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

Moon Miners' Manifesto

& The Moon Society Journal

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In FOCUS: Politician-Proofing is Moon-Mars Mission Priority #1

Since President GW Bush laid out his space exploration vision, there has been a fresh groundswell of public interest and enthusiasm for its two flagship goals: deploy a permanent outpost on the Moon; and send humans to explore Mars. As usual, those who say "Hey, wait a minute...." are disdained as spoilers. "Join the party!" we are encouraged.

Most of the enthusiasm comes from those too young to have lived through the yo-yo mood swings that took us from the ecstasy over the first moon landings in 1969 to the agony and insanity of our retreat from the Moon just three and a half years later! You know the old adage about what happens to those who learn not the lessons of history.

Politicians have been the enablers of great space endeavors. They have also been the spoilers. They control the up front money. And as long as up front money is the principal driver, our space dreams will remain hostage to politicians who, if they do appreciate the value of space programs, do so for all the wrong reasons.

Politicians are the spoilers, for two reasons. They can cancel a program on a moment's notice, as the way our system works, program approval remains tentative until the time a program runs its course. It can be canceled in mid-stream at any time, for any silly reason, usually money.

But cancellation is not the most insidious threat posed by the regime of constant and repeated political review. The worst danger by far, because it is not seen as a danger, is forced redesign by committee. That is the fate that befell the Shuttle, and then the Space Station. We ended up with "strong, hardworking " beasts of hardware. But they were mules, not horses, Through the redesign by committee process they were both sterilized, not capable of supporting "the next step" offspring.

How do we "politiician-proof" the EMM&B vision? Robert Zubrin, founder and leader of the Mars Society gave his answer at the Mars Convention last August. In a talk entitled "The Moon by 2012, Mars by 2016" he pointed out that if the bulk of the equipment needed was well under development by the time Bush had to hand over the reigns to his successor on January 20, 2009, the program will have become too robust to cancel. Okay, reaching that goal is a goal then, but realistically given the historic budget deficit created during the same period, an unlikely goal.

What other ways are there to politician=proof the return to the Moon and exploration of Mars? We've talked about them. It would mean getting NASA not to be the control freak it has always been. [⇒ p. 2, col. 2] **!**

What Asteroids Look Like, *Really!*

The dream destination of many a space enthusiast is neither the Moon nor Mars, but some place out in the wild and woolly Asteroid Belt, the ultimate boondocks where indivduals can be who they want to be, or so goes the lore. We've all seen pictures of Gaspra and Ida and Eros and a few others, but the details of **Itokawa** blow the mind:

http://www.isas.jaxa.jp/e/snews/2005/1102.shtml

Moon Miners' Manifesto

Moon Miners' MANIFESTO/ Moon Soc. Journal is published every month except in January and July.

• **Moon Miners' Manifesto CLASSICS :** Beginning with 'July 2004, we have begun an effort to re-edit, reformat, re-illustrate and republish the timeless articles of MMM's first ten years, with the intention of publishing two issues, each covering one year, in PDF format only, for free downloading, each January and July.

• **MMM's VISION:** "expanding the human economy through off-planet resources"; the early era of heavy reliance on Lunar materials; earliest use of Mars system and asteroidal resources; and the establishment of the permanent settlements necessary to support such an 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 several 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. Any presumption that participating organizations can be labeled by indirect mutual association is unwarranted.

• For the current 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 non-profit 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 40 chapters, dedicated to the creation of a spacefaring civilization.

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openfrontier@delphi.com => www.space-frontier.org

• **The Moon Society** is "dedicated to overcoming the business, financial, and technological challenges necessary to establish a permanent, self-sustaining human presence on the Moon." — See contact information on page 9.

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

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

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⇒ IN FOCUS Editorial continued from p. 1.

The Aldridge Commission advised NASA that it must seek ways to involve private enterprise, not just the usual stable of major contractors addicted to NASA money. After a period of soliciting ideas for a new CEV vehicle, is it any surprise that NASA has come up with its own design, or that the usual guilty parties will be the contractors?

Reaching the point of no return *is important* and we agree with Dr. Zubrin on that score. But we identify that milestone differently. We will reach that point when we have grown the self-funding entrepreneurial component to the point where business (not Congress) has too much at stake to let the Government opt out -- or even better, to the point where a business-industry front would be able to "to go it alone" should those who have never really been in our camp anyway, decide that the government must pull out.

This is especially true of the Moon. A government base will be put in the wrong place to support expansion of an industrializing lunar economy, and will be designed as a science and exploration base only, á la McMurdo Sound. The presence of the government even with International Partners on the Moon will work to discourage the rise of a private industry presence there. And only the latter can ever be called permanent. A government presence can be withdrawn at any moment: witness what is happening now to the government's support of the Space Station.

How do we get to this very different milestone marking a point of no return? Yes, it will involve a critical down payment level. But we see that as involving a critical mass of technologies and hardware that business & industry can use, rather than NASA, should NASA opt out, and private enterprise be faced with the need to "take over."

We repeat our recommendation, that NASA restrict its design activities to "interfaces" between modules, whether they are modules that will make up the CEV or any equivalent vehicle, or modules with which to complete the Space Station, or from which to assemble a lunar or Martian outpost. Interfaces are the Infrastructure. Let NASA concern itself with that. Such a foundation laid, business and industry rivalry will create the best options. NASA is to proud to let it self be relegated to such a role, failing to realize how important and future-enabling it would be.

Along with such "design infrastructure" goals, we need to create a legal groundwork that will favorably support, not cripple or stunt, business-industry initiatives on the Moon. This is about property rights and the right to develop resources.

Alas, the bulk of the space enthusiast community continues to wear horse-blinders as they cheer on what they think is a champion steed (but is only a mule). However, we can hope that business and industry will do its own thing regardless of NASA efforts to co-opt the future.

Keep the faith! PK

Industrializing the Moon with Delta 4s: Recasting the "High Frontier" Vision

By David A. Dietzler

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http://www.moonminer.com/Conquering-Moon-D4.html

The High Frontier Revisited

In 1976 Gerard K. O'Neill and others created The High Frontier and the prospect of space colonization to generate energy for Earth with solar power satellites. The original plan involved spending about $250 billion over ten years to place 3000 to 20,000 tons on the lunar surface with Shuttle derived heavy launchers that could place 80 or more tons in LEO. Today, such rockets do not exist, but the job can still be done. The Delta 4 is our most powerful ELV.

Imagine 100 Delta 4 heavy launches and 2500 tons of payload to LEO at 185 km. Or they might be launched from Korou, French Guiana to achieve a somewhat higher orbit that will not decay as fast that and which also has a more favorable orbital plane for launch from LEO to the Moon. If we have NEP {Nuclear Electric Power] tugs with 10,000 second specific impulse drives and vapor core+MHD power plants that generate at least 1 kWe/kg. that amass 20 tons we find that only 1.9 tons of propellant is needed to get to low lunar orbit with a 25 ton payload.

Exhaust velocity of ion tugs = 10,000*0.0098=98 kps

Since about 4 kps needed for Earth escape and braking into LLO, mass ratio = e(4/98) =1.04166 Propellant mass = 1.04166*45=46.8747 46.8747-45»1.9 tons

Since the tugs have to return to LEO we must factor in the reaction mass for this.

1.04166*20=20.8332»20.85 850 kg. of reaction mass for return to LEO. Less would be needed if aero braking is used. As this increases the Moon bound mass we find:

(25+20.85)*1.04166=47.76 A total of roughly 2.75 tons of reaction mass is needed per roundtrip. A total of 275 tons of reaction mass is needed.

If robotic ice miners and landers that use NTR and water in Kevlar bags for a high mass ratio are used no fuel for landers must be up-ported to the Moon. The O'Neill team did not know of this water resource on the Moon, although they suspected it. There is still some controversy regarding the ice, but let's be optimistic.

The ice miners might amass two tons each like a large automobile and the landers no more than 20 tons each. If we use five miners capable of pumping their water loads into the landers and two landers we have a total of 50 tons. To land this with NTR using water for reaction mass and an Isp of 400 seconds:

NTR exhaust velocity = 400*0.0098= 3.92 kps

Since 1.6 kps is needed to land from LLO, mass ratio = e(1.6/3.92) = 1.5

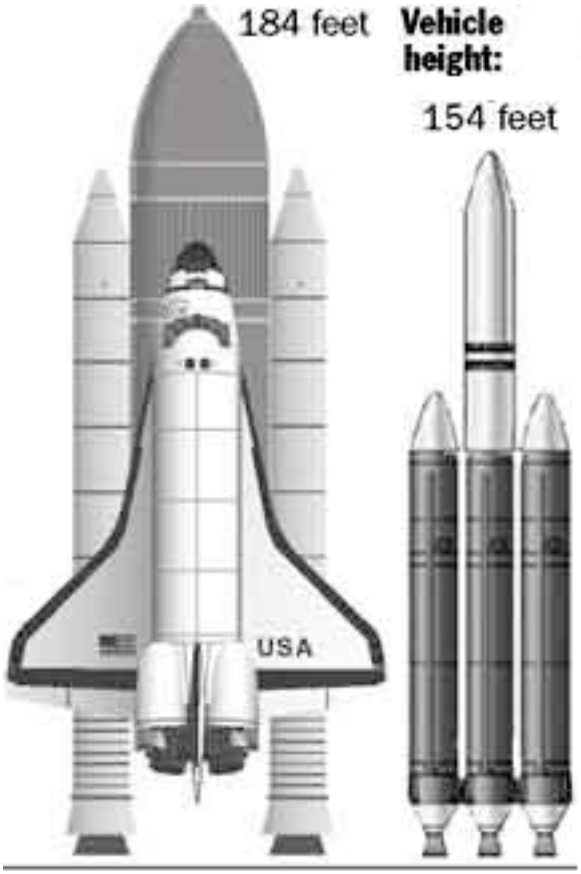
Propellant mass = 50*1.5=75 thus 25 tons of reaction mass needed

This must be sent to LEO and then by ion tug to lunar orbit. Water will not boil off during the multi-month voyage. Five ice miners + two landers + landing propellant = 75 tons. About nine tons of ion propellant brings us up to 84 tons. We might need some teleoperated orbital devices for transferring propellant and assembling the payloads, so let's estimate 125 tons for this ice mining 'bots and "nuclear steam" landers system to LEO.

We could land 2000 tons of industrial payload on the Moon, cannibalize cargo modules and Delta 4 upper stages, and even land the tugs to convert them to power plants on the lunar surface.

2500 (100 Delta 4 payloads to LEO) - 100(five tugs) -275(ion propellant) = 2125 tons payload lunar

2125 -125 (miners+landers, etc.) = 2000 tons to lunar surface .



The Costs

At $170 million (1999 dollars) per Delta 4 launch this would cost $17 billion. A drop in the bucket. The payload would consist largely of power supplies, stereo lithographic machines and metal extraction devices. This payload would multiply its own mass many, many times over as the years tick by. To get humans to the Moon we would use something like the Artemis Project system. Human crews would be minimal at first and robots will be primary.

Comparisons: Shuttle weighs almost 3 times as much as the SSME-powered Delta 4 but can lift only 18 tons to the Station in comparison to Delta 4's 24 , despite the Shuttle's greater thrust. Boeing's Delta 4, with aq 20 year history is now the workhorse of the U.S. fleet..

Since the tugs could be landed on the Moon and converted to power plants we get another 100 tons although it may be argued that the tugs might be putto better use if left in space for future cargo hauling. Occasional refueling with uranium or thorium would be required. The 50 tons of mining 'bots and landers should also be considered to be lunar cargo, so we've actually got 2050 tons to the Moon and some space transit infrastructure in the form of the NEP tugs. Also, we would get 100 Delta 4 upper stages amassing 3.5 metric tons each for a total of 350 tons of metal ready to be worked into various parts. These upper stages are 5m (16') wide and 12m (40') long. They would make excellent orbital fuel depot storage tanks for fueling up high thrust manned ships and habitat modules on the lunar surface. 2050 +100 (tugs)+350 (upper stages)=2500 tons of useful cargo (ignoring those teleoperated devices for transferring propellant to landers). That works out to about $3400 per pound. Not counting the tugs and upper stages, about $4150 per pound.

Astrodynamics Wizards Wanted

The Mark Maxwell ice tanker consists of a Kevlar bladder filled with water and a NTR engine. It would operate in conjunction with robotic ice miners to land payloads on the Moon that were lofted to LEO by Delta 4 rockets and transported too LLO by NEP tugs. It could also move water to L1 where it is loaded in aero braking modules and shot down to LEO depots when we have a station at L1 capable of splitting water into hydrogen and oxygen. This would be faster than using ion drives, and time is often money. It only takes 3150 m/s to go from LEO to L1. Locating a station at L1 should be more efficient than going from LEO to LLO. A minimum energy ellipse from L1 to the lunar surface and vice versa requires a delta V of about 2.3 kps and 70 hours. This would put payloads on the far side of the Moon. If we send payloads from L1 to LLO and then retro down from LLO to the near side surface about the same amount of energy is required. We could also travel directly to the near side from L1 in an almost straight line but this will require more energy. Since the Mark Maxwell ice tanker may have a very high mass ratio and 400 seconds or more specific impulse it might do the job. This gives mission designers and mathematicians plenty to think about if they are looking for something to work on!

Those who are knowledgeable might also point out that I have treated maneuvers with ion drives as if they were impulsive delta Vs and the actual astrodynamics are more complex. Perhaps twice as much propellant for ion drives or about 550 tons will be needed! I'm not asking anybody to clean up my mess, I'm just trying to spur some thought out there! I don't have the mathematical prowess or computer programs to make low thrust long duration trajectory calculations but one can estimate that twice as much delta V is needed as an impulsive thrust delta V and that roughly doubles propellant mass requirements with the mass ratios we are looking at here.

Then and Now

Many technologies exist today that did not exist in 1976. Computers and robotics have exceeded the expectations of the most optimistic speculators and they will continue their relentless progress so that by the time we actually commit to a space colonization program we will have some really capable AI [artificial intelligence] robots for work in space. By using AI robots we could avoid the expense of building Bernal Spheres for 10,000 people.

T.A. Heppenheimer thought that magazines would be faxed to high orbit and Xerox copies would be distributed amongst space colonists. He didn't foresee the internet, laptops, PDAs or DVD players, at least not publicly! In 1976 that was science fiction!

The relatively simple FFC process for extracting titanium for titanium dioxide did not exist back then. The early NASA studies looked at the laborious Kroll process for refining titanium in space.

The Delta 4, Atlas 5 and Titan 4 did not exist almost thirty years ago and everyone expected reusable Shuttles to be cheaper than evolved expendable rockets such as the previous three mentioned. The vapor core reactor with MHD which can get 1 kWe per kg. of system mass or better like that which is being developed at the University of Florida's Innovative Nuclear Space Power Institute did not exist either. In the seventies the best space nuclear power systems could get about 100 kWe from four tons of mass or about 1kWe per 40 kg. with almost 20 times as much power wasted as reject heat!

More technological breakthroughs are certain to come in time for a space colonization, industrialization and energy program. We might even see the use of

- artificial spider silk from GMOs which has five times the tensile strength of steel, and
- C60 nanofiber based materials, as well as
- AI computers with nanocircuitry. We might make use of
- gallium-indium-nitride solar panels that are 70% efficient
- and high temperature 77° K superconductors.
- Stereo lithography and laser additive manufacturing are far more advanced today and it will be possible to make
- molds from basalt for casting aluminum and magnesium as well as make
- parts directly from powdered titanium. In the free vacuum it should be easy to make powdered metals by evaporation of molten metals.

Build lunar mass drivers out of local materials

We will not ship mass drivers up to the Moon in finished parts. We will build them from local resources. The equipment sent to the Moon will consist mostly of

- power supplies,
- regolith refining devices like magma electrolysis furnaces,
- fluidized beds that use hydrogen to reduce ilmenite,

- magnetic separators,
- centrifugal grinders that need no abrasive wheels or grit that wears down with heavy use,
- Sabatier reactors and related gear to recycle carbon from CO gas formed during smelting,
- sulfuric acid makers,
- robotic mining shovels,
- stereo lithographic and
- laser additive manufacturing devices.

Integrated modules might receive Moon dust on one end while iron, titanium and ceramics come out the other end. Other modules will have inputs of metals and parts as output. We will make everything we can on the Moon from aluminum mass driver coils and titanium bracings, ceramic bricks for smelting furnaces, LOX tanks, molds and glass-glass composite materials to vehicles and volatiles/helium three mining machines.

Smart robots with teleoperated assistance from Earth and small crews on the Moon will assemble everything. We will even make habitat modules from local resources of iron and titanium. We will ship seeds to the Moon and grow crops in lunar soil fertilized with N, P and K mined on the Moon to create a food supply for future crews. The original 2000 tons of machinery will create more machinery and grow into a multimillion ton industrial base on the Moon like a tiny seed growing to become a mighty oak tree. This will take a lot of ingenuity, sophisticated software and human brainpower, but I am confident.

Justifying the Cost

Spending $17 billion to launch 100 Delta 4 rockets is not exorbitant. That's about the cost of eight new nuclear power plants. The actual cost of the program will be much higher when we include the cost of developing all the robots, ion tugs and ground support and operations centers. Operations centers will be located around the world and linked by cable and satellites. Sophisticated software will be needed to make everything work. We will also need remote control technicians to drive the robots on the Moon and operate the mining shovels. The young generation of video game enthusiasts will provide plenty of human talent for this. Global ground control centers will make it possible for daytime crews on Earth to operate the lunar machines 24 hours a day without forcing anyone to work the graveyard shift. The total cost of the program will be several hundred billion dollars with launch costs being a minor fraction, even at $3400 to $4150 a pound!

The cost is justified because the benefits will be clean solar energy from space and helium 3 fusion fuel with tourism and astronomical observatories coming later as icing on the cake. Let's consider the price of nuclear fission. Today it costs about $2 billion to build a nuclear power plant generating 1000 to 1500 MWe. In 2050 based on projected rates of growth we will need 53 TW of power. Even at this level of production half the world's people will have about as much energy as Mexicans do today and the other half about as much as Europeans. To generate 53 TW with fission we'd need about 50,000 power plants rated at 1 GWe each and this would cost $100 trillion! Even if we get about 20% of our power from winds, biomass, some fossil fuels, hydro and other sources we will still need 40,000 nuclear power plants. If the efficiency of these plants is increased by co-generation (also called combined heat and power) from a typical 35% to 70% we will need 20,000 nukes at a price in today's dollars of $40 trillion! Add the costs of waste reprocessing, waste disposal, increased global security costs to prevent nuclear proliferation and nuclear terrorism, and accidents to the picture and nuclear power becomes a costly way to defeat global warming and provide energy to the world. Space solar power will be much less expensive once we are tapping resources from the Moon instead of launching them from Earth. The program could be an international government-private corporate partnership. Preferably, the government role would be minimal or the project will become another pork barrel that politicians use to create jobs for their constituents and business for their corporate supporters. Perhaps government should limit its role to tax credits, awards, subsidies and defense contracts.

Finally, it is apparent that nuclear fission is the only non-carbon emitting energy source today that can be used for large scale reliable power generation, but the cost is outrageous even compared to space travel. For a few hundred billion dollars we can industrialize the Moon, build some powersats and start selling electricity. Reinvestment of profits will pay for the construction of more powersats and the initial investment will grow. Stocks sold to finance the project will increase in value. The economics of space solar power are far superior to nuclear power, despite the cost of rocket launches which tends to scare people off. The hostility of the space environment is no great threat to robots. Putting humans in space is a challenge but we've learned how to do this with years of experience on the Russian Mir and now the ISS. Supplying humans in LEO, GEO and on the Moon will be far easier than keeping humans alive during three year missions to Mars. We might even develop LUNOX augmented nuclear thermal rockets that can reach the Moon in 24 hours.

These could be launched atop Delta 4s which have a five meter diameter payload capacity or made from converted Delta upper stages. Some nuclear power will be needed in space but the risks presented by this will be miniscule compared to 20,000 nuclear power plants on Earth. Unimaginative corporate and political leaders might scoff at space power and advocate nuclear fission. That could be the greatest obstacle to the development of the High Frontier•

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CO-OPs as Enterprise Accelerators:

Homestead Garden-based and other Cottage Industry Cooperatives will take Early Lunar Frontier Enterprise "Prime Time"

by Peter Kokh

The Early Frontier Situation:

How do we progress from an early frontier settlement in which all arrivals have been recruited for full time production work in mining, processing, manufacturing, and other essential industries aimed at maximizing exports and minimizing the need for imports? When, and how will the settlement reach that stage where the first self-employed pioneers can successfully launch their own businesses? How do we get from a company town, hopefully a multi-company town, to what looks like a normal civilian settlement with a truly diversified economy?

The situation in the early frontier will be that every able person has a regular "day job" as an employee. Will some just "quit their day jobs" and set out on their own to make a living serving the pioneer consumer market? That is possible, but daring without a heap of capital and a hefty savings cushion. A far more likely "fail-safe" route is that talented and motivated pioneers will take the first steps in their free time, after/before work and on weekends, in their own homes, not quitting their day jobs "just yet."

Built-in Launchpads for Cottage Industry Enterprises

If the launching and development of private enterprises is something to be desired, the settlement Fathers could guarantee a favorable climate by "engineering into" the settlement system and both its legal and physical infrastructure a number of critical built-in features that would encourage and nourish "Cottage Industry" activities of many types, creating a favorable climate. Our pick of these built-in features follows.

a) Enterprise Seeds: Overtime Exemptions

Company employees wanting to attempt launching a cottage industry activity would apply for a limited time exemption from any mandatory overtime requirements: say six months. Near the end of this term, if the entrepreneurial activity had not been abandoned and was showing promise, an extension could be requested and granted. A non-company review board would hear the request and approvals would be binding on the applicant's employer. Without some protection of an employees "free time," the entrepreneurial climate would be severely handicapped.

b) Enterprise Seeds: "Greathome" Spare Spaces

Most of us might expect pioneer homes to be small and cramped, a carryover from space station and early outpost *sardine can living.* Way back in MMM #75, May '94, we introduced the "Great Home" concept.

Size of Lunar Homes - the "Great Home" Concept

We must resolutely and brazenly set aside the notion that lunar settlers shall be forever condemned to endure life in cramped quarters. As long as pre-built shelter must be brought in from Earth, weight limits will work to keep pressurized space at a high premium. ....

But once simply and cheaply and easily manufactured housing modules have been designed that incorporate local lunar materials almost exclusively, valid reasons for pioneers to continue accepting constrictive personal quarters evaporate.

If it can be achieved within the labor and productivity budgets of the settlement, there is no reason why lunar settlers should not request and receive homes that are spacious by American standards. Indeed, *there are good reasons to err in the opposite direction.* First, considering that lunar shelter must be overburdened with 2-4 meters of radiation-absorbing soil, and that vacuum surrounds the home, expansion at a later date will be considerably more expensive and difficult than routine expansion of terrestrial homes. Better to start with "all the house a family might ever need", and grow into it slowly, than to start with initial needs and then add on repeatedly.

Extra rooms can, of course, be blocked off so as not to be a dark empty presence. But they can also be rented out to individuals and others not yet ready for their own home, or waiting for one to be built.

Even more sensible is the suggestion that the extra space will come in handy for cottage industry in its early stages, before the new enterprise is established, matured, and doing enough business to be moved into quarters of its own. At the outset, with every available hand employed in export production, the demand for consumer goods, furnishings, occasional wear, arts and crafts, etc. will *have to* be met in after-hours spare time at-home "cottage industry". The lunar "Great Home" could meet this need elegantly

c) Enterprise Seeds: Homestead Gardens

The Moon, outside the airlock, will always be a harsh, hostile, unforgiving environment. More to the point, it will always be barren of life as we are used to seeing it outdoors. We have to bring the green lawns and gardens inside, if we are to have them and enjoy them at all. Those of us who enjoy living in detached single family homes enjoy outdoor greenspaces as an integral part of our property. On the Moon, such a welcome benefit must be provided indoors with built in garden space. We've talked about this many times, most recently in the article "Earthpatch" in MMM #148, Sep. '01. We followed up in the next issue, #149, Oct. '01, p. 5, "Homestead Gardens & Early Cottage Industry."

Many Hurdles Facing Cottage Industries

To develop a home-based enterprise, one must find affordable sources for tools, equipment, and needed raw materials: seeds,seedlings, fertilizer for the gardener; clay

for the potterer, etc. One must find appropriate packaging and labeling materials, and most importantly, markets. This all takes time and effort difficult to spare from the daily attention demands of the cottage industry activity itself. It becomes instantly clear that with out a supporting network of related industries, starting an enterprise becomes a losing proposition. Enter the co-op.

Co–ops Combine the Forces of Many Sparetimers

If our would-be home garden entrepreneur forms a cooperative association with others attempting to do the same thing, they can then combine purchasing power, and marketing resources. Taking our Home Garden example, the co-op can find seed and seedling sources, tools, fertilizers, pest control, and other business needs such as pots and other containers, labels, etc. Members can share advice and experience and tricks of the trade. Legal advice and insurance is another area best handled on a shared basis.

A Home Garden Co-op can find space to market the products of the individual members. Manning market outlets would be shared, with all members contributing a few hours. Coop markets could start as weekend enterprises, and expand hours as success and demand warrant. In this fashion, a number of spare-time entrepreneurs can launch a whole cottage industry sector even in a young settlement , without anyone involved on a full-time basis. With time-share management, minding the store and other duties become onerous to no one.

The Co-op can encourage friendly rivalry: development of improved and diversified products, more convenient packaging, and expansion of the consumer market.

In finding and developing a network of suppliers, the co-op encourages the rise of complementary industries. It all knits together. Support industries will include:

- containers
- labels
- canning supplies
- dehydration
- and more

Through home garden co-ops, pioneer consumers will find many new products:

- canned & foods: jams, jellies, soups & sauces, condiments
- seeds, seedlings
- cut flowers
- composting services
- fertilizers, mulch
- dyestuffs
- floral arrangements
- craft papers
- paper craft items
- wood items
- carved wood jewelry
- medicinals
- herbs & spices
- recipes, cookbooks
- cooking demonstrations

Online co-op markets are another way individual gardeners can work together to develop more business. For the individual consumer, the co-op market will make finding what they want so much easier - "one-stop shopping."

Streetside Garden Co-op markets could also host cafes and restaurants featuring their products and produce, as an unbeatable way to hook customers on their goods.

From Food to Fabrics: a Home Garment Industry Co–op

While it may be possible to grow cotton and other fiber producing plants in the home garden, the quantities needed render fiber production at home a most unlikely endeavor. However, using not the Earthpatch Garden space, but other spare space in the Great Home, individuals can get into the fabric and garment industry on a cottage industry basis. They can purchase bolts of fabric and/or standard issue garments for alterating from the settlement farm mill, as a basis for a number of Cottage Garment Industries.

The settlement fabric mill, a subsidiary of the settlement agricultural farms, in addition to production of a basic selection of fabrics available in bolts, will likely produce a line of basic standard issue products: underwear, shirts, blouses, pants and slacks, etc. In the interests of efficient productivity, a minimum of variety will be offered. both in garment designs and in fabric bolt colors and patterns. And that leaves the door wide open to follow-on entrepreneurs.

In addition to creating custom garments of their own design from available bolts, individuals can purchase standard garments in quantity at a discount for alteration either on request or on speculation re-tailoring them, dying them, adding appliqués and adornments, etc. A Co-op for home fashion creators would help improve output, profit, and variety. The co-op could purchase equipment and supplies at a discount for the benefit of its members. It could run Co-op consignment fashion outlets, both physical and online. Again, friendly rivalry would work to create more variety and better quality all for the consumer's benefit.

A Home garment industry co-op could run a fabric and garment dying operation much more efficiently, as it would do so on a full time basis, using equipment and raw materials more efficiently. A sewing machine repair person would be a complementary addition.

fabric and garment dyeing might well be one of a number of "controlled activities" because of the load it may place on the settlement water-recycling system. A co-op facility would be able to pretreat the effluent dye-containing drain water before dispensing it into the settlement's drainage network.

The Co-o's dying facility would purchase equipment sufficient to meet member demand, and work with members to schedule facility usage. It might also keep some equipment free for usage by individuals who need such services rarely and are not co-op members.

A Home Garden Co-op Consignment Outlet could, in addition to a variety of custom garments and apparel accessories, offer materials, equipment and patterns, for the fabric hobbyist wishing to make things for use around the home or as gifts, well short of plunging into a cottage industry business. Fabric and garment scraps would be for sale for turning into artifact creations from rag-rugs to rag-dolls and more.

A Woodworking Co-op

In general, it will be imperative for the settlement's success to recycle all biosphere-derived materials. All waste biomass will be recycled. Food, reprocessed by the digestive system will be further decomposed in the settlement sewage works back into water, carbon dioxide and soil amendments to reenter the biosphere food-growing cycle. Because wood incorporates rare hydrogen, carbon, and nitrogen, withdrawal of wood for use in construction, making of paper, and other uses for which substitutes can be found, will be discouraged by heavy "withdrawal" taxes.

This will make wood a precious item on a par with jewelry stuffs. In furniture, we are likely to see high end metal case goods (dressers, cabinets, etc.) sport wood handles - just he opposite of our common practice. Wood jewelry will be highly valued. And as it happens, common orchard fruit tree woods are hard, and make fine carving woods: apple, pear, and, of course, cherry.

So we are likely to see cottage industries based on premium wood use. A home-based wood adornment industry could benefit from a Co-op's purchasing power of equipment and supplies, as well as co-op maintained workshops outfitted with extra-expensive seldom used or needed equipment. It could maintain a wood craft and wood jewelry consignment store, both streetside and online.

A Custom Home Furnishings Co-op

In the section above about Home Garment cottage industries, we mentioned our expectation that the settlement fabric mills would of necessity concentrate on a bare minimum of standard issue garments, leaving to entrepreneurs their further customization as well as the creation from scratch of a great variety of apparel items and accessories. We expect that the same will be true of the settlement furniture factories. "You will be able to buy whatever you want so long as it is the one model and color we produce." "Issue" furniture, however, will be designed to be post-manufacture customization friendly. And that opens the door wide for individual designers and craftsmen getting start on a cottage industry basis. Cf. MMM # 77 July '94, p 4. Inside Mare Manor Pt. II: "Cinderella Style"; Furniture.

Homemakers want to express their own individual personalities in the way they furnish their "digs." The appetite for variety and distinctiveness and uniqueness is extremely strong. Those with appropriate talent will be much in demand. A furniture/furnishings cottage industry co-op could, in addition to bulk purchasing power applied to equipment and materials, maintain co-op workshops for less frequently needed and specially expensive woodworking and finishing equipment, leaving the home woodworker to concentrate on equipment to be used more frequently, etc. The co-op could also maintain streetside and online co-op consignment markets, leaving the member entrepreneur to concentrate on production.

Custom tables, dressers, cabinets, bed headboards, lamps, etc. will be in demand. Again, rid yourself of the expectation that wood will be a common furniture material. Think instead of metal alloys, ceramics, glass composites, even concrete. All of these will require special tools to shape, finish, and adorn. Unlike the situation here on our still well-forested planet, the furniture maker will not be a graduate carpenter.

Co-op Scavenging Industries

As here on Earth, scavenged materials have the very attractive quality of being free for the price of disassembly and cleanup. For craftsmen and other enterprising individuals operating, or beginning operations on a shoestring budget, scavenged items and materials present an attractive situation.

Such unwanted materials include not just consumer trash items, but also post-manufacturing seconds, scrap, and byproducts. To increase bottom line profits, manufacturers are always on the lookout for mass markets for these items for which they have no further use. Sales are sales. So what is available to the home entrepreneur is the trash leftover from this first skimming by other industries.

A Co-op could maintain an online inventory of available items and materials, sources for tools, and a place to post patterns for sale and use by others. And of course, both streetside and online consignment markets for trashure items whether they fall into the category of useful items or just interesting pieces of art and craft. A co-op would offer an environment wherein individual trashure artists can further inspire one another.

A Co-op for Rockhounds

To must of us earthlubbers and perhaps to many less discriminating settlers, a moon rock is a moon rock. "Once you've seen one, you've seen 'em all." A true rock hound knows better. A rockhound can appreciate subtle differences and will know about hidden assets. Rocks can be collected for arrangements in rock gardens, cut and polished to reveal distinctive hidden surfaces, to be incorporated into custom jewelry cabinet hardware. A rockhound co-op could accelerate the diversification of rock and regolith based products by bringing people passionate about rock and its hidden aspects together, purchasing tools and materials at a discount, and setting up streetside and online markets.

University of Luna Assistance

A settlement university should have a department that will encourage the transition from cottage industry through coop membership organizations and activities, to stand alone businesses that employ people full time. In this way the settlement's economy will expand from one consisting of a few basic industries designed to meet minimum consumer needs, to one serving the individual consumer and homemaker, an economy offering an every expanding variety of goods and service. Coops will be the "accelerant." **<MMM>**

The Moon Society

J O U R N A L

http://www.moonsociety.org

Please make NEWS submissions to KokhMMM@aol.com

The Moon Society was formed in July, 2000 as a broad-based membership organization with local chapters, to spearhead a drive for further exploration and utilization of the Moon in cooperation with other like-focused organizations and groups.

Artemis Society International was formed in August 1994 as a forum for supporters and participants in the **Artemis Project™** quest to establish a commercial Moon base as a first step to a permanent, self-supporting lunar community. **ASI** does not engage in any form of commercial business directly, but seeks to build a Project support business team. Registered trademarks of the **Artemis Project™** belong to **The Lunar Resources Company®**

PROJECTS: www.moonsociety.org/projects/

The Artemis Project™ – Project LETO™ – Rent–MDRS

Moon Society DUES include **Moon Miners'Manifesto**

- **Electronic** (pdf) **MMM $35** **Students/Seniors: $20**
- **Hardcopy MMM**: U.S. & Canada **$35** Elsewhere: **$60**

Join/Renew Online – www.moonsociety.org/register/

Mail Box Destinations:

□ **Checks, money orders, membership questions**
Moon Society Membership Services:
PO Box 940825, Plano, TX 75094-0825, USA **:**

□ **Projects, chapters, volunteers, information, etc.**
Moon Society Program Services
PO Box 080395, Milwaukee, WI 53208, USA

OUR LOGO above, shows the Moon in its natural beauty, empty and deceptively barren, waiting for human settlers to shelter and to mother as an adopted new human home world. We have work to do!

This issue of MMM marks the 10th Anniversary of Service to Artemis Society International & the Moon Society Starting with MMM #90, November, 1995

How it all began

Early in 1995, MMM Editor Peter Kokh first heard about the Artemis Moonbase Project™ to deploy the first commercial manned outpost on the Moon. Keeping in touch, he and fellow LRS member Bob Bramscher of Kenosha, drove down to the Artemis Society Organizing Conference in Huntsville that June. It was there that he met Artemis Society & Project founder Greg Bennett in person after much email exchange. Peter invited Greg to be the Science GoH (an unusual Guest of Honor category) at the 2nd annual First Contact Science/Science Fiction Convention that Peter had cofounded in Milwaukee the year before. Greg accepted and had a great time at First Contact that September. It was then and there that he proposed to the young Artemis Society International organization that ASI adopt Moon Miners' Manifesto as its monthly newsletter. Prior to that, Pleiades had been published on an erratic and sporadic basis.

The agreement was quickly finalized between LRS and ASI and the November issue was the first sent out to the entire ASI membership. It was a good deal for both. For MMM, it secured the distribution level safely above the minimum needed for bulk mail, 200 domestic copies. For ASI it meant a reliable newsletter with a proven record and a shared enthusiasm for lunar exploration and settlement on a free enterprise foundation.

July 2001: Enter the Moon Society

As time went by, Bennett had become convinced both that the burden of handling membership services was a drag on the Artemis Society's efforts to advance the Artemis Project itself, and that there was a great need for a more broadly based membership organization concerned not just with the free enterprise project but "with all things Moon." In July 2001, members of ASI and others gathered at Caesars Palace in Las Vegas, Nevada to write the founding documents for the new Moon Society. By this agreement, the Moon Society would take over membership services from ASI, including distribution to its members of Moon Miners' Manifesto, and leave ASI to concentrate on the Project itself, operating now as a foundation rather than as a membership organization. Membership in ASI was open and free to all Moon Society members. All dues would go to the Moon Society.

For the record:

MMM served ASI for 47 issues, MMMs #s 90-137. The first issue sent to transferred members under The Moon Society banner was issue #138 continuing through the current issue (52 issues and running.)

In Celebration of this Ten Year Legacy:

A Review of the Artemis Project™ And the Status of the ASI Website

by Peter Kokh

The Situation and the Problem

In retrospect, it seems that a totally unintended and unwanted consequence of the shift in membership services from the Artemis Society to the Moon Society was a steady attrition in the number of dedicated volunteers who had been working to maintain the Artemis Society website, complete the first edition of the Artemis Data Book, and endeavoring to continually improve the Artemis Project™ Reference Mission, a sketch of how we thought things could unfold and lead to the actual deployment of a first manned commercial outpost on the Moon.

Volunteers gone, the many hundreds of pages at www.asi.org slowly became dated, or outdated, to be frank. New developments in space technology had a bearing on many aspects of the plan, and no one was minding the store to address that. Lists of links to "Relevant External Websites" appended to each page became riddled with broken links, with no one to take note or correct them.

The Artemis Data Book, an effort that started with a grand outline of all the information and aspects involved in opening and settling the Moon, had been filled in here and there, but still had a lot of empty place holder subtitle index pages. That was fine when the empty spaces served to spur on volunteers to fill them, but with the volunteers gone or otherwise occupied, the empty spaces slowly became ever more of an embarrassment.

Outdated pages, old "last updated" lines, broken links, no longer relevant technological assumptions, and a once exciting project now suffers badly from neglect.

Doing Something About It

Moon Miners' Manifesto has a plan to address all this and get the Artemis Moonbase Project™ back on track to the point where if it is not realized directly, it will have served as a springboard for an enterprise that can put it all together successfully. And to have served in that capacity will be a great honor and vindication of the whole effort.

Proprietary Issues

Of course, the founders of the Artemis Project™, the stockholders in The Lunar Resources Corporation, have a proprietary interest in the realization of the dream on their own terms, and to their own profit. Profit is a legitimate and powerful force. Be that as it may, we humbly offer a set of measures, a comprehensive plan to get both the Project and the www.asi.org website "out of the ditch" and back onto the road leading towards achievement of our share dream, private enterprise-based lunar settlement!.

Calling Fresh Attention to the Artemis Project

by Strategically Naming the Moon Society's First Moonbase Simulation Exercise at the Mars Desert Research Station in Utah

"Artemis Moonbase Sim 1"

We could have named our first mission anything, of course. "MDRS Crew 45 Moon Society Exercise" would have been fine. But an Opportunity is something ignored at one's peril. All of us in the Space Enthusiast movement work at the disadvantage of having access to resources puny in contrast to our awesome goals. We must leverage and collaborate to turn every little advantage into a mighty lever.

Project LETO www.moonsociety.org/projects/leto/

The Moon Society early on announced a long range project under the code name Project LETO, an acronym for Lunar Exploration and Tourist Organization. The idea was to establish a facility for tourists to learn about the Moon, its resources, and our plans to set up outposts. It would include a mockup moonbase at which to conduct "Lunar exploration base simulations" very much analogous to the Mars Society's facilities in the Utah desert and on Devon Island in Canada's arctic far north. We are, however, not yet in a position to leverage the resources needed to launch such a project. But that does not leave us without homework to do.

Last year when the Moon Society learned that the Mars Society was willing to rent out its Utah analog station to other groups for two week periods, we announced a plan to do just that. Our reasoning was that such a "getting the feet wet" exercise would give us knowledge and experience to better design, locate, and operate such a facility of our own in due course.

Saturday, February 25 –Sunday, March 12,2006

Now, with the dates for our first exercise in Utah *on the calendar,* and mission plans and crew firming up rapidly, we have the opportunity to kill two birds with one stone: ✓ advance our project to deploy our own analog research station, and ✓ help get the Artemis Project™ and website back on track, reinvigorated, and hopefully putting to work many fresh volunteers.

There will be a considerable amount of attendant publicity, opportunities to be put to good use. Already in the works is a BBC (London) project to create a documentary on the Moon which will include interviews of many persons associated with the Back to the Moon movement. BBC has offered to fly us to Utah for "on location" filming and an interview in early December.

So, many people who have never heard of either the Moon Society or of the Artemis Project™ will now hear of both for the first time. We intend to be in a position to put to work any of those wanting to volunteer.

Refreshing The Artemis Data Book

If Presentation is Everything, the ADB gets a C minus

Task # 1. Correcting Broken External Links

In the Artemis Data Book, for every outline position, there is a list of External Related Websites (REWs) that shed light on the subject in question, be it methods of mining the Moon, or uses of lunar lavatubes, or methods of surface transportation. Many of these links are broken. The original sites in question may have moved to new addresses, or the website hosting them no longer exists. To the visitor the high percentage of broken links leads to the conclusion that the Artemis Site is an abandoned relic. This is an intolerable situation and fixing it is very high priority.

There is proprietary software that will quickly identify and create a report of all broken links on the website. Purchasing this software or the services of a Link Repair Service are a legitimate expense and use for available general funds. There may be freeware that does the job, but if so, why has it not been used, and repeatedly?

The job can be done by manually checking every link, a monumental task. It is better to have this done for us as we will still manually have to remove, or correct the errant links, a job that will consume many volunteer hours. Once that is done, we will want to find new appropriate links to replace those removed.

Task # 2. Presenting the Artemis Data Book

The idea behind posting the full outline of the ADB, [http://www.asi.org/adb/fulloutline.html] was to motivate volunteers to find appropriate articles, or write them when none are to be found, for every topic and subtopic listed in the Outline. This worked well while we had volunteers busy putting flesh on this skeletal outline.

Alas, currently, there are more empty topic and subtopic index pages and one sometimes has to click through several of these to find an actual article on anything. Given this situation, the full outline should be for registered volunteers only. The casual interested visitor should get an organized list of actual articles online, the blank spaces not included. If that is done, the considerable number of substantive articles already online begins to look impressive.

But how the ADB is presented is a policy decision that the Artemis Society Board has to address before any alterations or corrections can be made.

The point is, we are now showcasing what we have yet to achieve, rather than what we have already achieved, and instead of attracting new volunteers, that presentation only serves to turn volunteers away.

Perhaps we could open source the ADB, on the model of the **Wikipedia**, the free open-source online encyclopedia. Getting the job done is far more important than waiting until we can get credit for doing so ourselves.

It's Time to Reinvent the

Artemis Project™ Reference Mission

Adopting Procedures & Habits To keep it Fresh & Current

by Peter Kokh

The basic Reference Mission is now ten years old, and has been only partially reviewed in the interval since. There has been a considerable amount of technology development since then that is relevant to the designs and methods detailed in the Reference Mission. Further, the entrepreneurial space enterprise economy continues to build. It is time to review, and in some respects, reinvent our plans to deploy a first manned commercial moonbase.

The original proposal has some areas that incorporate real advances. For example, the innovative use of an open-cockpit lunar assent vehicle allows the landing vehicle to leave a substantial pressurized module on the Moon as a first installment for the outpost. NASA, in contrast, left only used equipment and the lander platform on the Moon.

The suggestion of using a triple SpaceHab shell as the main moonbase module was innovative. This is a proven structure and offers more space for less money than an ISS crew module. But soon there will be proven inflatable modules that offer even more volume for still less weight.

While the guiding idea was to use off the shelf equipment, certainly the most economic path in the short run, it may be more important to consider how the base should develop if it is to become a nucleus for civilian industrialization of the Moon based on indigenous resources. In that light, we need to identify and prioritize in timeline terms all the functions to be served and all the facilities and capabilities needed. Then, only then, after defining what we need to get to the position where we want to find ourselves should we begin to look at designs, off-the-shelf or original, with which to start deployment and construction. The triple SpaceHab may be a valid starting point. But without going through a *define & design process,* we cannot be sure that such a unit won't end up being a dead end.

We should keep the Reference Mission as a benchmark to be exceeded. We can start over fresh in an attempt to come up with a better design and a better economic game plan. The best way to guarantee a happy result is to open source the new Mission Plan. But again, we tread on proprietary toes here, and we have no power to make such a decision. But even if all the work is done in house, by our own volunteers, it should be open-sourced. Let the best designs and best technologies and the best game planes sort themselves out without an arbitrary selection of winners. *Let's do what it takes! Artemis Project Phoenix!*

Chapters & Outposts

Chapter/Outpost Projects to build your Group

by Peter Kokh

Nothing helps gel a new group together and works as effectively to help recruit new members as a Project. On the Space Chapter Hub site is an extensive list of Project Ideas. [http://www.nsschapters.org/hub/projects.htm] As a leader or underutilized member, you are sure to find something in that list that is up your alley - or which will get your gray matter wheels churning productively enough to suggest a more appropriate idea given your collective talents and resources and interests.

Currently, there are two new types of chapter project to consider.

• **Adopt a portion of the Artemis Website** to refresh or complete. √ You can check for broken external website links and repair them, tackling as many REW-containing pages as you can. Alternately, or additionally √ you can contribute an article or articles for the any of the many empty topic or subtopic pages in the Artemis Data Book. Just check the outline: [http://www.asi.org/adb/fulloutline.html]

• **Help Brainstorm feasible projects for the upcoming or future Artemis Moonbase simulation exercises at the Mars Desert Research Station.** If the project requires equipment, you can help procure it, of if there is no on-the-shelf equipment available, you can help design, and even build whatever is needed. For ideas with which to prime your brainstorming pump, contact *president@moonsociety.org* and put moonbase simulation project in the subject line, and list your collective talents, expertise, and areas of interest.

Projects planned for Artemis Moonbase Sim 1, our first crew at the Mars Desert Research Station. Two or more crew members will be involved in all of these projects:

- □ Modeling an Early Space Frontier Diet
- □ Developing Site Management Polices & Practices
- □ Studying Human Factors for Morale & Performance
- □ Studying the Ergonomics of the MDRS Hab design and layout and suggesting options for expansion with a view to enabling extension of the field season, as well as looking at options for a clean slate Hab redesign
- □ Studying features of the present EVA Spacesuits that restrict performance and induce fatigue and looking for ways to make improvements.
- □ Studying ways to inhibit the import of mud and dust into the MarsHab

Project suggested but not yet adopted

- □ Creating the illusion of the Earth suspended over the horizon at the apparent size and with the appropriate phases that it would show on the Moon.

The Moon Society's New Affiliation with the National Space Society Provides Ways to Spread our Presence

Since the early days of the Artemis Society back in 1994 and 1995, two National Space Society chapters, the **Oregon L5 Society** (Portland) and the **Lunar Reclamation Society** (Milwaukee) have found pragmatic ways to partner with Artemis Society International and the Moon Society. The Milwaukee chapter publishes ***Moon Miners' Manifesto***.

More recently, since the announcement that the Moon Society planned to rent the Mars Desert Research Station for a two week moonbase simulation exercise, the **Minnesota Space Frontier Society** (Minneapolis - St. Paul) has asked for similar partnership status.

On May 22nd, representatives of the Moon Society and the National Space Society signed an affiliation agreement at the 2005 International Space development Conference in Arlington, VA (Washington DC area). This document notes the desirability of mutual cooperation between Moon Society chapters and NSS, and NSS chapters with the Moon Society. All such collaborations are voluntary, of course, and defined on a totally pragmatic basis, partnering where interests overlap and merge.

√ Society members who have no nearby Moon Soc. chapter or outpost can look at the NSS US Chapter map:

http://chapters.nss.org/a/lists/Chapter_Locations_US.shtml

If you find a nearby NSS chapter, consider joining it, and representing the Moon Society's program and goals. In time you might make the case for that chapter to look for ways to participate in Moon Society projects. One still encounters persons who are very "turf retentive" but that's an unproductive attitude of the 20th Century. Collaboration and networking and pragmatic partnering work better!

Bay Area Moon Society

http://www.moonsociety.org/chapters/bams/

[South San Francisco Bay Area]

Contact: Bill Clawson <billclawson@yahoo.com>

Contact: Jonathan Goff <jongoff@masten-space.com>

Meeting the 4th Thursday of the month
at various locations, usually in member's homes

Moon Society St. Louis

http://www.moonsociety.org/chapters/stlouis/

Contact: Keith Wetzel <kawetzel@swbell.net>

Meeting the 2nd Wednesday of the month
at the Buder Branch Public Library
4401 S. Hampton, in the basement conference room

GREAT BROWSING !

Live Images from Mars from THEMIS (THermal Emission Imaging System)
www.spacedaily.com/news/mars-odyssey-05c.html

Major solar system bodies from other major solar system bodies in date specific display
(e.g. what will the Earth look like from the Moon on July 20th, 2019?)
http://space.jpl.nasa.gov/

Fly over Chasma Boreale at Mars North Pole
http://www.esa.int/SPECIALS/Mars_Express/SEM8T86Y3EE_0.html

Mark Hempsell'sinnovative Multi-Role Capsule
http://tinyurl.com/dmr5e

Itokawa: By far the best Asteroid Pix yet!
http://www.isas.jaxa.jp/e/snews/2005/1102.shtml

Pluto may have two more moons
http://hubblesite.org/news/2005/19
http://imgsrc.hubblesite.org/hu/db/2005/19/images/f/formats/web_print.jpg

Shenzhou capsule has capacity to loop the Moon
http://www.globalsecurity.org/space/world/china/piloted-lunar.htm
More - www.thespacereview.com/article/473/1

Canada's $750 M 10 yr Project: 30m Telescope
http://lot.astro.utoronto.ca/

DARPA to fund Very High Efficency (50%) Solar Cells
http://www.eet.com/news/semi/showArticle.jhtml?articleID=173402860

34 yearr old Japanese Entrepreneur "Dice-K" to be 4th Space Adventures Tourist to ISS
www.spaceref.com/news/viewpr.html?pid=18176

Explore the Moon from your PC
(Windows 2000 or XP only)
http://worldwind.arc.nasa.gov/moon.html

Priming the pump for lunar PGM mining
http://www.thespacereview.com/article/479/1

Science Aspects of NASA's Moon Return Plan
http://www.thespacereview.com/article/466/1

Human exploration could be cheaper in long run
http://www.thespacereview.com/article/483/1

the US Navy: Lost in Space?
http://www.thespacereview.com/article/480/1

Mega-Module Path To Space Exploration
www.spacedaily.com/news/oped-05zza.html

Hubble Looks for Valuable Ores on the Moon

"the first high resolution, ultraviolet images ever taken of the Moon"
Titanium-, Iron-, Oxygen-rich Ilmenite Distribution Map is the Goal

http://hubblesite.org/newscenter/newsdesk/archive/releases/2005/29/

"NASA has enlisted the Hubble Space Telescope's unique "vision" capabilities for making a new class of science observations of the Moon that support future human exploration. Hubble's exquisite resolution and sensitivity to ultraviolet light, which is reflected off the Moon's surface materials, have allowed Hubble to begin to search for the presence of important minerals that may be critical for the establishment of sustained human presence on the Moon.

"Preliminary assessment of these new Hubble observations suggests new patterns in the abundance of titanium and iron oxides, both of which are sources of oxygen, a key ingredient for life, and an essential ingredient for human exploration. Hubble's Advanced Camera for Surveys imaged Aristarchus crater and nearby Schroter's Valley rille on Aug. 21, 2005. These images reveal fine-scale details of the crater's interior and exterior in ultraviolet and visible wavelengths at a scale of approximately 165 to 330 feet (50 to 100 meters) per picture element. These new ultraviolet-light observations, after being compared and calibrated against Hubble's ultraviolet-light observations of the Apollo 15 and 17 landing regions, will be used to quantify abundances of the titanium-bearing oxide ilmenite."

NASA Press Release – http://hubblesite.org/newscenter/newsdesk/archive/releases/2005/29/text/

NASA & OfficeMax Bring Space to You

With the click of a mouse, you can go to a local OfficeMax to pick up printed and collated copies of NASA mission and program data, pictures and other space-related information. NASA and OfficeMax, Incorporated, Itasca, Ill., have partnered to get agency printed materials into the hands of students, educators and the public quickly and easily. Educators and NASA enthusiasts, who download documents from the agency's Web site, can have the large files printed at the closest OfficeMax store. OfficeMax Print and Document Services facilities are offering savings up to 50 % on all materials printed from NASA's Web site.

Anyone can search free materials on NASA's Web site: www.nasa.gov/education/materials - Teachers and enthusiasts can either print the materials themselves or click the new OfficeMax icon on the NASA Web site. The materials will be professionally copied and collated for delivery, shipping or available for next-day pick up at the nearest OfficeMax store. In many cases, materials are lengthy and have numerous color pictures and graphics, which can take hours toi download. **<NASA/OfficeMax>**

Spirit on Mars , Three Days of Shooting "Everest" Panorama: 20−20 Vision

Press Release07-Nov-2005

'Everest' Panorama; 20-20 Vision Animations can be downloaded in high (7.2 MB) & and very high (43.8 MB) res from

marsrovers.jpl.nasa.gov/gallery/press/spirit/20051107a.html

If a human with perfect vision donned a spacesuit and stepped onto the martian surface, the view would be as clear as this sweeping panorama taken by NASA's Mars Exploration Rover Spirit. That's because the rover's panoramic camera has the equivalent of 20-20 vision. You can take a virtual tour of the scenery by zooming in on your computer screens many times to get a closer look at, say, a rock outcrop or a sand drift, without losing any detail. This level of clarity is unequaled in the history of Mars exploration.

It took Spirit three days, sols 620 to 622 (Oct. 1 to Oct. 3, 2005), to acquire all the images combined into this mosaic, called the "Everest Panorama," looking outward in every direction from the true summit of "Husband Hill." During that period, the sky changed in color and brightness due to atmospheric dust variations, as shown in contrasting sections of this mosaic. Haze occasionally obscured the view of the hills on the distant rim of Gusev Crater 80 kilometers (50 miles) away. As dust devils swooped across the horizon in the upper right portion of the panorama, the robotic explorer changed the filters on the camera from red to green to blue, making the dust devils appear red, green, and blue. In reality, the dust devils are similar in color to the reddish-brown soils of Mars. No attempt was made to "smooth" the sky in this mosaic, as has been done in other panoramic- camera mosaics to simulate the view one would get by taking in the landscape all at once. The result is a sweeping vista that allows viewers to observe weather changes on Mars.

The summit of Husband Hill is a broad plateau of rock outcrops and windblown drifts about 100 meters (300 feet) higher than the surrounding plains of Gusev Crater. In the distance, near the center of the mosaic, is the "South Basin," the destination for the downhill travel Spirit began after exploring the summit region.

This panorama spans 360 degrees and consists of images obtained during 81 individual pointings of the panoramic camera. Four filters were used at each pointing. Images through three of the filters, for wavelengths of 750 nanometers, 530 nanometers and 430 nanometers, were combined for this approximately true-color rendering.

The *Explore Europa* Campaign

From the Planetary Society

www.planetary.org/programs/projects/explore_europa/

There may be life out there beyond Earth...life with no connection to us, life with an ancient history of its own, that, if discovered, would rewrite natural history as we know it. That life may even be right here in our solar system. Close enough for us to reach, to examine, to awe us, to view in its natural environment, and to push our science forward.

We are speaking of the tantalizing Jovian moon Europa. In a solar system full of astonishing planets and moons, Europa stands out. Scientists believe that beneath its frozen, cracked surface, there may exist an enormous ocean of water, perhaps twice as much as all Earth's oceans.

The evidence for this -- knowledge gained during past missions, such as the twin Voyager probes and the Galileo orbiter -- is so compelling that just two years ago, the National Research Council's Decadal Study (a project of the U.S. National Academy of Science) deemed a mission to explore Europa to be of the highest scientific priority.

Yet today, there is no mission going to Europa. That's a terrible omission. So The Planetary Society is now launching our international Explore Europa Campaign to convince the world's space agencies to immediately unite and commit to sending a spacecraft to this intriguing world.

European Interest 04/22/05 - /www.planetary.org/news/2005/0422_European_Scientists_Convene_to_Chart.html

International Europa Task Force: Exploring Europa will be among the most challenging missions ever attempted, taxing to the limit even the most experienced space agency. Which means it may best and perhaps onlybe conducted -- if the spacefaring nations of Earth work together.

The Planetary Society is seizing the opportunity to move forward now by creating the International Europa Task Force. The IETF will bring together the most talented scientists and engineers -- many already working to convince space agencies of the importance of a Europa mission -- who can lay out the best possible way to explore this moon.

The first step in our Campaign will be to convince government and space agency leaders worldwide of the value and tnecessity of a mission to Europa. We are meeting with space program leaders in the U.S. and other nations that might play a role. Armed with facts, figures, and recommendations from Earth's leading planetary scientists and engineers, we'll show them that a mission to Europa couldll be among humankind's most glorious missions of exploration.

We will use our international reputation and clout to engage working scientists and engineers worldwide, harnessing their knowledge, expertise and desire for a Europa mission. A mission to Europa absolutely must be an inter-national effort, bringing together the human and financial resources of two or more of the world's space agencies to create a do-able mission to explore Europa. **TPS**

Lets' Build *Another* Solar Sail

From Louis Friedman, The Planetary Society

The Planetary Society and its Members took a bold and daring step in creating and launching the world's first-ever solar sail spacecraft. We were all incredibly proud.

As you probably know now, the worst occurred -- the Russian Volnya launch vehicle failed. Losing Cosmos 1 was a tough blow. But even though this was our first attempt, in no way is this the last time we aim for the stars.

From all over the Earth, the messages have been pouring in to the Society, and nearly all of them calling for the same thing: "Let's build the next solar sail!" Even the NASA engineers who are working on solar sail technology -- with no current flight plan -- are urging us to try again.

And that's just what we plan to do -- if we can gather the funds from our own members and private citizens around the world.

We feel confident that we can fly again
perhaps as soon as the end of next year

First, we need to secure funding for a new solar sail. And second, we need to find a more reliable launch vehicle. We will not fly on a Volna again.

In order to get going now, we'll use our existing and experienced team. But we must raise $250,000 right away to start the spacecraft work and negotiate with new launch vehicle suppliers, and to keep from losing our momentum.

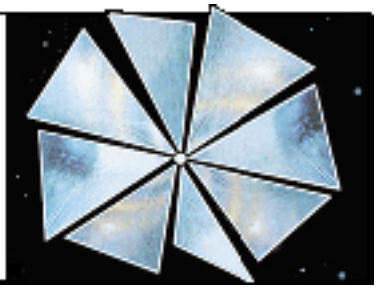
Contribute to the mission at:
https://planetary.org/donations.html

For all the projects we've done over the decades -- from SETI to the Mars Rovers and Mars Microphone, from linking space scientists in other countries with those in the U.S., to advocating missions to Mars and Pluto and Europa, and much, much more -- nothing has ever before brought forth the kind of spontaneous, grassroots reaction that our pioneering Cosmos 1 solar sail mission has.

Space is a very tough place. Exploring it constantly pushes us to the absolute limits of our creativity and innovation, testing us like nothing else. NASA knows this, as do all who have tried to enter space.

The Society will not quit. With supporters like you at our side we are again up for the challenge. I promise that your contribution will be immediately put to work creating a new solar sail and an even better chance at revolutionizing exploration through interstellar flight. **‹LF/TPS›**

There'll be a next time! The Stars Beckon and one day we will go! Kudos to the Planetary Society!



Rockets Away!

http://www.RocketsAway.net

Welcome to Rockets Away! Media,
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Virgin Galactic Clears Hurdles to Tourist Flights

http://www.virgingalactic.com/en/

"By the end of the decade, Virgin Galactic - the most exciting development in the story of modern space history - is planning to make it possible for almost anyone to visit the final frontier at an affordable price."

On July 27, 2005, at the EAA Oshkosh air show in Wisconsin, Sir Richard Branson and Burt Rutan announced their signing of an agreement to form The Spaceship Company — jointly owned by Virgin and Scaled Composites. This new company will manufacture launch aircraft, spaceships and support equipment and market them to spaceline operators, including the launch customer, Virgin Galactic.

Virgin Galactic has placed orders for five ships and two launch aircraft with options on further systems, thus securing the exclusive use of the systems for the initial 18 months of commercial passenger operations.

Test flights are on schedule to begin in 2007, with commercial operations to begin a year later. The cost to experience four to five minutes of weightlessness is about $200,000 (£113,242). The project was threatened earlier this year by US export control regulations. Virgin Galactic has collected $10m in deposits from people wanting a quick ride beyond Earth's atmosphere. **‹VG/SC›**

[Book Announcement]

HALLEY'S QUEST:
A SELFLESS GENIUS AND HIS TROUBLED PARAMORE

halleysquest.com

by Julie Wakefield – juliewakefield.com

"I want to notify Moon Society members about my first book, Halley's Quest, released October 11 by the Joseph Henry Press. It's a biography of Edmond Halley of comet fame but it talks a lot about his contributions to moon research."

List Price: $27.95 – Amazon.com **Price: $18.45**
Hardcover: 261 pages
Publisher: Joseph Henry Press (October 11, 2005)
Language: English
ISBN: 0309095948
Dimensions: 8.8 x 5.9 x 1.0 inches
***** **Average Customer Review:** based on 2 reviews.

"Halley's Quest takes readers on a trilogy of sea voyages, each of which proved to be as novel and revealing as it was difficult and controversial. But more than a yarn of risk and adventure, the story at the core of the book is a deeply personal and intellectual tale that captures the science and the spirit of an almost forgotten episode in the history of navigation. This delightful book emphasizes the drama of Halley's mission and the passion of an era hungry for the stories science had to tell. – *Joseph Henry Press*

[ESA Press Release N° 41-2005]

ESA selects Pair of Target Asteroids for *Don Quixote* Asteroid-Deflecting Mission

Based on the recommendations of asteroid experts, ESA has selected two target asteroids for its Near-Earth Object deflecting mission, Don Quijote. currently under study by ESA's Advanced Concepts Team (ACT). Earlier this year the NEO Mission Advisory panel (NEOMA) of well-known experts in the field, delivered its target selection report, identifying the relevant criteria for selecting a target and picking up two objects that meet most of those criteria. The temporary designations of the two asteroids are 2002 AT4 and 1989 ML.

The Advanced Concepts Team has completed an extensive assessment of suitable mission architectures, launch strategies, propulsion system options and experiments.

The current scenario envisages two spacecraft in separate interplanetary trajectories. One spacecraft (**Hidalgo**) will impact an asteroid, the other (**Sancho**) will arrive earlier at the target asteroid, rendezvous and orbit the asteroid for several months, observing it before and after the impact to detect any changes in its orbit.

Industrial studies are about to start to propose alternative solutions for the design of the low-cost NEO precursor mission. This will be the first step towards the development of a means to tackle asteroid impacts – one of the few natural disasters that our technology can prevent.

But every good performance needs rehearsing and in order to be ready for such a threat, we should try our hardware on a harmless asteroid first. Don Quijote would be the first mission to make such an attempt. The big question was: which asteroid and what should it be like?

Looking for the perfect target

The NEO population contains a confusing variety of objects, and deciding which physical parameters are most relevant for mitigation considerations is no trivial task. But in February 2005 the NEOMA experts provided ESA with their recommendations on the asteroid selection criteria for ESA's deflection rehearsal.

Will performing a deflection test, such as that planned for Don Quijote, represents any risk to our planet? What if things go wrong? Could we create a problem, rather than learn how to avoid one?

Experts worldwide say the answer is no. Even a very dramatic impact of a heavy spacecraft on a small asteroid would only result in a minuscule modification of the object's orbit. In fact the change would be so small that the Don Quijote mission requires two spacecraft – one to monitor the impact of the other. The second spacecraft measures the subtle variation of the object's orbital parameters that would not be noticeable from Earth.

Target objects can also be selected so that all possible concerns are avoided altogether, by looking into the way the distance between the asteroid's and the Earth's orbits changes with time. If the target asteroid is not an 'Earth crosser', as is the case with NEOs in the 'Amor' class (orbits with perihelion distance well over 1 AU), testing a deflection maneuver represents no risk to the Earth.

Other considerations related to the orbit of the target asteroid are also important, especially the change of orbital velocity that is required by the spacecraft to 'catch up' with the target asteroid – the so-called 'delta V'. This should be sufficiently small to minimize the required amount of spacecraft propellant and enable the use of cheaper launchers, but high enough to allow the same spacecraft to be used with a number of possible targets. Navigation and deflection measurements requirements set some heavy constraints on the target selection. The shape, density, and size are all important factors, but are often poorly known. A spacecraft orbiting an asteroid needs to know about the object's gravitational field in order to navigate. The 'impactor spacecraft' must know the position of the center of mass to define the point it is aiming for.

ESA has selected asteroids 2002 AT4 and (10302) 1989 ML as mission targets because they re resent best compromise among all the (sometimes conflicting) selection criteria. A decision on which of the two will become the final destination of both Sancho and Hidalgo spacecraft will be made in 2007. Spacecraft Design is next on the agenda.

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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(*Board Members & Ken Paul < kenpaul@cape-mac.org >)

LRS Upcoming Events – November, December

Saturday, November 12th, 1–4 pm

LRS Meeting, Mayfair Mall, Garden Suites Room G110
AGENDA: www. lunar-reclamation.org/page4.htm

Show & Tell: a 16" inflatable Moon Globe with a realistic, as seen from space look. **Update on the Moon Society Mission to Mars Desert Research Station. Brainstorming** some project ideas for this mission.
Stuffing Envelopes: Invitiations to our annual Holiday Party

Saturday, December 10th, 1–4 pm

LRS Meeting, Mayfair Mall, Garden Suites Room G110
AGENDA: www. lunar-reclamation.org/page4.htm

Annual pre-Holiday Potluck & Classic Sci-Fi Film

"**Stranded**" - a 2001 made in Spain (English) about a mission to Mars in which the Crew is stranded, but finds something unexpected! (92 minutes) Starts 2 pm.

- Joint event of LRS and the Wisconsin Mars Society with former members and NSS members invited
- Exhibit materials about the upcoming Moon Society/ LRS Mission to the Mars Desert Research Station in Utah, February 25- March 12,2006.
- Unannounced Goodies & Door Prizes
- Pot luck 1-2 om: no guidelines, bring something to share, home made or purchased, hot or cold, solid or liquid, your choice.

U.S. CHAPTERS

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Space Chapters HUB Website:
[http://nsschapters.org/hub/]

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**
November 19 – December 17 – January. 21

MINNESOTA

Minnesota Space Frontier Society

c/o Dave Buth 433 South 7th St. #1808
Minneapolis, MN 55415

Tom Greenwalt (w) 763-784-6244 (h) 763-442-6015
David Buth (w) (612) 333-1872, (h) (763) 536-1237
Email: tomg@mnsfs.org

[www.mnsfs.org/]

MN SFS News & Pictures

Ben reaches lofty SETI @home milestone

Ben Huset reported on October 10th that he had crunched 7,000 SETI@home units. That amounts to 7.989 years of Total CPU time. SETI@home is a scientific experiment using Internet-connected computers in the Search for Extraterrestrial Intelligence (SETI). Participants run a free program that downloads and analyzes radio telescope data.
Tues., Nov. 8th Meeting: continuation of October's meeting. Gaia theory, or Earth Systems Science, part 2. Rockford Road Public Library, 6401 42nd Ave. N., Crystal, MN

Gleason-Lake-Family-Sci-Nite Pix

http://freemars.org/mnfan/mnsfs/2005-Gleason-Lake-Family-Sci-Nite/

WISCONSIN

Sheboygan Space Society

728 Center St., Kiel WI 54042-1034

c/o Will Foerster 920-894-2376 (h) <willf@tcei.com>
SSS Sec. Harald Schenk <hschenk@excel.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 Thursday** of the month at **7-9pm**
NOV 17th: UW-Sheboygan, Room 6101, **Sheboygan**
Dec.15th The Stoelting House, **Kiel**
JAN 19th UW-Sheboygan, Room 6101, **Sheboygan**

PENNSYLVANIA

Philadelphia Area Space Alliance

PO Box 1715, Philadelphia, PA 19105

c/o Earl Bennett, EarlBennett@erols.com
215/633-0878 (H), 610/640-2345(W)

[http://pasa01.tripod.com/]

PASA regular business luncheon/formal meeting from **1-3 pm**, the **3rd Saturday** of every month 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 or Mitch 215-625-0670 to verify all meetings.

Next Meetings: Nov. 19 (Philcon*) – Dec. 17 – Jan. 21
*we gather at this event for lunch or dinner at some point

October Meeting Notes: Pre Meeting: We had a rather wide ranging discussion before the scheduled reports with Gregory Olsen from New Jersey (and President of Sensors Unlimited) taking a one week trip to the ISS.. This was subsequently brought up also by Mitch Gordon who brought a report from The Metro paper on the flight. Mitch also brought copies of Ad Astra, the publication of The National Space Society, for our members who may not belong to this organization. Others will be given at Philcon.

Meeting Notes: We had a brief financial report from Michelle Baker, our treasurer. it was short and sweet: no checks in but no bills received. She will look into an N.S.S. new member payment reimbursement we are due.

Mitch Gordon gave the primary report on our enjoy-able Franklin Institute outreach event. We where invited, through Mitch's efforts, to exhibit at the Institute as part of International Space Week We presented information and did science demonstrations, with discussion, on October 1st and 2nd. We had material from several organizations with special attention being given to Mars and the Moon. As always I talked of the needs for low cost launchers and using off Earth resources and Mitch emphasized the need for access so that tourists and entrepreneurs could do fun and interesting things in space. His emphasis is often on jewelry and consumer oriented interests and future biotech that could be done in space. We where joined on Sunday by Michelle Baker This addition allowed us to handle almost everything that the visitors could toss our way.

We had the very popular Space Bricks developed by Peter Kokh as well as some other demonstration material: The kilogram of science, which is used in several talks, a small satellite model (more later) . Also: I brought some magnetic demonstration material (more later) and. This was used to explain the operation of the mass driver and other systems. Mitch wants to bring more material on the L-5 ideas of open public spaces and friendly environments that attracted many people to the concept of space for everyone. He may start this at Philcon or soon after.

Hank Smith apprised us of the upcoming Philcon event that we may participate in with David Weber for writer GOH. and David Mattingly as Artist GOH. Hank had information on possible panel subjects and confirmation of one talk that brings standing room only. Michele's on J.P.L. activities. Due to various reasons Hank is assisting the head of science programing this year. We have a number of members who have been part of events at Philcon and will have to get back to Hank and the head, Mark Wolverton, on the members who can be of service in December. Philcon will be held next year at The Wyndham Franklin Plaza just off of the Benjamin Franklin Parkway, our french Boulevard.

Janice Guidotti brought material from our new blog site (phillypasa.blogspot.com) where I have posted a greeting to browsers and several members, including Janice, have posted material to converse about on line. She also brought material from NASA's websites: "Astrobiology Magazine" and "Earth Observatory" are both on line. The current Astrobiology had an article on life in unusual Earth environments that pointed to possibilities of life elsewhere. Thisse in addition to NASA's print publications. The center that does exobiology now (as its specialty) was almost closed once as a cost saving move. My editorial comment.

Earl Bennett talked on several subjects including: Our great time at the Franklin Institute and the science exhibits I brought and the public participation items we use. Derrick Pitts, the Institute's chief Astronomer, came by to to us, but also answered questions that we couldn't answer or needed help with. He liked Peter Kokh's Space Bricks and

we may see something like them at the museum. Although we didn't have huge crowds (a overdue sunny weekend) the crowd was impressive. To misquote Garrison Keiler: All of the children were above average with caring parents who where doing what they could. Due to its reputation, the Institute audience came from all over the world. American Muslims, Indian Hindus, Japanese, Chines, Britts and others.

On our display: I will try to send pictures later of the exhibit (Mitch will mail some to NSS also) but will give a short outline: On the left end was our demonstration area where I did several magnetic interaction demonstrations. One involves a copper tube and a weak and a strong permanent magnet that are dropped down the tube separately. The guests see the effect of the high field interacting with the conductive tubing,a plastic tubes rate of fall being available for additional comparison. This led to another demo using a spinning, multiple poled magnet that interacted with a long magnet that children could hold to give them a feeling of the interaction (magic!). Finally I used a small coil to show the moving magnet generating electricity. this was all brought together in the explanation of the operation of the Mass Driver, and both why we might need it and why we might only ship freight with it initially,and other devices that might use magnetic interactions. The Kilo gram of Science was part of this but was also used to introduce the Funsat concept previously reported (a program for students at the college level (not sure if it extends to high school seniors.) The school can work with students to compete for a chance to design and build a small satellite tol be launched into orbit. Weight limit one kilogram. Sze limit (stowed) is a 4 inch cube. I built a simple (mirror film coated cardboard) model to hand around for "making it real" as well as the kilogram mass (most of this audience understood "weight" and "mass" at least as well as I do) with a number of eyes lighting up at this future "school project".

Next came part of our Mars Society display and free stuff material. In the mid section we had a Mars Globe, thanks to Gary Fisher our Mars Society & Mars Homestead Project coordinator, with much public interest in findings there. To the right was material on the Moon, which started conversation on what we had done and the White House's announced plans, and the other part of The Mars Society display. Several children picked up free buttons we brought while the adults listened to our talks on doing things in the way Robert Zubrin first described and Nasa subsequently partially adopted (although certainly not on our timeline).

We where not alone in this forum: members of a Princeton amateur Astronomical society and Kenneth Kremer (Ph.D.) representing The Planetary Society on Saturday. His great set up included free Planetary & NASA material. He also brought a video projector with material on the Spirit and Opportunity missions. Unfortunately he was unable to do both days but he gave us material to pass on to the public.

And lastly: On Sunday Michelle and I did not go see "Magnificent Desolation" at the Franklin Institutes, IMAX Theater. However, we did see Story Musgrave give an excellent presentation both on his own childhood and how he developed into the man who could design the tools to mount the optical systems and the equipment to install the fix the problems subsequently found in the primary system. He has also published a book and it is currently available. We missed the other guest Guy Buford who is our own Philadelphia Astronaut. Luckily he is our astronaut and we can catch him at another venue. Submitted by Earl Bennett

CALI FORNIA

OASIS: Organization for the **A**dvancement of **S**pace **I**ndustrialization and **S**ettlement
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/]

oasis@oasis-nss.org
Odyssey Newsletter Online
http://www.oasis-nss.org/articles.html

Regular Meeting 3 pm 3rd Sat. each month
Microcosm, 401 Coral Circle, El Segundo.
NEXT MEETINGS: Nov. 19 – Dec. 17 – Jan.. 21
Information: OASIS Hotline, 310/364-2290; website.

Upcoming Events

- **"From Darkness to Light: The Exploration of the Planet Pluto"** by Dr. Bonnie Buratti, JPL Principal Investigator & Science Team, New Horizons Mission to Pluto.

  Thurs Nov. 17th, 7:00 pm - Von Kármán Auditorium at JPL, 4800 Oak Grove Dr, Pasadena

  Fri. Nov.18th, 7:00 pm Von Kármán Auditorium at Pasadena City College, 1570 E Colorado Blvd.

  Sponsored by Theodore von Kármán Lecture Series. Free. Broadcast & webcast on NASA TV. 818/354-0112 or http://www.jpl.nasa.gov/events/lectures/nov05.cfm.

- **Sat. Nov. 19th,** starting at 3:00 *p.m.* at the home of Steve Barlett and Tina Beychok, 7108 *E.* Peabody Street, Long Beach.
- **Fri_Sun. Nov. 25–27th,** *OASIS* will be providing science programming for **LosCon** and we will be finalizing perparations for the event at the Nov. 19th meeting (time & location above).

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=>for those outside participating chapter areas <=

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Moon Miners' MANIFESTO

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