Louis Union Station now serves as one of America's great historic tourism destinations and event spaces! Union Station first opened in 1894, but ceased operation as an active train terminal in 1978. Union Station reopened in August of 1985 as the largest adaptive re-use project in the United States geared toward St. Louis tourism, commerce, and events. The elegant 120-year-old National Historic Landmark includes the Grand Hall, the jewel of St. Louis Union Station, which now features an innovative high-definition projection mapping dazzlingly projected on the Grand Hall's 65-foot tall ceilings and across the space. The Midway which shepherded 100,000 travelers a day will be the Exhibit Hall.

This issue of Moon Miners' Manifesto, #301, is the very last.
The plan was to publish this issue, #301, in December 2016, but that goal evaporated when our computer was stolen for the second time.
But we will continue to write and publish in a new publication.

Outbound: The Moon, Mars, & Beyond (in pdf file format only)

We will endeavor to publish monthly through the remainder of 2017, to give the Moon Society a chance to come up with its own newsletter. Starting next year, there will be no set schedule.

Moon Miners Manifesto
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INDEX to MMM #301, February 2017

Moon Society and National Space Society chapters whose members have been receiving Moon Miners' Manifesto, will receive a pdf file of "**Outbound**" to distribute freely