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

Moon Miners' Manifesto

& The Moon Society Journal

www.MoonMinersManifesto.com

237 | AUGUST 2010

Above: "**Moonbase Alpha**" from the sci-fi TV series **Space 1999** (1975-7), is not properly shielded, but gives an idea of the scale of our proposed International Lunar Research Park, subject of a presentation at ISDC 2010 in Chicago, by Dave Heck, Boeing-St. Louis

Feature Articles in This Issue

Bigelow Modules vs. the TransHab Promise

We are all excited to see Bigelow Aerospace make slow but steady progress towards supplying more spacious modules for space and lunar application at a lower cost on a commercial basis. And now Boeing is buying into this venture, aiming to supply the vehicles to reach them. But has the company incorporated all the promising features of TransHab? And are the units to be made for orbital space equally suited for the Moon? See pp. 4-5.

IN FOCUS The Moon: we've got "Time to Wait, but No Time to Waste"

By Peter Kokh

There can be no doubt that that many of us feel let down, by NASA's redirection. In part this is NASA's own fault by choosing an "Apollo on Steroids" {Mike Griffin] mission plan that was sure to cost too much money and offer too low a flight rate. Yes, now there *will be* delays and setbacks. Meanwhile, [=>p. 2, col. 2]

Moon Miners' Manifesto

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

• **Moon Miners' Manifesto CLASSICS:** The non-time-sensitive articles and editorials of MMM's first twenty years have been re-edited, reillustrated, and republished in 20 PDF format volumes, for free downloading from either of two locations:
www.Lunar-Reclamation.org/mmm_classics/
www.MoonSociety.org/publications/mmm_classics/

• **MMM Glossary: new terms, old terms with new meanings:**
http://www.moonsociety.org/publications/m3glossary.html

• **MMM's VISION:** "expanding the human economy through off-planet resources"; the early era of heavy reliance on Lunar materials; early use of Mars system and asteroidal resources; and establishment of permanent settlements supporting this economy.

• **MMM's MISSION:** to encourage "spin-up" entrepreneurial development of the novel technologies needed and promote the economic-environmental rationale of space and lunar settlement.

• **MMM retains its editorial independence.** MMM serves many groups, each with its own philosophy, agenda, and programs. Participation in this newsletter, while it suggests overall satisfaction with themes and treatment, requires no other litmus test. [Opinions expressed herein, including editorials, are those of individual writers and not presented as positions or policies of the **National Space Society**, **Lunar Reclamation Society**, or **The Moon Society**. **Copyrights** remain with the individual writers. Reproduction rights, with credit, are granted to NSS & Moon Society chapter newsletters.]

• **For additional space news** and near-term developments, read ***Ad Astra,*** the magazine of the **National Space Society**, in which we recommend and encourage membership

• **The 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. LRS serves as NSS' Milwaukee chapter: www.Lunar-Reclamation.org

• **The National Space Society** is a grassroots pro-space membership organization, with 10,000 members and 50 chapters, dedicated to the creation of a spacefaring civilization. National Space Society, 1155 15th Street NW, Suite 500, Washington, DC 20005; Ph: (202) 429-1600 - www.NSS.org

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

• **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, Appleworks, pdf attachments
√ Mac compatible CD / or typed hard copy must be mailed to:
Moon Miners' Manifesto, c/o Peter Kokh,
1630 N. 32nd Street, Milwaukee WI 53208-2040

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⇒ In Focus Editorial continued from p. 1.

(meanehile) there is much homework for us and others outside NASA to do. If NASA were ready to take humans to the Moon tomorrow, *WE* would *not* be ready to hitchhike a ride towards establishment of lunar frontier industrial settlements.

Homework needed for the establishment of a permanent lunar community

We need to do much more R&D on the kinds of **building materials** we can produce from lunar regolith without a lot of capital equipment or sophisticated precursor technologies.

Concrete, steel and other alloys, glass and glass composites, ceramics, and cast basalt are prospective lunar-appropriate technologies.

It is not enough to rest on paper studies and anecdotal laboratory trials. It is also *up to us* to develop modular architectures that build on the characteristics of these new materials. This will require the work of materials scientists, metallurgists, and chemical engineers, and, yes, entrepreneurs willing to invest in analogous technologies with potentially profitable terrestrial applications and markets -the "spin-*up* paradigm."

We need to do a lot more work on biospheric systems. They should be *modular, so that they grow as the outpost or settlement grows.* Practical research with graywater systems and living walls are promising in this regard. NASA had stopped all biological life support system research.

We need to develop methods of insuring plants survive to harvest in an environment with 15-day long dayspans of continuous sunlight and equally long night-spans when only artificial light is available. We need to experiment with all sorts of plants but concentrating on those that best promote menu variety. We need to develop plant cultivation methods suitable for teleoperation from Earth to free personnel on the Moon for other things needed to expand the outpost and its operations.

We need to further develop inflatable technologies, especially hybrid-rigid-inflatable options begun in the TransHab program but abandoned by Bigelow.

Inflatables will be our first way of providing livable elbowroom but we must advance quickly to production of habitat and activity modules manufactured on location with lunar materials.

Until we reach that stage, true lunar settlement will remain an illusive dream.

To help address some of this litany of research needs, especially those technologies at a low "readiness state", we will soon introduce

a decentralized but comprehensive lunar analog research plan, quite unlike the analog terrain based Mars Society program, that will endeavor to advance the readiness state of the required technologies.

We will welcome other organizations, even our individual chapters, to participate if interested.

Those of us with writing talents need to work harder to get the message across to the public. This plan will be designed to invite academic and student participation, and to incorporate public outreach programs.

No time to rant, rave, or pout!

Yes, we seem to have been forced onto an unexpected and unwelcome detour.

I have a plaque in my bedroom that reads,

"The contented man is the one who enjoys the scenery along the detours."

My life experiences have found that bit of wisdom to be so true. To mope and complain wastes valuable time and energy. The new path is loaded with opportunities. We must not wait for NASA to discover them, or to take advantage of them. There are so many avenues of research that NASA has not had the money to follow, at least not in its accustomed manner and overly expensive way of approaching everything

We must all keep in mind that NASA's goals are far short of our goals. We envision

"***the creation of communities on the Moon involving large-scale industrialization and private enterprise"***

[from the top of the Moon Society home page]

NASA is not now and never has been focused on such a goal. In many ways, NASA is captive of planetary scientists interested only in answering questions, not in enabling the building of a new human frontier.

If we are to get there, we must take responsibility for seeing to it that the significant amount of research not prioritized by NASA does gets done. There are many options to whittle away at the long homework list. But we don't have a chance of making progress if our wagon remains hitched to NASA's. So let's not worry about NASA doing its job. Unless we do ours, it won't matter how well they will or won't have done theirs.

Have faith. It will all sort itself out; but only if we do ***our job***. Remember, a permanent civilian frontier on the Moon is ***our dream***. The man who does not take responsibility for his own dreams is not to be taken seriously.

Part of NASA's prior Constellation Program may be restored. That is a shame because it is still *Space Transportation 1.0* and we need badly to invent and plunge into *a Space Transportation 2.0 paradigm.* If Congress approves some level of Constellation Program restoration, that will delay us doing what we need to be doing instead. At best, NASA will give us something to hitchhike on, at an unnecessarily exorbitant price. NASA's shoulders are not those on which we need to stand.

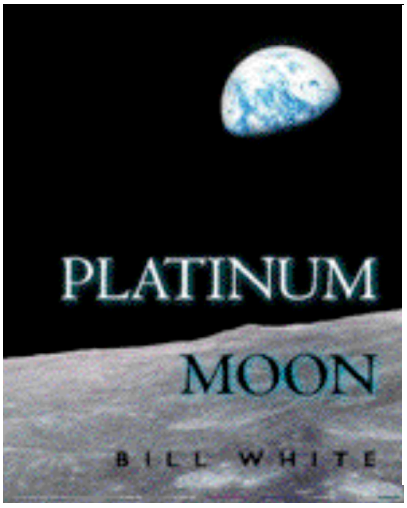
Getting to the Moon in a much more economical way is not the total answer. It is up to us to ensure that we are ready to take steps to expand in the direction of industrial settlements once a less expensive space transportation architecture is in place.

Our dreams are the greater ones. We alone are responsible for taking measures to realize them. What we are called upon to achieve is even more daring and stupendous than the boldest of NASA missions. So let's not get distracted. Let's dig in with even more fervor. **PK**

Audentes Fortuna Juvat: "fortune favors the bold"
- OpenLuna.org

To suggest that we have explored the Moon, is to suggest that Europeans had recognized the full potential of the Americas after their first have dozen landings."
– R. l. Staehle

He who hesitates is *last!*
– Mae West



Moon Society member **Bill White** comes through with first science-fiction novel that takes the recent "sea-change" in NASA's mission plans as the given situation for his story

International intrigue, adventure and suspense wrapped around a moon landing

[from www.platinum-moon.com]

"After NASA abandons plans to return to the Moon, New Hampshire native and global entrepreneur Harold Hewitt steps in to fill the void. Rejecting the notion that the exploration of space must be reserved to government, Hewitt establishes Lunar Materials LLC to prospect for lunar platinum – platinum needed for fuel cells that will help mitigate global warming. Hewitt sees himself as an old fashioned Yankee trader, touting his lunar ambitions as an altruistic endeavor undertaken in harmonious collaboration with global partners. His opponents view Hewitt as a Yankee traitor selling out his country in pursuit of profit.

"A well orchestrated media and marketing campaign culminates in unprecedented worldwide television ratings as Lt. Commander David Anders, an expatriate naval aviator, leads an international crew to the lunar surface on-board PGM-1, the world's first fully reusable lunar lander. Hewitt's ambitious plans, however, threaten powerful interests and when unexpected trouble strikes PGM-1, the entire world watches and wonders whether they will soon witness another first – the first humans to die stranded on the barren lunar surface.

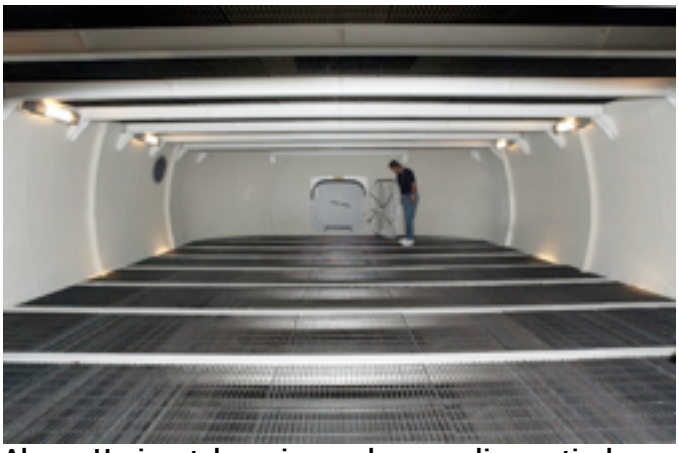
"Platinum Moon is filled with scientific and engineering detail as well as insights into the nuances of international relations, the power of the global media and America's uncertain role in the 21st century. Implications arising from the ownership of extraterrestrial resources and extensions of national sovereignty beyond Earth are also addressed, as are the internal struggles of vivid characters wrestling with conflicts between personal goals, obligations to family and duty to country. The novel also breaks new ground by portraying a privately owned EML-1 Gateway Station and a thriving sub-orbital rocket racing league centered at Spaceport America near Las Cruces, New Mexico."

Platinum Moon is available through this website as well as on Amazon.com in both paperback and Kindle editions. **Peter Kokh's review** of this novel can also be found on the Amazon.com page. You can download the first third of the novel in a variety of e-book formats without cost or obligation via Smashwords.com

Bill White lives in Downers Grove, IL, Chicago suburb. MMM congratulates him for this achievement, and for his positive vision for the future of the Lunar frontier.

The **TransHab** Project had been developing two concepts: an **inflatable envelope** & a **rigid core** carrying the bulk of the outfitting needs. Bigelow Aerospace has advanced the first, but not the second. That may prove to be a big blunder, and constrain BA sales.

Right: an illustration of the interior of a TransHab



Above: Horizontal version replaces earlier vertical one

Did the Bigelow team make a major blunder in deciding that TransHab's Rigid Inner Core was non-essential, and to develop only the Envelope?

By Peter Kokh

When I first saw sketches of the TransHab design in the late 1990's, I noticed a striking resemblance to a design in a paper we had presented at ISDC 1991 in San Antonio, and subsequently published in the conference proceedings. Our Lunar Reclamation Society 'think tank' team dubbed Copernicus Construction Company, had presented the concept of a "Big Dumb Volume" lunar outpost structure which would be habitable only when an "amphibious" lunar lander Crew Cabin/surface coach, the "frog", was docked to it, sharing its life-support and power systems. "**The Lunar Hostel: An Alternate Concept for First Beachhead and Secondary Outposts**"

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

The essence of our suggestion was that an inflatable envelope would be launched in an uninflated state around a rigid axial core that included an ***outfitting package that would expand as the envelope was inflated to provide a structured interior, complete with basic utility systems.***

As NASA was very present at that ISDC, It was natural to winder if our paper had been an influence on the TransHab designers. We also wondered how much an influence Lowell Wood's earlier concepts for inflatable space modules. These questions were settled in a Space Review Interview with TransHab developer William Schneider, conducted by Dan Schrimpsher, 08.21.2006.

http://www.thespacereview.com/article/686/1

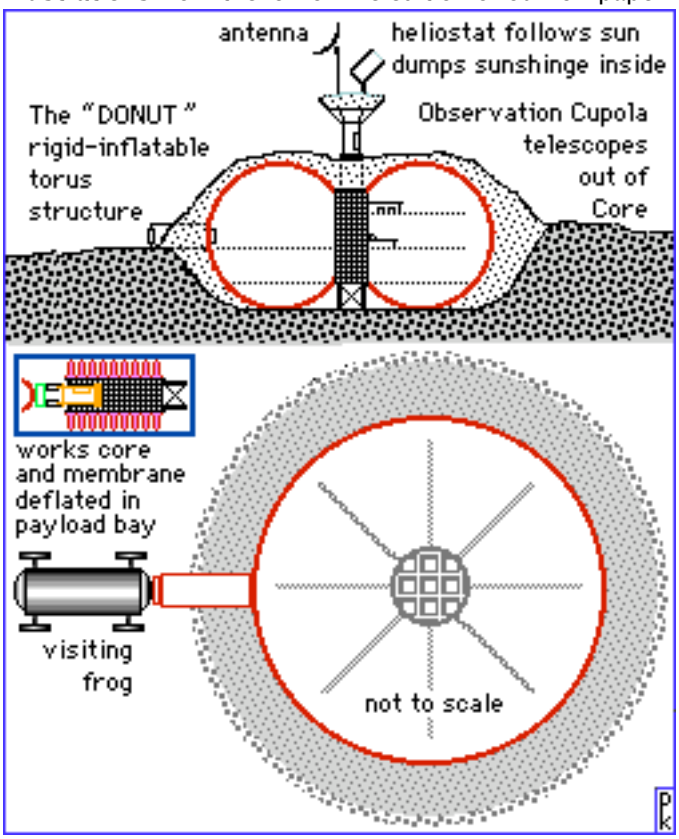
Excerpts from William Schneider's replies:

WS: "I am not familiar with the paper by Lowell Wood that you reference so it did not influence the design."

WS: "The original purpose of the TransHab design was for a Mars mission. The habitat for the Mars mission was required to be 600 cubic meters. For an aluminum shell structure—the type that had been conceived—to be that large while being launched (enduring high launch acceleration loads plus high launch vibrations) required a thick wall and heavy wall stiffening. Because of the large surface area the entire habitat became prohibitively heavy. An inflatable, however, could be launched in the collapsed configuration, *strapped tightly around a central core so that it could easily withstand the harsh launch environment;* once in orbit, where the acceleration and vibration loads are zero, it would be inflated to the required volume."

So this was yet another example of solutions so elegantly logical that they must inevitably occur to more than one person. History is full of such instances were an idea was conceived or invented independently by more than one person. We were content to be one of those.

Illustrations from the '92 online edition of our '91 paper



Note the illustration left center of the unit deflated in a Space Shuttle payload bay. Note also the observation and EVA dock tower that also rides in the rigid center core.

The "donut" torus interior structure pops out of the walls of a "works-packed" rigid cylindrical structure in the donut "hole". It was this TransHab prefiguring

hybrid-rigid-inflatable architecture that seemed to us to be the most promising way to get the most out of the shape/weight constraints of the Shuttle payload bay – or of an External Tank Aft Cargo Carrier etc.

The "donut" could be loaded with pull-out built-in features: top-mount central solar, visual, and EVA access, side-wall vehicle docking port, decking parts brought up in the core module's "basement', and a peripheral jogging track. The inner surface of the outer sidewall could be pre-painted or printed with a 360° panoramic mural medley of Earthscapes and Moonscapes.

Two extra coupling ports in the outer wall at 120° angles we would make possible clusters of individual donut units on a hexagonal grid for open-ended "organic molecular" expansion potential.

Small conventional instrument-packed canister modules brought up from Earth and coupled at unused ports would allow endless upgrades. [**Note:** Dave Dunlop had since rechristened our "donut" as the "Moonbagel"]

The "donut" was one of several "hybrid-rigid-inflatable" options illustrated in our 1991 paper.

Has Bigelow Aerospace made a potentially "Business Plan Crippling" mistake in scuttling this once "integral" part of the TransHab architecture? *We think so.* But we also think that *it is a mistake from which recovery is possible.*

Why it was a mistake

Bigelow Aerospace BA 330 units are currently advertised at $100M delivered to orbit. But the problem is that unless you want to use them as a free fall "gym," they are unstructured and definitely *not ready for use.* The question of "how much it will cost to structure the interior for use *after launch* (instead of before) is not addressed.

While Bigelow's Business Plan has had a very substantial boost form its recent partnership agreements with heavyweight Boeing, which will provide its Atlas 5 for launching BA 330s into orbit, and also provide a crew capsule for visiting them, the outfitting for usability question remains both unmentioned and unaddressed.

Now recovery from this potentially business-plan-torpedoing mistake is possible, and provides **a business opportunity for a third partner.** The new company would purchase a BA 330 airlock and design "slip thru" compact outfitting packages that once inside, would structure the interior.

This will be easier if the customer can settle for a vertical design as in the TransHab cutaway concept at the top of this article. But with enough ingenuity, horizontal outfitting packages are possible – for these, Bigelow's oversight is moot, as it does not seem *"as feasible"* to prepack a horizontal outfitting package in an uninflated BA 330 prior to launch. But most often, "where there is a will, there's a way."

Why attention to this oversight is urgent

We most definitely do want Bigelow Aerospace to succeed. Our criticism is meant to positively constructive, and to encourage formation of a third commercial partner company. At stake most urgently, are Bigelow's orbital opportunities, as potential additions to ISS and as, in clustered complexes, new space stations and tourist complexes, some of them in equatorial orbits. Then at last we can get read of *the stupid "The"* in "The ISS".

For Lunar applications, another *thick* bone to pick

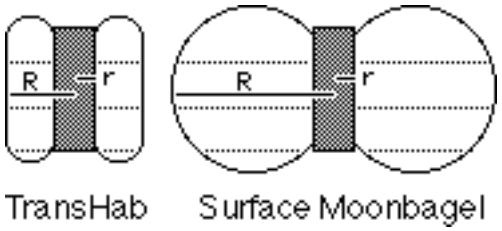
The BA 330 module is depicted in this Bigelow Aerospace tabletop model of a future lunar outpost concept

There are two things wrong with this picture:

1) It shows the modules "on" the surface, giving *the misleading impression that the one foot thick inflatable envelope,* designed to be puncture resistant to micro-meteorites and micro-space-debris, *is also sufficient protection against cosmic rays and solar flare radiation.* That would be very convenient, but it is an assumption that seems unreasonable on the face of it.

2) *If instead of an on-the-surface deployment,* we dig a trench, set the module in it, then cover it with 2 meters of moondust shielding, we would have enough radiation protection for personnel staying six months or so (but not a lifetime.) But then the one-foot thickness of the envelope becomes unnecessary. The envelope for a unit, meant to be covered with moondust, *need only be thick enough to contain the desired air pressure* (which for purposes discussed many times in other articles, we believe should be set at 0.5 ATM, all the reduction coming from Nitrogen, not Oxygen.)

3) Now *if Bigelow produces a separate thinner-walled unit for lunar deployment, the compacted for shipment weight and volume of the unit would be much less.* That saving can be spent in a much larger envelope! Consider the illustration below:



Left: thick wall unit

Right: thin wall unit shipped in same weight and volume

A deployed larger thin wall unit would occupy the same shipping space with the same weight. Now granted, the vertical design shown will be less easy to shield than the horizontal version, but it definitely can be done.

At least 2 Commercial Business Opportunities

The upshot then is that we need a new startup company to produce **"slip-in" outfitting packages** for Bigelow units to be deployed in orbit; playing "Roebuck" to Bigelow's "Sears." And a new company to design thin_wall Moon-bound inflatables pre-outfitted with interior structuring packages. *Calling all entrepreneurs!*

Research and Development Projects For an International Lunar Research Park

By Dave Dietzler, Moon Society St. Louis
With contributions from others

Introduction

The Industrialization of the Moon and Earth orbital space offers these R&D opportunities:

- Helium-3 fusion fuel
- Lunar power beaming systems
- Solar power satellites
- Trans-continental and trans-oceanic power relay satellites
- Large high-powered GEO telecommunications platforms
- Space-based defense systems
- Asteroid deflection systems
- Development of Mars exploration and settlement technologies
- Materials and propellant for ships to Mars and elsewhere in the Solar System
- Materials for orbital factories and settlements
- Scientific research including astronomy, planetary science and SETI
- Development of robotics and spacesuit technologies
- Tourism and sport
- Media production opportunities (space-based reality/documentary television)
- Advances in Mining, manufacturing and ISRU
- Advances in robotics/telerobotics for space and terrestrial applications
- Advances in compact/miniature industrial automation
- Advances in large-scale distributed systems automation
- Advances in nanotechnology
- Advances in artificial intelligence
- Advances in renewable energy technology
- Advances in fiber and wireless telecommunications technology
- Advances in microprocessor solid-state data storage technology
- Advances in modular building technology for space and terrestrial applications
- Advances in hydroponics, mariculture, microbe, insect and small animal farming
- New on-orbit manufactured products based on space environment processing
- Employment/economic stimulus through orbital industrial development
- New in-space remote data vault facilities

Investment

Investors are key to the success of space Industrialization. Private stockholders, banks and governments will not put up their money for space industrialization projects without solid proof of their viability. Theoretical or experimental devices shown to work on Earth, even in simulation chambers, are not going to attract the financing that machines tested and proved out in the real world of the lunar and orbital environment will.

We propose the creation of an International Lunar Research Park to test the limits of man and technology on the Moon and in outer space. Not only do we seek scientific and engineering data, we seek to determine the cost effectiveness of various technologies in the real world.

Governance

Any single government or corporation would not own the ILRP. An international body similar to a "port authority" would control an ILRP.

- Various entities would own or rent facilities combined with common facilities like life support, command centers, a landing/launching pad, power supplies, etc.
- The core of the base that supplies these basics – Life Support Systems (LSS), power, command, etc. would be owned and operated by the base authority that charges fees for services.
- Private contractors--governments, corporations, universities and perhaps even hotels would plug their laboratory, shop and habitat modules into the core structure.

This plan will reduce the up-front costs to the contractors who rent or own modules where they do their work. Wheeled vehicles and sub-orbital rockets would also be available to contractors by lease or rental plans, for exploration and prospecting on the Moon.

Research

At the ILRP research will be done to investigate whether mining and manufacturing on the Moon to make products for lunar and orbital industry rather than rocketing everything from Earth has more benefits than drawbacks, especially when finances are concerned. The technologies that are most cost effective will be determined before massive investment in large-scale space industry occurs. Research will also determine what the best kinds of lunar resources are, the cost effectiveness of their acquisition and their location.

Locations

There are several options with distinct advantages for different sets of research directions. Various goups of collaborating contributors might establish ILRPs at select locations. Any "The" in "ILRP' will hopefully be temporary

Areas of Investigation – Science

--Astronomy—telescopes could be built on Earth and rocketed to the Moon where they will have no atmospheric distortion to deal with. Eventually, huge telescopes would be built on the Moon from on site materials and these could be used to hunt for potential asteroid impactors and Earth-like planets orbiting other stars.

--Lunar geology/prospecting—ground truth probes into ice containing polar craters, deep bedrock core sampling, crater central peak sampling, seismic studies and drilling near volcanic domes to search for pockets of volcanic gas, lava tube exploration, investigation of magnetic anomalies like Gamma Reiner, Mare Marginus and Mare Ingenii

--Bio-medical—one of the chief areas of study will be the effect of low gravity on humans, animals and plants. Methods of coping with muscular and bone atrophy like sports, exercise, special diets, and medications must be studied.

[Editor's comment: The above is but a general report. To date, ILRP brainstorming has gone into depth on several topics. You can follow on this google group website; http://groups.google.com/group/international-lunar-research-park (requires google username, password) ###

The Challenges of Dr. Abdul Kalam to The National Space Society & the World

By David Dunlop

Dr. Abdul Kalam, former President of India, addressed attendees at the 2010 International Space Development Conference in Chicago on May 30, 2010 via a teleconference hookup from India.

An Honor for NSS

Space Based Solar Power has been proposed for a long time, since the first advocacy of Solar Power Satellites by Dr. Peter Glaser in the late 1960s. It has undergone several significant technical and economic appraisals during this period. (1) But a new threshold for the National Space Society and SBSP was crossed in May 2010 at the International Space Development Conference in Chicago when Dr. APJ Kalam, former President of India on the topic "Harvesting Energy From Space", addressed the ISDC audience. (2)

This to my knowledge was the first time a former head of state of a major country had addressed the ISDC. Dr. Kalam discussed space solar power in the context of India's energy needs through the year 2052, not only as the former head of state in India but also as one of India's foremost rocket scientists. He called NSS "an enlightened audience for this address."

A Global Space Vision

Dr. Kalam did not stop with India's needs. In his ISDC address, He called for a World Space Vision and for action by Integrated Global Leadership through a Global Energy Technology Initiative for Harvesting Energy from Space. The Global Space Vision includes:

1. Large Scale Societal missions (including Space Solar Power Mission) required for and enabled by low cost access to space.
2. Evolution of a Comprehensive space security doctrine, policy, and program.
3. Expansion of Space exploration and current application missions.

The World Space Vision 2050 would enhance the quality of human life, inspire the spirit of space exploration, expand the horizons of knowledge, and ensure space security for all nations of the world."

A Challenge to NSS: Kalam stated,

1. "The organizers of the ISDC may address to the leaders of the G-20 a comprehensive paper on all aspects of space solar power and to request the participation of experts for a cooperative International Preliminary Feasibility Study project that would benefit all nations. "
2. "Meanwhile, an Interim Working Group could be set up to suggest the structure and content of the Preliminary Feasibility Study, and that should lead on seamlessly to the creation of an international steering committee and two or three International Study Teams of world experts."
3. "These Study Teams may cover among other aspects of space transportation and cost of access to space, efficiency of energy conversion, power transmission from space, possible collaborative mechanisms, experiments from nations and possible organizational mechanisms with potential sources of funding."

He made the observation that, "the present capabilities of **major space faring nations***** (my emphasis) are not optimally utilized and called for a 'certain paradigm shift' in international collaboration to bring the benefits of space to humanity as a whole." The launch vehicles, spacecraft, potential applications, space scientific research potential, and huge financial challenges call for a coordinated international approach. Dr. Kalam said his experience suggested this could be successful if each nation made substantial contributions in technology and resources.

> "We are witnessing such phenomenon in other areas also. The countries of the world had come together to find solutions for the global economic turbulence. Issues like energy and water are in the realm of international community. *Then is it not an opportunity for the space community of the world, which has played a key role to bring the world together, to think ahead and create a 'World Space Vision' and work out 'mechanisms' for taking up missions?"(Italics mine)*
>
> "Hence, it is a great challenge and opportunity for the world of nations, **particularly space faring nations** (my emphasis) to create imaginative mission mechanism(s) to take up global R&D program(s) and implementation so that the twenty first century can blossom to create SSP and its enabling technologies. I wish the Special Symposium a very special success."

A Potential National Space Society Response

I am proud as an NSS member, to belong to an organization not only recognized for its enlightenment by someone of the stature of Dr. Kalam but an organization also given a special charge to address a comprehensive paper to bring Dr. Kalam's World Space Vision Challenge to the forum of the G-20 nations. Our advocacy of Space Solar Power has been noticed by President Kalam who also specifically complimented our NSS Space Solar Power library on our website. The NSS collaboration with other organizational advocates of Space Solar Power has clearly paid off and been effective as an open advocacy effort.

The NSS has therefore received an historic charge and responsibility unique in our experience. NSS has experience in the US with annual advocacy efforts with the US Congress, but we have never before approached the forum of the G-20 nations or even the narrower group of all the space faring nations.

NSS membership however, is diverse as well as international. The President and Chairman of the NSS Board, of Directors is Mr. Kirby Ikin from Australia where there are several NSS chapters. Paul Swift of our affiliate organization, the Canadian Space Society, hosted the 1994 ISDC in Toronto. And one of the highlights of ISDC 2010 in Chicago was the Space Canada sponsorship of the dinner hosted by renowned Canadian broadcaster Bob McDonald with Space Canada's new film on Space Solar Power.

NSS chapters are found in seven other G-20 member nations such as Brazil, France, Germany, India, Mexico, and the Netherlands as well the US. We can therefore claim an international advocacy within our own membership, chapters, and affiliates. The NSS vision of space development is one inclusive of the interests of the whole world and our advocacy is consistent with the

embrace of a World Space Vision and Global Energy & Space Solar Power Technology Initiative suggested.

Perhaps what I like best about Dr. Kalam's proposal is that while it is couched in terms of space technology, lowering the cost of space access, space energy supply, and yes, space exploration, its focus and strength of impact is clearly centered on our most important planet, the Earth. How could NSS advocacy be any more mainstream?

Geopolitical and Geocommercial Aspects

I find it interesting that Dr. Kalam focuses on two international groupings: First he discusses the opportunity for a paradigm shift and collaborative improvement of the major space faring powers, those nations with the national technology means. Then he proposes a Global Vision brought to the G-20, the most important economic members of the global economy, which also collectively represent 90% of the global economy, 80% of the global trade, and 66% of the global population. To this larger economic forum he would assign the development of 'mechanisms' for implementation that speak to both the economic and political process. The close ties of NSS to the Space Solar Power research community and to the Space Investment Summit are potential assets in the development of a comprehensive paper for the G-20.

Space Security

Dr, Kalam called for the evolution of a comprehensive space security doctrine, policy and program. This is very important arena, which implies a more active stance with regard to the topics of space security doctrine. Space security is a term which covers the national activities involving the national defense capabilities of every country as well as the safety and reliability of space assets and capabilities.

I think in the first instance space security involves principles comparable to the "freedom of the seas doctrine" in which all nations pledge to support the right of free access to space for all of the international community. This would also imply that international assets would be used in support of such right of access as well as assistance for assets in distress. It would also be important to constrain the waste of resources that could result from a militarization of space.

It must also address the poor international record with regard to the generation of space debris and the need to remediate both the threats posed by this growing problem and to develop proactive practices to prevent the growth of space debris. The "pollution of the commons" is what is at stake and the risks must be balanced and monetized in terms of insurance and remediation costs that are reflected in the price of market driven services. Space security is necessary for increased geocommercial space investments.

New Space Mission Applications & Global Growth

Space communications resources are part of vital infrastructure affecting the economies of every nation. Therefore the expansion of the growth of the space economy is threatened by the failure to come to grips with space debris. Proposals for increased development of space stations and human presence in LEO and cis-lunar space, for larger more capable GEO platforms, and for solar power satellites must address investment requirements, risk management, and the development of active measures to mitigate the risks of space debris.

The current $150 Billion annual global space economy is only a slight fraction of what could be orders of magnitude greater space-based economic activity in the next four decades. These additional space mission applications are the third element of his challenge and the call for study panels on: communications growth, Earth observation activities, space tourism, space manufacturing, and space solar power, and expanded space exploration. These study panels will underscore the economic and growth potential to create a truly Earth-Moon econosphere in cislunar space which will expand activities in LEO, GEO, Earth-Moon Lagrange Point 1, and on the lunar surface. Lunar in situ resources can be brought to bear on production of space solar power facilities and even space computation facilities.

Creating Mechanisms for Action

Dr. Kalam further calls for the appointment of an Interim Working Group and study panels. *International coordination could be facilitated by the formation of a* ***Space Solar Power Working Group*** *on the order of those such as ILEWG (International Lunar Exploration Working Group) and MEPWG Mars Exploration Group working programs.*

Members of such an Interim Working group might include some of the many international contributors to the Space Solar Power symposia and the International Academy of Astronautic study on space solar power represented from Canada, Europe, India, Japan, and the US and broadened to include both Russian and Chinese participation. The International Academy of Astronautics study group on space solar power, with the leadership of Drs. John Mankins and Nobuyuki Kaya of Kobe University has been working the past two and a half years to complete the first international study of space solar power. The first preliminary report should be completed by the end of this year with full publication expected in the Spring of 2011. This study should provide a timely foundation for expanded collaborative international research and additional recommendations originating from an Interim Working Group.

NSS, consistent with its free market values, would expect an Interim Working Group to develop into a more well-resourced Space Solar Power Working Group with formal participation and support from:

- COSPAR: Committee On SPace Research
- CCSDS: Consultative Committee for Space Data Systems
- National Space Agencies of major space faring countries
- The Commercial Aerospace sector
- The Commercial Power Industry
  (Electric Power /Research Institute would be a logical participant in the US)
- Representation of the Global Investment Sectors
  The World Bank.
  The Space Investment Summit group
  Regional Development Banks
- NSS: The National Space Society
- TMS: The Moon Society
- Other Space Solar Power Advocacy organizations

www.moonsociety.org/reports/space_solar_alliance.html

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Humans are 'teletropic' - drawn to far-off places, to the frontier, and to forever beyond

The Moon Society www.moonsociety.org

An international nonprofit 501(c)3 educational and scientific organization formed to further the creation of communities on the Moon involving large scale industrialization and private enterprise

Objectives of the Moon Society

Include, but are not limited to:

- Creation of a spacefaring civilization which will establish communities on the Moon
- Promotion of large-scale industrialization and private enterprise on the Moon
- Promotion of interest in the exploration, research, development, and habitation of the Moon, through the media of conferences, the press, library and museum exhibits, and other literary and educational means
- Support, by funding or otherwise, of scholarships, libraries, museums and other means of encouraging the study of the Moon and related technologies
- Stimulation of the advancement and development of applications of space and related technologies and encouragement their entrepreneurial development
- Bringing together persons from government, industry, educational institutions, the press, and other walks of life for the exchange of information about the Moon
- Promoting collaboration between various societies and groups interested in developing & utilizing the Moon.
- Informing the public on matters related to the Moon
- Provision of suitable recognition and honor to individuals and organizations which 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 Who We Are

We envision a future in which the free enterprise human economy has expanded to include settlements on the Moon and elsewhere, contributing products and services that will foster a better life for all humanity on Earth and beyond, inspiring our youth, and fostering hope in an open-ended positive future for humankind.

Moon Society Mission

Our Mission is to inspire and involve people everywhere, and from all walks of life, in the effort to create an expanded Earth-Moon economy that will contribute solutions to the major problems that continue to challenge our home world.

Moon Society Strategy

We seek to address these goals through education, outreach to young people and to people in general, contests & competitions, workshops, ground level research and technology experiments, private entrepreneurial ventures, moonbase simulation exercises, tourist centers, and other legitimate means.

Our Full Moon Logo above:

The Moon in its natural beauty, empty and deceptively barren, waiting for human settlers to shelter and to mother as their adopted second human home world. We have work to do!

Masthead Design: Charles F. Radley, Society Vice-president\

Monthly Moon Society Progress Reports: visit our Homepage http://www.moonsociety.org and scroll down the center of the page to the prominent yellow **Frontlines** link. This report has been issued monthly since April 2008.

Our 3rd Annual Membership Meeting

August 11, 2010 in the ASI-MOO chat room environment

Our 3rd Annual Report to Members

A message from Moon Society President, Peter Kokh

Our apologies for not having given a heads-up on this meeting in the June issue of MMM #236. However, notice has been sent to all current members for whom we have current email addresses. Those of you without email addresses are most likely without an Internet connection to attend the meeting anyway.

For the benefit of those unable to attend, our 3rd Annual Report to Members is posted at:

http://www.moonsociety.org/members/reports/annual_report2010.html

You will need your Moon Society member login (username and password) to access this file.

Renew 3 Years for the Price of 2 + CD

The CD is the Moon Miners' Manifesto 20th Anniversary CD published by NSS to insert in the registration packets for all those attending last year's (2009) International Space Development Conference in Orlando. At this year's ISDC, NSS gave us the surplus on the order of 1,000, as a courtesy.

We finally received the needed mailing jackets, and should soon get caught up with mailing these out to all those renewing for 3 years and to all life members.

2 Reasons to Visit Our Homepage *Often!*

1) To **check the latest Space News** online articles.
2) The **Changing "Featured Image"** just above the Moon Society Announcements Section – See page 11

Other Website Additions & Improvements

We've been introducing some "vector quick link pages"

Interested in Mars?
http://www.moonsociety.org/mars/

Interested in Asteroids
http://www.moonsociety.org/asteroids/

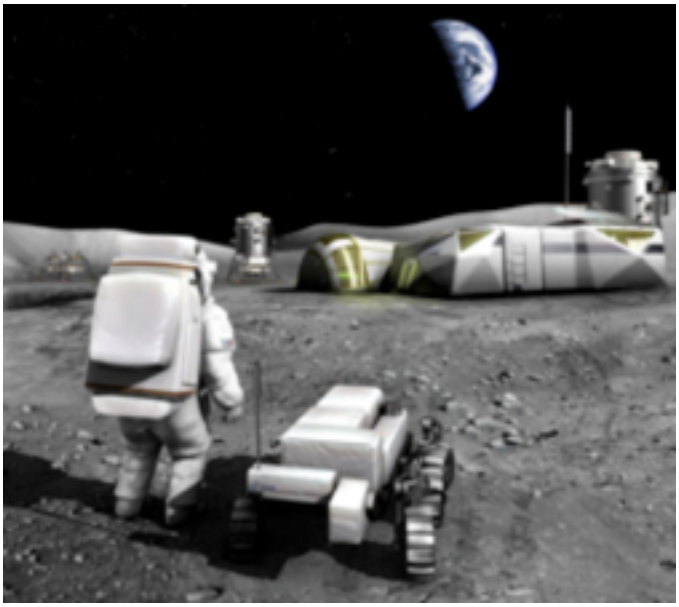
Interested in Research?
http://www.moonsociety.org/research/

Want to tour the Moon someday?
http://www.moonsociety.org/tourism/

Want to look at Moon-related art?
http://www.moonsociety.org/art/

Interested in Moon sFlags?
http://www.moonsociety.org/flag/

Do we have a sense of humor?
http://www.moonsociety.org/humor/ – u.c.



NEW SPACE BOOK ANNOUNCEMENT: LUNAR PIONEERS

Infinity Publishing has announced the release of a new space book, Lunar Pioneers, a sequel to Launch Out, by the same author, Philip Robert Harris, Ph.D. (www.buybooksontheweb.com, 2010, $18.95). This is a science-based novel about living, working, and settling the Moon in the year 2050. Dr. Harris has written this 50th published book from his research as a NASA consultant and Faculty Fellow, as well as for his professional text, Space Enterprise – Living and Working Off-world in the 21st Century (www.springer.com 2009). The present volume also includes three professional articles – a Foreword by Prof. Madhu Thangavelu, co-author of The Moon: Resource, Future Development, and Settlement; a Prologue by Dr, David Schrunk, technical advisor for Lunar Pioneers as well as a co-author of that same book; and a Prologue by the author from his perspective as a management/space psychologist.

The 357-page book is about lunar exploration, industrialization, and settlement in this century. Twelve, well illustrated, chapters center on these themes: activities in the first city of LUNA WORLD called, Selenopolis; surviving, performing and prospering off-world; challenges in constructing lunar infrastructure and civilization; creating lunar transportation and utility systems; high frontier science and astronomy; expanding solar energy and power; discovering new knowledge for lunar applications; experiences of contractors and technauts on the Moon; coping with lunar challenges and problems; planning for exploration of Mars and beyond from the Moon; developing galactic consciousness and strategies. The saga is a tribute to the vision of aerospace engineer, Krafft Ehricke and its first lunar industrial park is named in his honor.

A longtime member of the National Space Society and the Moon Society, Harris is an associate Fellow of the American Institute of Aeronautics and Astronautics, and has receive several journalistic awards for excellence from the Aviation/Space Writers Association. Phil Harris has donated his copyright for Lunar Pioneers to The Moon Society and devotes his last two pages to their services. Further information is available from:

www.drphilipharris.com or www.infinitypublishing.com

NASA Introduces Moonbase Alpha Game

Report by Jason Tuttle, Moon Society Vice-President

Moonbase Alpha is a NASA funded game that offers a glimpse of what life might look like as a member of a life support team on a hypothetical lunar outpost on the South Pole of the Moon. Players are faced with numerous obstacles and challenges that can be played out solo or through multiplayer co-operation over the internet. The game offers a unique perspective of the terrestrial environment by utilizing a 3D immersive game engine that attempts to entertain, educate, and invite players to further explore the Moon while increasing public interest in NASA and further reinforcing the NASA e-Education agenda.

The game starts as a meteorite impact damages critical life support systems. It is your job to restore these critical life support systems before running out of time. Players have a variety of tools at their disposal to restore the life support systems, including: remotely controlled robots, drivable rovers, and various repair tools.

Moonbase Alpha is just one component of a multitude of e-Education agendas aimed at inspiring and reaching out to the public at large. The multiplayer environment facilitates learning through team building exercises and promotes competition by saving your scores on the leader boards. This new approach, utilizing MMO style interactive 3D worlds, will give NASA additional opportunities to reach talented minds and those with an interest in space related research.

The highly interactive environment allows you to play the game as it was intended or explore the environment around you. Part of the fun is being able to experience how the gravity of the Moon affects how high you can jump and how well you can move about in this altered environment. According to NASA (n.d.), "This is a proof of concept to show NASA content – lunar architecture in this case – and a cutting edge game engine could be combined to produce a fun game and inspire interest in STEM education" [Science, Technology, Engineering & Mathematics].

NASA has always been at the forefront when it comes to anything related to space. It is exciting to see them continuing to develop additional resources for those of us with an interest in reaching the stars and beyond through the use of freely downloadable, interactive, and educational software titles. Be on the lookout for the next planned MMO [Massive Multiplayer Online] release, titled: Astronaut: Moon, Mars and Beyond!

NASA Moonbase Alpha Game Site
http://www.nasa.gov/offices/education/programs/national/ltp/games/moonbasealpha/index.html

Moonbase Alpha Game Trailer on YouTube
http://www.youtube.com/watch?v=jI8_9eN-2Uo&feature=player_embedded#!

Our Homepage "Changing Image" Feature Undergoes a Major Upgrade

By Peter Kokh

This feature was added to our website over five years ago, and at first the Changing Image Library had less than 2 dozen images. It has been an action item of mine to keep adding images. Click on the small image and get a larger one. As of publication time, the library has grown to 134 images, and what you get by clicking on the "teaser" image is sometimes a larger "developed" image along with an explanation about the concept in question.

Recently, it occurred to me that this was a wasted opportunity to introduce members and visitors to the vast amount of free (no login required) material that has been published over the yeas. Now, 80% of those 134 images, not only call up a larger picture with message, but if you click on the larger one, you get a document that contains an article about the concept. (The image gives the page #s in that document, so pay attention to that.

Scotty Gammenthaler has handled revision of the script I use to post new images, to allow for this second link tier, along with an Image Library browsing option.

Every time you call up our homepage afresh, you will get a new featured image, picked randomly by the software. So, considering the wealth of ideas and infor-maiton about them that you will gain by getting into the habit of clicking on images that you haven't clicked on previously (or not since the revision upgrade early this month (August 2010) visiting the home page often, even daily, not only gives you links to the day's space news (in the white center panel in the lower part of the homepage) but also helps you explore the very wide range of topics and ideas covered in Moon Miners' Manifesto over the past (already) 24 years. Tapped for this purpose are the following free access publications: MMM Classics (which has now republished all the non-time sensitive articles from years 1-20), MMM Themes issues (which collects these same articles in volumes according to themes)' MMM-India Quarterly, and online MMM Papers.

This is important especially to our newer members and visitors. We cannot possibly write about all topics relevant to the Moon Society Vision and Mission in the ten regular MMM issues each year. But believe me, if it's relevant, we've written about it. We make all this material available to new members and visitors precisely to allow them to "get up to speed." So do explore these login-free publications.

You can go to these publications directly (you will find the links on www.moonsociety.org/publications/) or via these Changing Featured Images. But there is one more way to explore the breadth of concepts and ideas in past issues, and that is to visit **the MMM Glossary** of "MMM-speak" – old words given new meanings in MMM, and new words coined when no existing word could be stretched to cover the concept in question. There are currently over 300 entries, some of them illustrated, in the Glossary. There is a link to the Glossary on the publications page (link above.) So there are two fun ways to explore all this material, in addition to just reading all the files one after the other. We want to make your exploration a fun adventure! **PK**

An Engineering Design Competition for a "Lavatube Skylight Explorer" Probe

By Peter Kokh

Now that we have found at least half a dozen lavatube "skylights" on both Moon and Mars, with the real prospect of finding more, the question thrusts itself upon us: how are we going to explore what lies below? Both worlds have areas of extensive lava flows (the lunar maria and on Mars, in the flanks of the several very large shield volcanoes) that give the lie to the popular impression about both Moon and Mars as "barren rubble pile land-scapes." If we do not want public and even enthusiast support to lag, we have to demonstrate the reality of these "Hidden Valleys" that offer pre-shielded volumes of enormous extent. Lavatubes offer ideal environments for industrial parks, warehousing, acre-hungry agriculture, archiving, and even settlements.

We have sent the following proposal to a new "project-focused" Mars organization, ExploreMars.org.

To Artemis Westinberg[1] (Pres); Chris Carberry[2] (ExecDir)

Below is one specific project proposal we would be happy to pursue in collaboration with ExploreMars.org This is a takeoff on NASA's new AXEL rover concept. http://www-robotics.jpl.nasa.gov/systems/system.cfm?System=16 This ingenious rover is designed to winch itself down (and back up) a steep crater wall on Mars.

Might we undertake a new **Engineering Design Competition** to take this one step further? A rover that could land on the rim of one of the lavatube skylights found on Mars' shield volcanoes, and/or one of those recently found on the Moon by Kaguya, and Lunar Reconnaissance Orbiter, and winch itself down the considerable distance (~ a hundred meters or more) to the tube floor?

If the cable could carry data, and the lowered probe was equipped with radar that could scan and map what it saw at intervals on the way down, data could be transmitted to Earth from a transmitter attached to the cable anchor on the skylight rim, in the event that something prevented the probe from successfully winching itself back to the surface.

It would be quite a challenging task to engineer such a probe, and its cable, keeping both as light weight as possible, finding a way to keep the probe from twisting out of control at the end of the cable, etc. New woven nanotube cables might be light enough (less than Δnkmlthe weight of AXEL's much shorter cable). The cable could also transmit power so that the weight of an RTG for example need not be added to the descending probe. As we all know, the lighter the weight, the lower the mission cost.

Many people see both the Moon and Mars as discouraging and forbidding rubble piles. Even such limited initial exploration of the extensive "Hidden Valleys" of these two worlds would work to transform public interest and impressions.

Respectfully, *Peter Kokh*, President, The Moon Society

[1] Artemis and I served together on MDRS Crew #34 in March 2005

[2] I met Chris at ISDC 2008 in Washington DC

The Moon Society Chapters & Outposts Frontier Report

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

Moon Society St. Louis Chapter

http://www.moonsociety.org/chapters/stlouis/
Contact: Keith Wetzel <kawetzel@swbell.net>
Next meetings – August 18th, September 16th
Meetings **3rd Wed** monthly at Buder Branch Library
4401 S. Hampton, in the basement conference room

Moon Society Phoenix Chapter

http://www.msphx.org
http://www.moonsocphx.blogspot.com/
Contacts: Craig Porter portercd@msn.com
Chuck Lesher: chuckmiester999@yahoo.com
Meeting the **3rd Saturday of the month**
Moon Society Phoenix' next meetings are on
Saturdays **August 21st, Sept 18th, Oct 16th**

Our july 17th meeting was held on time at Denny's.
We had fve members present.

Item one, CopperCon30 Panels:

Don Jacques has two panels and will have them on the Phoenix websiteafter the convention is over. Chuck Lesher has one panel and his presentation will also be on the web- site after the convention is over. Craig Porter has three panels, one of his panels will be on the website after the convention is over the other two panels are audience participation. Each panel placed on the website will be under "Tranquility Community College" or an appropriate name and will be available for members use in their own presentations, the only thing that we ask is that credit be given where due.

Item Two, Telepresence racing:

The details are still being worked on to sponsor the races at the Challenger Center in Peoria, AZ this fall. We are planning several different types of races, basic Telepresence Racing, Advanced Telepresence racing, and the Moon Challenge Race. We are still working on the exact parameters of each race although the basic is just that, basic, Advanced will be more difficult and the Moon Challenge will have several extra requirement to it. Those requirements may include "time lag transmissions", remote materials handling, relay legs, and other possi- bilities. Also discussed were the possibility of taping the video from the cars and web casting the action. Further discussions included whether to record the races to DVD for sale to the participants.

The Challenger Center is also talking about sponsorships for the racing to help pay for the events and equipment if they furnish the hardware. Don and I have an appoint- ment with Greg Stiles, the Director of Marketing, on the sixth of August to discuss the options that are available. Some of the options include:

1) Celebrity Sponsoring,
2) have students at the Challenger Center build the hazards on the race course,
3) timed racing and 4) head to head racing.

We decided to sponsor four cars ourselves. We need to have cars that have different frequencies for head to head racing. Possibilities also exist for running the telepresence races at other places in the valley.

New business:

Visiting the local Rocket Launches: We will be contacting the local Rocket Club to get permission to attend a Rocket launching event some time this fall.

The members present agreed to reimburse Ben for the cost of the Domain Names he had reserved for us and we would take over the responsibility for paying for the ones we are keeping active and dropping the others.

– Minutes by Craig Porter

Moon Society Houston Chapter

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

The Houston Chapter's next **regular meetings (every odd # month)** are scheduled for **Mondays September 20th** and **November 15th** at Coffee Oasis in Seabrook, 4550 NASA Parkway at Kirby.

Once again, this will be a joint meeting open to members of the NSS and the Mars society. I do hope to see you there! Whatever your desired level of participation, though, I encourage you to come to the meeting. See you there! -------- Eric H. Bowen

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

===== Moon Society Outposts =====

www.moonsociety.org/chapters/chapter_outpost_map.html

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

Bay Area Moon Society, CA **Outpost** – South Frisco Bay
http://www.moonsociety.org/chapters/bams/
Contact: Henry Cates hcate2@pacbell.net
Informal meeting at Henry Cate's home in San Jose
The 4th Thursday every month

Moon Society Longview, TX **Outpost**
Contact: James A. Rogers jarogers2001@aim.com

Moon Society DC Metro, DC-MD-VA **Outpost**
Contact: Fred Hills Fredhills7@aol.com

Moon Society Milwaukee Outpost –
Meeting jointly with the Lunar Reclamation Society (NSS- Milwaukee), Publishers of Moon Miners' Manifesto
Contact: Peter Kokh kokhmmm@aol.com

Moon Society DUES with ***Moon Miners' Manifesto***
Electronic MMM (pdf) **$35** Students/Seniors: **$20**
Hardcopy MMM: U.S/Canada **$35** Elsewhere: **$60**
Join/Renew Online - www.MoonSociety.org/register/

Moon Society Mail Box Destinations:

Checks, Money Orders, Membership Questions
Moon Society Membership Services:
PO Box 940825, Plano, TX 75094-0825, USA

Projects, Chapters, Volunteers, and Information
Moon Society Program Services,
PO Box 080395, Milwaukee, WI 53208

< End Moon Society Journal Section >

GREAT BROWSING

Golf the moons of Saturn?
http://www.ciclops.org/sector6/golf.php

Kepler Space Telescope finds 306 new exo-planets
http://arxiv.org/abs/1006.2799

How Human Mars Exploration can help on Earth
http://www.thespacereview.com/article/1644/1

Hayabusa's heroic return a test for Japan's resolve
http://www.nytimes.com/2010/07/02/business/global/02space.html?_r=2

NASA launches new 3D Game: Moonbase Alpha
http://www.nasa.gov/offices/education/programs/national/ltp/games/moonbasealpha/mbalpha-landing-collection1-overview.html

Game Review: Moonbase Alpha
www.space.com/entertainment/game-review-virtual-lunar-life-nasa-moonbase-alpha-100706.html

In LRO's first year in orbit, "a Whole New Moon"10
www.space.com/scienceastronomy/new-moon-revealed-lunar-reconnaissance-orbiter-100707.html

10 coolest new discoveries on the Moon
http://www.space.com/scienceastronomy/top10-lro-discoveries.html

Top 10 ways to deflect an errant asteroid
http://news.discovery.com/space/top-10-asteroid-deflection.html

Singularity University Space Goals: to Stay, not Go
http://www.space.com/news/singularity-university-future-space-exploration-100708.html

Gap in financing models for NewSpace Companies
http://www.thespacereview.com/article/1663/1

The Space Show Classroom
http://spaceshowclassroom.wordpress.com/

IKAROS Solar Sail Propulsion Confirmed!
www.jaxa.jp/press/2010/07/20100709_ikaros_e.html#pict2

NASA's new $50k "Game Changer" Commercial Space Innovation Prize
www.parabolicarc.com/2010/03/18/nasa-offers-110000-prizes-rice-business-plan-competition/

New NASA Contest for Inflatable Habitat Designs
http://www.space.com/businesstechnology/nasa-inflatable-space-house-contest-100713.html

Astronauts in support of Commercial Transport
www.spaceref.com/news/viewpr.html?pid=31239

Citizen (student) science: Lunar Reconnaissance Orbiter images
http://www.moonzoo.org

A post-American Moon
http://www.thespacereview.com/article/1618/1

Japan Could Put Human(oid) on the Moon by 2015
http://www.space.com/businesstechnology/japanese-humanoid-moon-robot-100504.html

"Mission pull" and "technology push"
http://www.thespacereview.com/article/1627/1

Need to understand how humans can live in space
http://www.thespacereview.com/article/1613/1

How human exploration of Mars can help on Earth
http://www.thespacereview.com/article/1644/1

Being able to actual spot aliens may take centuries
http://www.space.com/scienceastronomy/alien-contact-will-take-centuries-100429.html

Being able to actual spot aliens may take centuries
http://www.space.com/scienceastronomy/alien-contact-will-take-centuries-100429.html

Space Station to get chance to realize full potential
http://www.thespacereview.com/article/1620/1

How big is the International Space Station?
http://www.lifeslittlemysteries.com/images/stories/iss-how-big-100511-02.jpg

Top 10 Star Trek Technology Predictions come true
www.space.com/technology/top10-star-trek-tech-1.html

GREAT SPACE VIDEOS

MOON COLONY VIDEOS – The Moon Society

30 plus thought-provoking videos, produced for the Moon Society by Chip Proser (Celestial Mechanics, Inc.) http://www.gaiaselene.com

This month's selection below:

Saving the Earth by Colonizing the Moon
http://gaiaselene.com/Saving%20Earth/SavingEarth.html

Space Solar Power
http://gaiaselene.com/Solar/Solar.html

Orbital Refueling Stations (multi-part)
www.gaiaselene.com/GASteroid/GASteroid.html

Lunar Greenhouse (multi-part)
http://www.gaiaselene.com/Lunar Greenhouse/LunarGreenhouse.html

ASSORTED SPACE VIDEOS

Why we need human explorers
http://www.ted.com/talks/brian_cox_why_we_need_the_explorers.html

"Case for Mars" set to Music (Zubrin, Sagan, etc.)
http://www.youtube.com/watch?v=2kKCtDcrrHo

Moonbase Alpha Game Trailer *****
http://www.nasa.gov/offices/education/programs/national/ltp/games/moonbasealpha/index.html

QUOTES FOR INSPIRATION

"All men dream, but not equally.
Those who dream by night in the dusty recesses of their minds wake in the day to find that their dreams were just vanity:
But the dreamers of the day are dangerous men, for they may act out their dreams with open eyes ...making what they dream possible."

– T.E. Lawrence

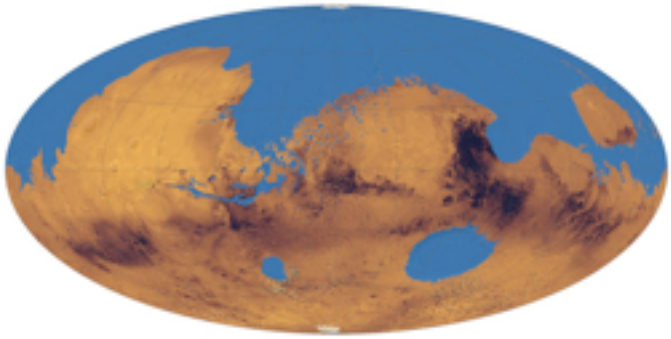
"Every great dream begins with a dreamer. Always remember, you have within you the strength, the patience, and the passion to reach for the stars to change the world."

– Harriet Tubman, 1820-1913

"Destiny is not a matter of chance; but a matter of choice. It is not a thing to be waited for, it is a thing to be achieved."

– William Jennings Bryant

MMM PHOTO GALLERY

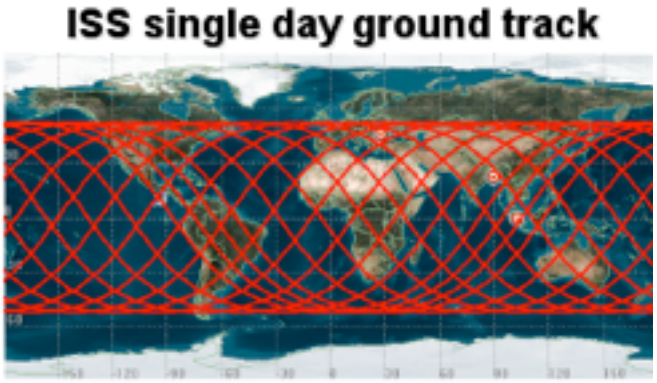


Area of Mars covered by water about 3 billion years ago, Roughly the size of the Atlantic (North & South)
http://www.space.com/scienceastronomy/ancient-mars-vast-oceans-100613.html

Atlantic Ocean for comparison
(areas above/below 60° N ands latitude excluded)

After nearly five years of suspense, Japan's crippled Hayabusa probe successfully returns capsule bearing samples from 1755 ft (535 m) long asteroid Itokawa (pictured above) to the Australian desert near Woomera rocket test range.

Scientists find the Haybusa Asteroid Sample Container in the desert near Woomera, Australia
For *a fictional account of what happens* when they open it in a laboratory in Japan, read Dwayne Day's "Diary of Juhzoh Okita, exobiologist" –
http://www.thespacereview.com/article/1651/1



ISS' high inclination orbit makes it unsuitable as a depot to outer space destinations, but an outstanding perch for Earth studies, and tourism, as it covers most of the inhabited areas of our planet daily.

Astrobotics Google Lunar X-Prize Rover hopes to launch on a Falcon-9 in December 2012 for Apollo 11 site
http://astrobotictechnology.com/wp-content/uploads/2010/06/astrobotic-payload-specifications.pdf

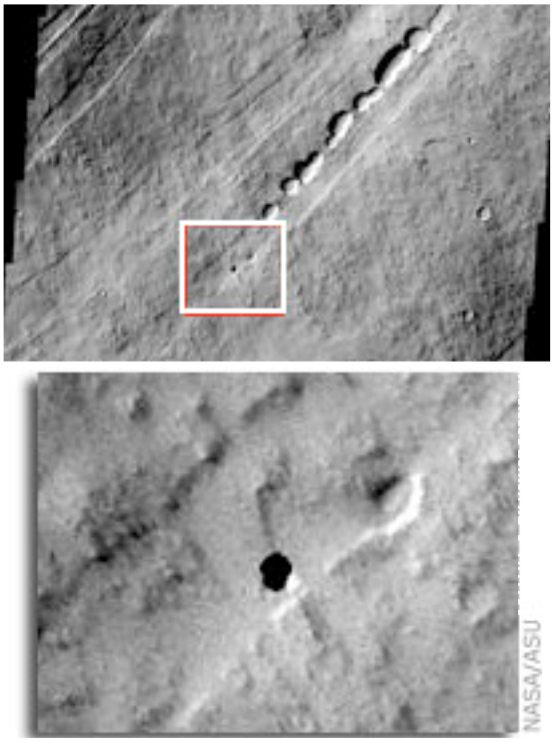
Discovering a Lava Tube Skylight on Mars
An Example of What Students Can Do

http://asunews.asu.edu/20100617_skylight

Seventh Grade Students (ages 11-12!) in a California (US) Middle School, undertook a project to look for lavatubes in the data flow from the THEMIS instrument on NASA's Mars Odyssey Orbiter which has been studying the red planet since 2001. This effort was a class project for the Mars Student Imaging Program (MSIP), a component of Arizona State University's Mars Education Program.

http://msip.asu.edu/ - http://marsed.asu.edu/

They found clear evidence of a "skylight" - a deep black pit on Mars surface which is clearly the result of the collapse of part of the surface above an underground lava tube. Several such skylights have previously been found on the flanks of Mars greart shield volcanoes, just the kind of terrain we'd expect to house lavatubes, as do shield volcanoes on Earth. As these subsurface voids of great size and volume offer ready-made shielding from the cosmic elements and stable temperatures, this bodes well for the prospects of establishing of human communities on Mars someday. To date, one such skylight has been identified on the Moon by Japan's Kaguya probe.



In the top frame, the small black dot is visible but had not previously caught anyone's attention until this study.

Too much data for the professionals to study

There is such an enormous volume of data coming in from the various probes about the Moon, Mars, and Venus, that the "principle investigators" and their teams can only scratch the surface. This leaves an enormous fertile source for "data mining" by students and others.

Students do not have to wait until they graduate from university to begin to make significant contributions. This kind of project needs little in the way of expensive equipment, just patience and time.

We recommend that students in India consider doing similar projects collaborating with ISRO, and even with NASA. These students will be proud of their achievements for the rest of their lives!

Data Mining as a wide-open career

Many a probe has produced far more data than there is money to analyze. Many probes and orbiters have had their data analysis shut down prematurely after the first easy conclusions were drawn simply because money was needed elsewhere. Data mining by students, whether as part of a group project, as in this case, or by an individual in support of a thesis, is a promising way to get more research done.

Agency-paid analysts have looked for the obvious, searching in promising directions. But there may be many discoveries just waiting to be made, including unsuspected paradigm-busters that end up defeating previously wide held beliefs and assumptions are the reward for tireless hours spent looking for more.

At ISDC 1998 in Milwaukee, there was a presentation on just this need, to throw the seemingly thankless task at unpaid students, whose reward may be just the thrill of a new discovery, but could be the stuff of a doctorate-winning thesis

Perhaps the most novel means of analyzing "too much data" was the SETI@home project, enlisting owners of hundreds of thousands of computers to import a data stream from JPL that could be analyzed by a program running in the background, without disturbing whatever else the computer was doing.

The point is, one does not have to go looking for new data, when there is so much in our possession that has never been looked at. At the end of the *Magellan* mission that crated the first radar map of Venus, it was thought that the total data mass from this mission was greater than all the knowledge in all the books of mankind. To this day, only a small fraction of the data was analyzed, As soon as the easy finds have been made, and new finds become few and far between, there is strong motivation to not spend any more money pumping what may be a dry well. Its not that we think that there is nothing new to find, but that the law of diminishing returns demands spending time and money elsewhere.

But for unpaid students, hobbyists also, its not about money, but the chance to make a name, for oneself and/or to successfully defend a thesis

The Meaning of "Commercial Space"

New National Space Policy paper June 28, 2910.

http://www.whitehouse.gov/sites/default/files/national_space_policy_6-28-10.pdf

The term "**commercial**," for the purposes of this policy, refers to:

- "space goods, services, or activities
- "provided by private sector enterprises that
- "bear a reasonable portion of the investment risk and responsibility for the activity,
- "operate in accordance with typical market-based incentives for controlling cost and optimizing return on investment, and
- "have the legal capacity to offer these goods or services to existing or potential nongovernmental customers."

A Chapter Living Wall Project

By Peter Kokh

At Larry Ahearn's suggestion (Larry was in charge of Exhibits for ISDC 2010), the Lunar Reclamation Society in Milwaukee agreed to create a "Living Wall" exhibit. But there was no way a working full-size yet portable unit could be build in the time frame and for the money available. Instead LRS member James Schroeter settled on a design and assembly of a working hydroponics unit that would be similar to what might be needed for a Living Wall. Peter Kokh designed the tri-fold backdrop.

Belatedly, we came across a new approach that suggests a great chapter project. In a Google Images search for "living wall" we found this image:

http://i5.photobucket.com/albums/y189/lemonastronaut/plantsonwall.jpg

"Graham Crackers for your Walls"

"If you want your walls to stand out this fall, try Promise Design's Phytoslim modular wall panel system that allows plant enthusiasts to literally bring their walls to life. The frame is composed of a plastic endoskeleton combined with coconut fibers, allowing bonzai-flavored plants to dig their roots in and really grow on your walls.

Well that's good news, not only for those of us who would like to do a show and tell, but for prospects of making Living Walls a key ingredient in any analog lunar research station, and eventually in lunar outposts and settlements. These modular panels, of course, would need to be mated to a water delivery and collection recirculation system.

But here is the bad news. We can't find the site from which that quote comes, and, as a result, we can't figure out how practical a project this is. A Google Image Search did not turn up the image above, at least not in the first several pages.

We'll have to look into the availability of such panels (the image dates from 2005). And it would be good to know if we could produce such panels *"largely"* from the elements fairly common in moondust. So look for an update on this idea after we, or any of you readers, are able to find out more! ###

For men and women of the new age, four directions are not enough -- Ray Bradbury

Lunar Reclamation Society, Inc.
P.O. Box 2102
Milwaukee
WI 53201
www.lunar-reclamation.org

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

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LRS News

● **At our June meeting we planned a Field Trip for this summer.** We used to do this annually, but this will be our first Field Trip in a while. On Saturday August 21st we will be visiting "Growing Power" on N 55th & W. Silver Spring.
http://www.growingpower.org/
http://www.growingpower.org/milwaukee_projects.htm
"**Growing Power** is a national nonprofit organization and land trust, supporting people from diverse backgrounds, and the environments in which they live, by helping to provide equal access to healthy, high-quality, safe and affordable food for people in all communities. Growing Power implements this mission by providing hands-on training, on-the-ground demonstration, outreach and technical assistance through the development of Community Food Systems that help people grow, process, market and distribute food in a sustainable manner."

● **Ensuring the Continuity of MMM:** We are drawing up a document that would insure the continuity of MMM to cover various contingencies. If need be, rights to the name and to continue publication would be transferred to The Moon Society, and should that organization not be capable of continuing publication, then to the National Space Society. For all practical intents and purpose, LRS will continue to publish MMM as we do currently, for our own members as well as for the members of the Moon Society and for members of several NSS Chapters.

● **We are attempting to recover lunar-reclamation.org** In the meantime, we are now using:
http://www.moonsociety.org/chapters/milwaukee/

LRS Upcoming Events
(No meetings in July/August)
Saturdays: 1-4 pm

September 11th - October 9th - November 13th

LRS Meeting, Mayfair Mall, Garden Suites Room G110

AGENDA: Report on ISDC 2010, Space News, etc.
www.moonsociety.org/chapters/milwaukee/meetings.htm

News & Events of NSS "MMM" Chapters

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

COLORADO

Denver Space Society
(FKA The Front Range L5 Society)

1 Cherry Hills Farm Drive
Englewood, CO 80113
http://www.angelfire.com/space/frl5/

Eric Boethin 303-781-0800 eric@boethin.com
Monthly Meetings 6:15 PM on Tuesdays
August 24th, September 14th, October 12th
Englewood Public Library, Englewood, CO 80110
1000 Englewood Parkway, First Floor Civic Center

ILLINOIS

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

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

Host of ISDC 2010 – May 27-31, 2010
http://isdc.nss.org/2010/

WISCONSIN

Sheboygan Space Society
728 Center St., Kiel WI 54042-1034

c/o Will Foerster 920-894-2376 (h) astrowill@tcei.com
SSS Sec. Harald Schenk hschenk@charter.net
>>> **DUES:** "SSS" c/o B. P. Knier
22608 County Line Rd, Elkhart Lake WI 53020
[http://www.tcei.com/sss/]
● We meet the 3rd Thurs even # months 7-9pm
At The Stoelting House in Kiel, WI
Aug 19th – Oct 21st – Dec TBA

OREGON

Oregon L5 Society
P.O. Box 86, Oregon City, OR 97045

voice mail / (503) 655-6189 -- FAX (503)-251-9901
[http://www.OregonL5.org/]

Allen G. Taylor allen.taylor@ieee.org
Bryce Walden moonbase@comcast.net
(LBRT – Oregon Moonbase) moonbase@comcast.net
* **Meetings 3rd Sat. each month at 2 p.m.**
Bourne Plaza, 1441 SE 122nd, Portland, downstairs
August 21st, September 18th, October 16th

MINNESOTA

Minnesota Space Frontier Society
c/o Dave Buth 433 South 7th St. #1808
Minneapolis, MN 55415
David Buth (w) (612) 333-1872, (h) (763) 536-1237
Email: info@mnsfs.org
www.mnsfs.org/

Proud hosts of the MDRS Web Cams
http://freemars.org/mdrscam/

Calendar: MN SFS 2010 Past & upcoming chapter events
www.freemars.org/mnfan/MNSFS/2010-12-Review/
MN SFS Meetings: Sept 13th, Oct 11th, Nov 8th, Dec 11th

Puerto Rico Space Congress

San Juan – October 24-27, 2010
Hosted by **NSS-Puerto Rico**
Sponsored by The Leeward Space Foundation
Cosponsored by The Moon Society
http://www.puertoricospacecongress.com
http://leeward.crowdvine.com/
Sheraton Puerto Rico
Convention Center Hotel & Casino
200 Convention Boulevard · San Juan, Puerto Rico
00907 · US · Phone: (787) 993-3500
$129/night (1-4 persons/room)
Registration; Members NSS, Moon Society, Leeward Fndtn/Students $137 early bird extended thru **Sept. 7**
Tour to Arecibo Radio Telsescope !!

PENNSYLVANIA

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

c/o Earl Bennett, Earlisat@verizon.net
215/633-0878 (H), 610/640-2345(W)
[http://pasa01.tripod.com/]
http://phillypasa.blogspot.com

● **PASA regular business luncheon/formal meeting 1-3 pm**, the **Ist Saturday of every month** (unless otherwise specified) at the **Liberty One food court** on the second level, **16th and S. Market.** Go toward the windows on the 17th street side and go *left*. Look for table sign. Parking at Liberty One on 17th St. Call Earl/Mitch 215-625-0670 to verify all meetings.

Next Meetings: June 5th, July 11th (2nd Saturday to avoid the July 4th holiday), **Aug 1st**

Meeting times and locations: We will meet on June fifth, July tenth and August fifteenth (a Sunday) at our regular meeting location at the Liberty One Food Court. We meet from one to three p.m. and will put up a table display, such as an N.S.S. poster or Lunar Prospector labeled briefcase standing on a table, to indicate where we are on the seventeenth street side of the Court. In addition to these meetings, Mitch has received an invitation for us to be at The Franklin Institute for there Lunar Landing Event, which will be great, as there is a lot of interest in robots exploring the Moon in the near future (Lunar X Prize).

Our meeting was well attended, with eight people coming including Hank Smith and our two associate members: Janice and Wallace. Due to circumstances, Hank is also an associate at this time but still reports on the Science fiction events here and in other areas. He is waiting on an appointment.

As part of the science programming team for the next Philcon Convention (November 19 to 21 at The Crowne Plaza Hotel, Cherry Hill, NJ), Hank says this years chairman will be Todd Dashoff, who has helped run the event in the past. Hank may or may not attend the great Balticon convention around Memorial Day weekend. However: he is looking forward to the 2011 World Science Fiction Convention, which will be in Reno!

Our report from Larry included an update on our picture gallery (which now includes the Empire State Building in a Lava Tube display (rev. 1.0)) and some other shots from Michelle Baker. He also commented on using Facebook, which has a PASA site and which he and Dorothy also both have a presence, and the possibility of Facebook charging for particapation in the near future We voted against using it if it charges. Larry will soon work on upgrading both PASA's and Dorothy's sites through the use of something called Cascading Style Sheets that should make accessing various parts of the sites easier.

Dorothy reported on events in our area and the Washington/Baltimore region as well as giving me a copy of her Dotty's Dimensions, a mix of travelog & commentary on various activities she is involved in including our group! Contact her at dottymk@yahoo.com, or see the website: http://members.tripod.com/lp_web4us/ For May and June she brought a listing of a number of book signings for the Smithsonian including one for May 29: Beyond: Visions of the Interplanetary Probe, with author Michael Benson at the Gallery 101 Museum Shop from one to three p.m.. Another event of the Smithsonian is a star party in June: Skywatching at Sky Meadows State park on June fifth. This costs five dollars to park at the Virginia location (near Paris, Va.). Other events included movies and planetarium shows, both at the Smithsonian sites and those connected with the Maryland Science Center. I should point out that we will have new shows at The Franklin Institute and The Academy of Natural Sciences and events in the near future.

We had a surprise visit from Dennis Pearson who will be going to the ISDC on Memorial Day weekend in Chicago. He lamented the lack of support for the Solar System Ambassador program, which he joined last year, but will continue his personal outreach activities. His trip to the ISDC will be a stepping off point for other activities including a later visit to Boeing's Seattle site. Go Dennis!

Mitch brought us some of the invitations noted above, and a revised members list that should be sent on to M.M.M. for subscription purposes. We are a rather small organization at the moment and will have to improve our local membership pitch. To help us do this, Mitch is working on the college student aspect again, and has asked us to look out for any new space books we could get the authors in town for signings at Boarders or Barnes and Nobles stores in our area, or at the center city main library. And, for the fall, we are invited to the Franklin Institute for International Space Day in October. Mich also brought handouts on both the President's plans for the space program, including a piece from the Wednesday, April 14 Philadelphia Enquirer on Obama keeping the space capsule of the cancelled Constellation program (by Seth Borenstein and Marcia Dunn), and, from the April 21st paper, the opinion of Derrick Pitts, Chief Astronomer of the Franklin Institue, on Mars as a lofty goal for NASA: "Obama's Space Plan is right to reach for Mars"

Janice is continuing her work on getting more on Apopsis and the possibility of diverting in during its "close" approach to Venus in the next decade. We began discussing impact energy again, with the size of the asteroid and a reference size impactor, the object that created Meteor Crater in Arizona (house size), and what this would mean to the world. Since we considered an American football field sized object, at 30 mps, it could cause considerable damage on most of its projected impact paths. That is very preliminary, as the data to refine these possibilities won't be available until the 2020s or 2030s (impact in the 2036 time region). She will post a NASA report from a researcher on our blog site soon. The deflection idea is nice but, at least at present, requires a national or international effort. Remember, even if it is made of ice at one gram/cc, it weighs 1000 kg per cubic meter, about a ton, so a simplified mass estimate is 72 million kg. As can be seen from this: the sooner deflection starts the better. Check the PASA blog for a more knowledgeable assessment of this subject.

Earl brought a variety of material on a number of technology-oriented subjects including: an ad for a new

3D printing device for making prototypes and feasibility models of software described objects. This device, which can produce printed objects that are 33% larger than could be made with the advertisers previous unit of the same size, works with a plastic material that is put down in layers to make what you describe in your computer aided design files. The Uprint Plus Personal Printer, from Dimension Printing, starts at $19,900 and fits on an engineers desk top. Dimensionprinting.com/pdd3 for more. Also: from the May Sky and Telescope in the "Exploring the Moon column is a report on recent lunar data from several probes and its analysis using different tools (page 51, by Charles A. Wood), and a discussion of new software on page 55, by Paul Deans, called Lunar Discoverer (for both the Mac and P.C.). This is a test report, and the author notes that the software doesn't take libration into account. In spite of this and a few other points Paul will be using this program for doing observations. Versions: basic at $44.95, Deluxe: $59.95.

From the March/April Amsat Journal are several interesting reports, including on the annual meeting for 2009 in Baltimore, which includes a commitment to get more small satellites launched, progress on the ARRISat-1 project(pages four to six) which will be launched from the Space Station this year (it will include two slow scan cameras), an article on a beginner trying to use one of the newer satellites, AO51, on page eight. And from this publication: Gems from the past: UoSAT-Oscar-9 CCD Image Display- 22 years After Reception, by John A. Magliacane. John recorded, on tape, and examining it with modern software after all that elapsed time. Much historic technical detail and a few images to show what we used to hope to see back them. The satellite was built at The University of Surrey, England, by the Electronics and Electrical Engineering Department, pages 26-7. And several articles on energy related topics: from the May Electronic Products: Thin-film Thermoelectrics Cool Optoelectronics, by Dave Koester of Nextreme Thermal Solutions.

These devices, Thermoelectric energy converters, can be used to move heat away from, or to, a place using electric currents, or use thermal differences to generate electrical differences (current flows). This application is to keep the operating wavelength from changing as the ambient varies from some cause. Constructing the device using thin film techniques holds the potential for larger areas of application through automated mass production.

From Wireless Design magazine for March/April a background report on what energy harvesting is, by Michele Kinman of the Energy Harvesting Forum. The full article is at the magazines website, but the short form mentions the use of thermoelectric effect as a power source, piezoelectric (usually piezobenders) generators, and the ever popular solar panels.

And lastly: from the Brainstorm section of Product Design and Development magazine this spring " How can we make solar panels more efficient" with a number of contributors with there thoughts on improving the *overall* efficiency of a solar power system. One author, Steve Liker of Trident Solar, describes using ink jet printer technology to economize on the application of the diffusion and contact making material used to make the cells.. This report some background on what it takes to make a working solar power generator, and this applies to many of our space borne systems as well. See the ECN magazine website for more. I am currently revising the Empire State Building in a Lava Tube display. Submitted by Earl Bennett.

CALIFORNIA

San Diego Space Society
http://sandiegospace.org/
info@sandiegospace.org

Meeting the 2nd Sunday monthly
Next: Aug 8th, Sept 12th, Oct 10th, 14th 2:30-4:30 pm
Serra Mesa Branch Library 9005 Aero Dr, San Diego
Quarterly Newsletter: ***The Bussard Scoop***

CALIFORNIA

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

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

Regular Meeting 3 pm 3rd Sat. each month
Next Meetings: Aug 21st, Sept 18th, Octr 16th
thInformation: OASIS Hotline, 310/364-2290; website.

Saturday, August 21, 3 pm - OASIS Board Meeting
Home of Craig and Karin Ward, 1914 Condon Avenue, Redondo Beach, CA 90278

Saturday, September 18, 3 pm - OASIS Board Meeting
Home of Lisa Kaspin, 3206 Summertime Lane, Unit 206, Culver City, CA 90230

Saturday, Octtober 16, 3 pm - OASIS Board Meeting, Columbia Learning Center, Downey, CA - *Pending!!*

Saturday, November 20, 3 pm - OASIS Board Meeting, Home of Steve Bartlett and Tina Beychok, 7108 East Peabody, Long Beach, CA 90808

November 26-28, Thanksgiving Weekend
***LOSCON* Science Fiction Convention**
Once again, OASIS will have a table, be providing programming and host a Space Party. Come join us!

Saturday December 11, 3 pm - OASIS Board Meeting and Holiday Party
Home of Bob Gounley and Paula Del Fosse
1738 La Paz Road, Altadena, CA 91001

The Secret of Success is to start from scatch
And keep on scratching

Moon Miners' MANIFESTO

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

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Electronic MMM (pdf) **$35** Students/Seniors: **$20**
Hardcopy MMM: U.S. & Canada **$35** - Elsewhere: **$60**
P.O. Box 940825, Plano, TX 75094-0825, USA

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Send proper dues to address in chapter news section

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

- **$12 USA** MMM Subscriptions; • US **$22** Canada;
- US **$50** Surface Mail Outside North America

Payable to "LRS", PO Box 2102, Milwaukee WI 53201

CHICAGO SPACE FRONTIER L5
- $15 annual dues

LUNAR RECLAMATION SOC. (NSS-Milwaukee)
- $12 low "one rate"

MINNESOTA SPACE FRONTIER SOCIETY
- $25 Regular Dues

OREGON L5 SOCIETY
- $25 for all members

O.A.S.I.S. L5 (Los Angeles)
- $28 regular dues with MMM

PHILADELPHIA AREA SPACE ALLIANCE
- Annual dues for all with MMM $25, due in March or $6 times each quarter before the next March

---

SHEBOYGAN SPACE SOCIETY (WI)
- $15 regular, • $10 student,
- $1/extra family member

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