

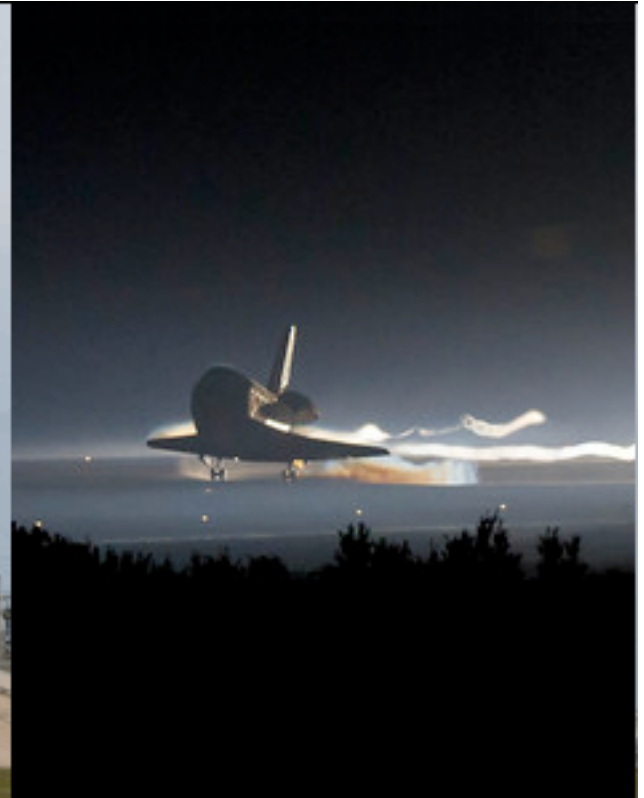
Moon Miners' Manifesto

& The Moon Society Journal

www.MoonMinersManifesto.com

#247

AUGUST 2011



L: Atlantis sits on the launch pad ready for the last shuttle launch, R: the last Shuttle landing – end of an era

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Von Braun's concept for a space station & shuttle

At right is a famous painting showing von Braun's concept of a 100-person rotating space station and a shuttle and its booster, in space nearby. His ideas were ignored as too costly, and remain "a path not taken." Where would we be today if his vision was given more attention? We'll never know.

IN FOCUS Why it was/is necessary to end the Space Shuttle Program

Personal opinion by Peter Kokh

The Space Shuttle seemed like a great idea when we first heard about it. Then it was a proposal of Wernher von Braun, legendary rocket scientist at Penemunde in Germany, behind the V-2. But the space shuttle and station we got bore little resemblance to what he had in mind. (see below) [=> p. 2, col. 2]



Moon Miners' Manifesto

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

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

www.MoonSociety.org/publications/mmm_classics/

• **MMM Glossary: new terms, old terms with new meanings:**

<http://www.moonsociety.org/publications/m3glossary.html>

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

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

• **MMM retains its editorial independence.** MMM serves many groups, each with its own philosophy, agenda, and programs. Participation in this newsletter, while it suggests overall satisfaction with themes and treatment, requires no other litmus test.

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• **The National Space Society** is a grassroots pro-space membership organization, with 10,000 members and 50 chapters, dedicated to the creation of a spacefaring civilization.

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

• **Submissions by email** to KokhMMM@aol.com - Email message body text or MS Word, Texr files, pdf attachments

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Moon Miners' Manifesto, c/o Peter Kokh,

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⇒ In Focus Editorial continued from p. 1.

The Shuttle we got was "redesigned" by a political committee, not one of space engineers and scientists. Worse, Congress demanded it be designed so that the US Air Force could use it as well, and this demanded further expensive compromises. What we got was a mule not a thoroughbred horse.

The Shuttle sales pitch plugged its "economy." Wisconsin Senator William Proxmire warned that "the cost to build and cost to fly figures" were fiction. Back then many of us resented Proxmire, especially those of us from Wisconsin. But Proxmire had been right on.

"The shuttle did not turn out like we planned," Dr.

Story Musgrave told The Huffington Post. "It was going to [fly] 66 times a year and it ended up with about five times a year. It was going to cost \$10 million a flight, and two months ago, an independent study showed that it cost \$1.2 billion a flight. It was massively fragile, difficult to operate and exceedingly dangerous."

The idea that crew & cargo should fly together in one conjoined vehicle was also intrinsically flawed. Cargo on the shuttle flew at a much higher cost due to the extra expense of man-rating. Crew flew at extra expense because they were carrying a one-size-fits-all cargo hold/payload bay. That all new crew vehicles in development will carry crew only, says enough. The modular language is always best, compatible units with each having a number of versions tailored for the specific mission, brings maximum economy.

The big lie was that the shuttle was reusable. In truth, the shuttle was "overhaulable" not "reusable," requiring 10,000 man-hours to turn around. Can you imagine how much a flight would cost you if at each intermediate stop your plane required 10,000 man-hours to get ready for take off to the next airport?

All these man-hours were necessary because the Shuttle main engines, once fired, need a complete overhaul, and because we needed to rebuild the shuttle tile protection system, as labor-intensive a system as could be devised, one necessary only because NASA preferred a particular angle of attack on reentering the atmosphere, one considered unnecessary by others.

Space enthusiasts wanted the External Tanks put in a safe parking orbit for future use. Congress ordered NASA to do so. NASA found an out - they would do so only if someone contracted them to do so. "We'll show you who's the boss!" Each ET cost \$50 to start with, this figure growing to over \$173 million over time - *what was that about each Shuttle launch costing only \$100 million dollars?* The throwaway mentality has ruled long enough.

The Shuttle worked, **yes!** It did great things, **yes!** We are proud of it, **yes!** No one else has built such a capable transport system, **yes!** But NASA did so in a way that made no sense and which would be unsustainable in the long run. Not learning its lesson, NASA was on its way to build the Constellation system. The NASA program is a *socialized space program*: Not exactly "as American as Apple Pie." *It's time to let the Commercials have at it.* Americans have gloried in the Shuttle. But the Shuttle did not make use of the best of the American way. The real future is ahead of us. **PK**



What many do not know: Space Activists worked hard to put an end to the Shuttle Era

Personal commentary by Peter Kokh

The Space Shuttle has been flying for 30 years, longer than many of today's ardent space fans have been alive. It is understandable that they do not know the role space enthusiasts of older generations played in getting the government to sign on to a space shuttle system, let alone the considerable effort many of these same enthusiasts waged to get the George W. Bush Administration to sign on to a "Sunset" act forcing the Shuttle system into retirement.

"Say what?"

The previous commentary explains some of the Shuttle's several serious shortcomings. Most important, as a socialized space program, NASA and its flagship Space Transportation System worked rather effectively to discourage competition by commercial companies that would have been more in tune with our loudly proclaimed support for "free enterprise." Indeed, one often hears distrustful remarks that private enterprise could not do it right or safely. Er, how "American" is a comment like that?

There has been a strong minority element in the Space Enthusiast movement for decades that would go even deeper: either disband NASA altogether or break it up into so many independent centers that would compete with one another. As radical a thought as that was, given the heavy involvement of senators and representatives in states and districts where NASA was spending its money and hiring their constituents, a certain amount of political mischief would have been bound to occur anyway. Private enterprise is rightly

subject to government regulation, but not to government decision making on "what is built where by whom."

Enthusiast worked hard to get Nixon to okay the Shuttle System. Then frustrated that the Shuttle was going nowhere in particular in space, lobbied for the Shuttle-Mir program, which had great public support and interest.

Then we lobbied hard for the Space Station. The proposed station "Freedom" kept getting cut back, first to "Fred" then to "Fried!" It was not sufficiently popular in Congress. There has been a false impression that Republicans are more supportive of Space than Democrats. However JFK and Johnson were Democrats; Nixon who canned Apollo a Republican. No Republican had succeeded in getting the Station through Congress, until Democrat Clinton pushed the Station as a way to keep unemployed ex-Soviet scientists "out of mischief." The truth is that space has enjoyed wide bi-partisan support and such finger pointing only serves to create a negative environment.

More importantly, Space needs to be taken out of the political environment altogether. Nothing logical can come out of the political process as votes are decided on non-germane grounds way too often, and irrational results are to be expected.

When the space enthusiasts who has worked so hard to get the shuttle program and the space station program adopted saw the twisted irrational results after each had survived the political approval process, and how the program that they had initially supported was undercutting free enterprise, we (yes, I am proud to have been one of them) began to work hard to get a Space Shuttle "Sunset Act" written and passed. Bush approved it, dedicated as he was to free enterprise, and the COTS Program was initiated to assist commercial rocket companies financially to come up with viable alternative vehicles that could bring cargo and crews to the space station at much less cost. This program is on the verge of success. Space-X Falcon 9 and Dragon cargo vessels have already proven themselves. Falcon Heavy promises to be the 2nd most powerful booster ever at tremendous cost savings per pound to orbit. NASA has approved for the next Dragon capsule to dock with the station.

There is opposition! It comes from other national space agencies, notably Roscosmos, which has a stranglehold on station access at the moment.

It has been a decades-long effort for free enterprise space advocates. Hopefully, the fruit of our vision will result in something NASA could never have achieved: opening space not just for some holy priesthood of government astronauts, but for all of us. Those of us who dream of pioneer frontiers on the Moon and Mars should be especially encouraged. Governments may support space exploration, but, at least not now, not yet, *space settlement*.

The goal is not Earthlings exploring space. The goal is Earthlings leaving Earth behind, and becoming an interplanetary species, just as Africans left Africa to become an intercontinental species.

"The World" is "Wherever we are and live." PK

Anatomy of a Moon Day

By Ken Murphy

Who, What, Where

A little over three years ago, the Frontiers of Flight Museum at Love Field in Dallas approached the North Texas chapter of the National Space Society about putting together an event to honor the fourth decadal anniversary of the Apollo 11 Moon landing on July 20, 1969. Rather than limit the event to a single 40-year-old historical event, it was proposed instead to broaden the theme to "A Celebration of Space Exploration", and show off the diversity of space content found in the Dallas/Fort Worth metroplex.

A chance to learn about the Moon, and so much more!

In 2011, Moon Day was more successful than ever, and promises to be even bigger in 2012. How did this come about? Let's take a look at how the event was put together, with the goal being to inspire the reader to consider organizing space-themed events that teach about the Moon in their own communities.

Hosting Options

The first consideration is venue. Public events can be held in libraries, restaurants, community centers, and many other locales. In the case of Moon Day, Frontiers of Flight (FoF) approached NSS of NT and provided the venue without expense. In return, all ticket sales at the door are kept by the museum, as they have to cover electricity for lighting and A/C, and other overhead expenses. Restaurants tend to prefer that attendees at the public event purchase a minimum amount of food. The requirements may vary, but usually some venue can be procured for no expense to the organizers.

Content

Once space has been secured, it has to be filled with content. The strategy that has evolved with Moon Day is: **Exhibits, Speakers, Handouts**

Exhibits

In the case of exhibits, the substantial main floor of the museum is available. This year Moon Day filled approximately 2/3rds of the floor space, indicating that there remains room for more exhibitors in the future. *Local organizations that touch on space topics are invited to have booth space at no charge at the event.* This is one difference from typical space conferences, in that exhibitors are usually charged some fee for the space that is applied to the overhead of the conference. Moon Day recognizes that the exhibitors are incurring expenses just by being there, and we want them to be there to show off their stuff.

So who are the exhibitors? **NSS of NT**, as co-host of the event, usually has a six-table display. The **local astronomy societies** come out to share their telescopes and provide opportunities to look safely at the Sun, hoping to encourage visitors to become interested and join the club. The **UT Arlington Planetarium** always has a table, where they encourage visitors to sign up for their monthly newsletter, and advertise their annual Astronomy Day in October. The **UNT Planetarium** turned out last year, and will be back next year, to help let people know about their shows

up in Denton. One of our local **JPL Solar System Ambassadors (SSA)** shows off her Moon materials to let people know that she'll come talk to your school or home schooling group about the Moon and space exploration.

This year the **Dallas Mars Society** is hosting the annual conference in Dallas, and used their booth to highlight the event and get people excited. This year **The Moon Society** had a booth with the Space-Based Solar Power satellite demonstrator, genuine fake Moon rocks, Earth/Moon/Mars gravity bricks (very popular) and a Moon-base diorama.

The **Civil Air Patrol** showed off their aerospace programs to encourage interest in youngsters joining CAP. The **Dallas Area Rocket Society** showed off tons of cool rockets and highlighted their monthly launches up in Frisco. The **Museum of Nature & Science** hauled out their portable planetarium that can do events at schools and other venues. The **Astronaut Training Center** is going mobile, and highlighted the Space Camp-type activities that they can bring to your locale. **Spaceminers.org** brought out their tether-climber, which we hope to make mobile for next year. The **UT Dallas Center for Space Sciences** highlighted their *Cindi in Space* comic, produced as part of the EPO budget for the CINDI mission to study the upper atmosphere. Cindi was there in costume as well. Last year the **Texas Meteorite Laboratory** down in Austin showed off commercially available meteorites, and **Armadillo Aerospace** out in Caddo Mills showed off some rocket parts.

Future plans include the **Boy Scouts**, who have a new STEM project in the works as well as many topical merit badges like engineering, robotics, and space exploration (which merit badge pamphlet NSS of NT is in the process of updating for the post-Shuttle era), and the **Monnig Meteorite Gallery** at TCU in Fort Worth, which is one of the largest collections of meteorites in the world, and the **Dallas Personal Robotics Group**. As you can see, the exhibitors are limited only by creativity. We've even had displays from telescope and bookstores.

Speakers

As the event has grown, our strategy for speakers has evolved. In prior years, with only four hours to work with, it was relatively easy to figure out what to do with speakers: a few in the auditorium, a few in the conference rooms, and a few in the classrooms. Content was whatever we could scare up.

- A local professor at Brookhaven College offered a class using the Lucite disk of Moon rocks from JSC. An SSA offered to run her Toys in Space class.
- A local UT Dallas professor turns out to have been involved in the creation of Lunar regolith simulant, another to have studied the Lunar atmosphere during Apollo 11 and with instruments on Mars.
- Yet another to have been involved with the teams that studied the returned Lunar samples.
- A professor at UNT, and another SSA, has given talks on the origins of the Moon and asteroids, and has offered meteorite door prizes

For next year, we are formalizing the different speaking tracks a bit. The downstairs classrooms have generally been geared more towards family-friendly presentations like the Moon rock disks and Toys in Space. This year another SSA added a class on Exploring the Solar System with a comet-building activity. Next year still another SSA is going to offer a Moon class with crater-making exercise. And the local rocket club will be back with a rocket-building class in the model shop. The museum is going to arrange a Moon Academy structure that will allow kids who take a certain number of classes to earn a certificate of accomplishment.

The talks in the upstairs conference rooms have always been geared towards those with a higher level of academic accomplishment, generally high-school level and up. Next year this will be formalized into the **Lunar University track**. The auditorium is generally reserved for top-name speakers. My dream team is to have Richard Garriott and Anousheh Ansari come speak about their ISS experience. We also use the auditorium to screen the independently-produced space exploration film "**Postcards from the Future**".

Handouts

So with displays and speakers covered, the last things to cover are handouts. These are procured by requests sent to many, many organizations and institutions that may have publicity or informational material for distribution. Of the many, many requests, perhaps half will reply, and half again will supply something to distribute.

Many places and organizations are moving to online only materials, with the expectation that the end-user such as a school or space club will cover the printing costs. It is unlikely that your organization has the budget for printing expenses, so *the best strategy is to not pay for someone else's publicity*. These may be desirable materials, but one of the quickest ways a club can empty its treasury is a printing binge.

We want to be sure that the kids take home appropriate materials and so we provide a "**Lunar Sample Bag**" at the door with a number of materials already included, and to which they can add as they wander the museum. We've been able to find underwriting for the last two years for the bags, and so have had inexpensive over-the-shoulder messenger bags with the underwriter's web address printed on them. The first year we used white kitchen garbage bags, because the budget was, and remains \$0.

Because of this rather constrained budget, **advertising the event, usually starting about a month out**, requires old school grassroots efforts, but with a modern twist. An 8.5x11" flyer is produced for distribution to all of the participants. It can be printed up in small batches and hung at workplaces, bookstores, coffee shops, record stores, any place that has a community bulletin board, or is willing to hang it in the window. This gets the event in front of eyeballs the old fashioned way.

The other stratagem is to put the event on as many online local event calendars as possible, so that as people are looking for things to do the new-fashioned way they will stumble across the listing.

Keywords describing the event are an important consideration for search result returns.

Persistence

The main thing is not to get discouraged. The turnout at your first event may be spotty at best as no one knows what to expect. The first time NSS of NT did a World Space Week event at Frontiers of Flight there were no more than a handful of visitors over the course of the day. The first Moon Day did okay, with over 500 attendees, but attendance the second year slipped noticeably, and there was a great deal of uncertainty as to whether there would be a third. Sophomore efforts are always more difficult. The third Moon Day turned out to be better than ever, with the promise of an even grander one next year.

Finding Speakers

That's the basic architecture of Moon Day. Your local team need not shoot quite so high in your first effort. You might start out with some well-advertised guest speakers at your Moon Society meetings. Find out if they'd be willing to do other Moon-related outreach, and start planning accordingly. A great place for a first event is your local library. This need be nothing more grandiose than a speaker or two, a Moon Society display, and maybe some readings from Moon-themed picture books.

There's a line from a Ben Bova novel that helps keep the protagonist going as he overcomes hurdle after obstacle. "*If it's to be, it's up to me.*"

No one other than The Moon Society is really positioned to convey the importance of the Moon in our future efforts as a society and a civilization. It's up to us to educate people in our communities as to just how important a role the Moon will play as we face the challenges of space exploration and our own planet.

If we don't do it, who will?

KM

Editor's Comments:

Another way around handout **printing costs** is to print just one sheet with links to printable material with a brief description of each. This way, *the end user pays* the printing costs, and only of those items in which he or she is really interested. Most often, people pick up everything without examination, and when they look over their horde back at home, most of it goes in the waste basket. Ken's "Sample Bag" is a great idea.

Exhibits are the key to getting attention to handout material, so it makes more sense to invest in exhibits that you can use again and again. Exhibits tied to speakers can help boost their talk attendance.

A new upcoming Moon Event

International Observe the Moon Night - Oct. 8, 2011

<http://observethemoonnight.org/>

This event invites the world to look up and learn about the Moon. It's surprising how many new discoveries about the Moon don't make it into the heads of Joe six-pack and his kids. Since the 1990s, many spacecraft have visited the Moon from so many nations! Yet, despite the wealth of new info, no available public school book contains lunar science results that come from modern exploration. It's time to change what people know about the Moon.

MMM

Moon Mining Machines: A Materials Challenge

By David Dietzler

Editor: Dave sends submits this article with a note:

"I hope it gets the point across to the reader that we need to start looking at things built for the Moon and on the Moon of lunar mats rather than continuing to design ultra-light aerospace grade payloads that are rocketed to the Moon."

I have the utmost respect for Matthew E. Gajda, his associates at the University of Wisconsin, and their Mark 3 lunar volatiles miner designs. See:

<http://fti.neep.wisc.edu/pdf/fdm1304.pdf>

I have no doubt that this will evolve into even better machines in the future. We really have no other design for a Moon mining machine to base any projections on. However, the design relies on materials like Ti-6Al-4V, Ti-6Al-6V-2Sn, Molybdenum alloy, stainless steel and carbon-carbon that are not to be had on the Moon. In the future, we need to see designs for vehicles, mining machines, even trains based on lunar available materials. Tin, vanadium, zirconium, and molybdenum are not available on the Moon unless we rocket them in at great cost. Chromium and manganese are present in regolith but not in large concentrations. Carbon in the form of solar wind implanted volatiles and possibly from polar ices will be needed mostly for life support systems and what little there is for Industrial uses will be needed for tool steels, electric motor winding insulation and silicone lubricants.

The lunan engineers will have to figure out how to build things from straight titanium, titanium-aluminum alloys and titanium aluminides. There will be plain aluminum, aluminum-silicon alloys, and aluminum alloys with various amounts of magnesium, manganese and chromium. Magnesium can be alloyed with lunar aluminum, silicon, manganese and possibly thorium. These aren't the best alloys but they will have to do. Nickel might turn out to be the lunan engineers' savior. Carbon free **maraging steels** can be made by alloying iron with 18 to 25% nickel.

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

There is very little nickel in regolith, but it is easy to extract. Meteoric particles containing 5% to 10% nickel are present in regolith at concentrations of a few tenths of a percent. These can be extracted magnetically extracted by harvestors that process millions of tons of regolith every year. The nickel can be separated from the meteoric iron with carbon monoxide gas or by electrodynamic devices similar to mass spectrometers. There won't be much cobalt, niobium or molybdenum for maraging steels but there should be plenty of titanium and some chromium to alloy them with.

At www.makeitfrom.com/data/?material=Maraging_Steel we read, "C-type grades contain cobalt, which is the main strengthening agent in the alloy. T-type grades contain no cobalt, and use titanium in the same role. Despite significant differences in composition, mechanical properties do not vary significantly between the two types:

- (1) used in rocket parts, recoil springs, landing gear components, high-performance machine parts (including shafts, gears, and fasteners), and
- (2) in extrusion and casting tooling."

Vacuum welding will be a problem that Lunan engineers will have to deal with. This can be prevented by making metal parts that come in contact out of dissimilar metals with different microcrystalline structures. So we might see titanium gears bolted in with maraging steel bolts and combinations of intermeshing maraging steel and titanium gears. Solid lubricants can also prevent vacuum welding, but molybdenum and tungsten for sulfide solid lubricants are lacking on the Moon. We might make do with cheap iron sulfide.

Pure iron might be used for low stress applications but otherwise won't have much use in machinery. Iron-aluminides are very strong and corrosion resistant but lack ductility. Magnesium might be used for reflectors and low stress applications that demand low weight. Glass fibers, glass cloth, and glass-glass composites might find uses (e.g. farings, coverings). Basalt might be used for its high abrasion resistance. Tubes that convey regolith and basalt coatings on mining buckets come to mind. Basalt is very hard but brittle. A basalt-coated bucket handling powdery moon dust should be okay unless it hits a rock and cracks.

Many terrestrial exotic alloys are made for high strength and lightweight for aircraft applications. This won't be so important on the Moon when it comes to ground vehicles and mining machines. Earthly alloys are also made for high temperature operation in jet engines and internal combustion engines. There won't be many combustion engines on the Moon, with the exception of Moon made rockets. Mining machines will use electric motors cooled with sulfur dioxide gas perhaps and the highest temperatures they will encounter will be about 250 F. during the lunar day.

Corrosion resistance won't be that important on the airless, dry, salt water free Moon. Exceptions to the above statements will be volatiles miners that have to heat regolith up to 700 C. to unleash solar wind implanted light elements in the form of H₂O, CO, CO₂, CH₄, N₂ and He. If sulfur is to be extracted thermally, higher temperatures will be needed and the possibility of sulfuric acid formation arises. Iron and nickel aluminides might be used instead of stainless steel in volatiles miners.

Engineers determine the stress on parts in machinery and figure out how stout a part made of a given alloy must be. They will have to "beef up" parts made of any "second-best" alloys producible on the Moon. This would not be good for a machine that is to be rocketed up to the Moon because mass must be kept low; but for machines made on the Moon, weight won't be an issue. *It might even help to make lunar machines more massive* so they can get more traction in low lunar gravity.

Machinability, weldability, ductility and ease of forming are also factors that engineers consider when they select materials. We can only hope that Lunan manufacturing engineers are able to figure out how to work with lunar available materials.

Commercially pure titanium is said to be easily-formed. I am not a metallurgist or engineer, but I've heard repeated complaints from an engineer friend about the problems with welding Ti-6Al-4V in a vacuum. It seems the aluminum boils out of the alloy.

The bottom line is this: We can land 1,000 tons of cargo in the form of 100 Mark 3 or more advanced Mark 4 or Mark 5 miners at ten tons each – or we can land 1,000 tons of production machinery and bootstrap up factories for making as many volatiles miners, excavators, bulldozers, slushers, drag lines and other equipment that we want. If these Moon-made machines have to be twice as heavy using thicker parts made from weaker lunar materials instead of exotic alloys available on Earth – it just won't matter. The cost of rocket transport from Earth will always be higher than making things on the Moon once industrial infrastructure is built there, or so we reckon.

The umbilical cord to mother Earth has to be cut. DD

Star Trek Replicators for Spaceships, Outposts

<http://www.youtube.com/watch?v=ZboxMsSz5Aw>

Enthusiasm about this process needs to be tempered with reality checks.

Plusses – you get what you need right away.' The data needed can be sent from Earth at the speed of light.

Minuses – You have to have the powder supply – *and if you can't produce that from materials where you are*, you must import it, and that takes time and money. if it is not included in setting up your post.

On Mars, you may be able to make such powder on site if the secret ingredients are each easy to extract from the atmosphere or marsdust where you are.

On the Moon most likely this powder must be supplied before hand, so this would be more expensive than just shipping replacement items, but can be done in anticipation of needs.

This works for items whose need is unanticipated. But is not a way to cut overall imports. While the powder can be more expensive than the parts themselves, the advantage is instant manufacture when needed, avoid having to wait until the next rocket from Earth can be scheduled etc.

Now if we can print out of a "powder" easily produced from easily extracted elements common in moondust anywhere, then we will be in business.

Relevant Links: <http://boingboing.net/2009/04/09/homemade-3d-printer.htm>

Lunar Iron and Alloys of Iron

By Dave Dietzler

(Continuing the thread from the article above)

Also of interest are iron-aluminides. These contain 10–30% Al by wt. and have excellent corrosion and oxidation resistance similar to stainless steel. They have also been under investigation for high temperature mechanical properties. At lunar day span temperature of 123 C. the Fe-Al alloy designated FAS (15.9% Al, 2.2% Cr, 0.01% B,) has a UTS of 109,000 psi with an elongation of 15% and a yield strength of 42,000 psi. [3]. Aluminum and chromium are present on the Moon. Boron is rare. Note than only 2.2% of this alloy consists of chromium, while stainless steels

contain 10 to 25% Cr. This alloy is stronger than cast iron or cast titanium but lacks ductility and toughness.

In conclusion, it is evident that although the Moon is lacking in carbon for the production of steel making it practical to produce steel by the crucible or cementation process on the Moon only in small amounts when no other material can substitute (e.g. tooling), there are numerous iron alloys that can be produced with lunar available elements. Lunar industry will not rest on steel as does Earthly industry. It will rest on metals like aluminum, magnesium, titanium, iron and alloys of iron.

ALLOYS OF IRON

Name	Composition	Properties	Uses
Ingot iron	Pure industrial grade	Ultimate tensile strength (UTS) 42-48,000 psi elongation (el) 22-28%	Structures, beams, plates
Iron whiskers	Single crystal	0.00004 in. diameter UTS up to 500,000 psi	Structures, electronic parts small powder metallurgy parts
Iron powder	C and 1 free	10 to 40 micron powder	Propellants,
Iron-silicon	4.5% Si	50-60,000 psi UTS el 8-22%	Structures, beams, motors, transformers
Iron-nickel	47-55% Ni	UTS 70-90,000 psi el 30-50% nickel increases strength w/o loss of ductility	Structures, containers
Iron-titanium	Eutectic solutions	Increased hardness and strength	Structures, containers
Iron-manganese	1% Mn	UTS 60,000 psi, el 40% Mn increases strength and hardness	Structures, beams

Also of interest are iron-aluminides. These contain 10–30% Al by wt. and have excellent corrosion and oxidation-resistance similar to stainless steel. They have also been under investigation for high temperature mechanical properties. At lunar day span temperature of 123 C. the Fe-Al alloy designated FAS (15.9% Al, 2.2% Cr, 0.01% B,) has a UTS of 109,000 psi with an elongation of 15% and a yield strength of 42,000 psi. [3]. Aluminum and chromium are present on the Moon. Boron is rare. Note than only 2.2% of this alloy consists of chromium, while stainless steels contain 10 to 25% Cr. This alloy is stronger than cast iron and cast titanium, but it lacks ductility and toughness.

In conclusion, it is evident that although the Moon is lacking in carbon for the production of steel making it practical to produce steel by the crucible or cementation process on the Moon only in small amounts when no other material can substitute (e.g. tooling), there are numerous iron alloys that can be produced with lunar available elements. Lunar industry will not rest on steel as does Earthly industry. It will rest on metals like aluminum, magnesium, titanium, iron and alloys of iron.

DD

Our Planets may be the offspring of a tryst between ProtoSun and another protostar

By Peter Kokh

The consensus from time immemorial has always been that the Sun and our family of planets from Mercury out to Neptune formed from the same rotating disk of gas and dust, the Sun forming at the center and the planets at intervals further out in the condensing disk. Suddenly, there is an unexpected mismatch in the solar and planetary "DNA" so to speak. The percentages of the isotopes of Oxygen and Nitrogen in the planets do not match those in the Sun. At this stage, everyone is perplexed, if not taken aback.

We propose a simple scenario whereby this might have happened. The disk of matter around our protostar, the condensing Sun, intersected the disk of gas and dust in the process of forming another solar system. The two embryonic stars did not touch or exchange matter, but their two surrounding disks did, and in the process exchanged gas and dust, each disk peppering or seasoning the other with their unique signatures of elemental and isotope ratios. Here is what that tryst might have looked like.



Would such a sexual stellar encounter be unique? Consider that many stars are formed in clusters as the host gas cloud forms little eddies that begin to condense. In such stellar nurseries, near passes and actual collisions with an exchange of dust and gas may be relatively common. While all the stars forming in a cloud may have similar characteristics, if the cloud is not homogenous in its composition throughout, systems with "mixed genes" may occur.



The famous Pleiades cluster of young stars



This stellar "nursery" is the famed Lagoon Nebula

In MMM #MMM #61 December 1992, page 7,

[MMM Classics #7, page 5 – a free download from www.moon-society.org/publications/mmm_classics/]

We ran an article with the title "Heliades Cluster" which posed the possibility that the Sun was not an only child but may have been born in a cluster. Helios being the Greek word for "Sun" we dubbed our hypothetical birth cluster the Heliades.

Since the Sun and our Solar System were born 4.5 billion years ago, we have circled the galactic core perhaps 18–20 times, and any differential velocity and vector between the Sun and its hypothetical cluster-mates may well have dispersed them so widely that we would be fortunate to identify any solar siblings.

The Evidence

So what is this difference in isotopes? The article we saw was this, dated June 26, 2011.

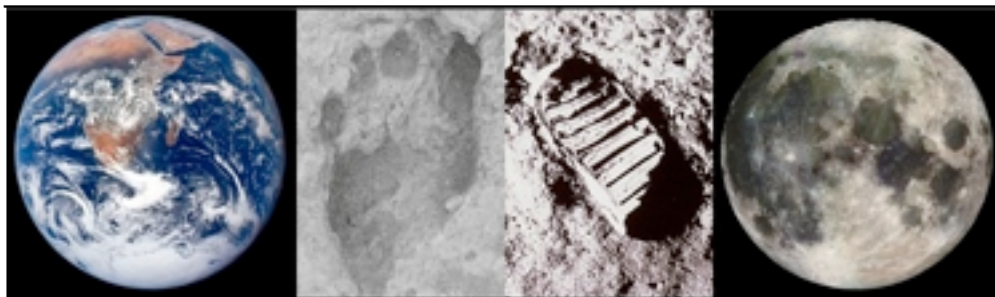
<http://www.eneusp.com/latest-news/science-a-environmental/25123-nasa-mission-suggests-sun-and-planets-constructed-differently.html>

"Researchers analyzing samples returned by NASA's 2004 **Genesis mission** have discovered that our sun and its inner planets may have formed differently than previously thought. Data revealed differences between the sun and planets in oxygen and nitrogen, which are two of the most abundant elements in our solar system. Although the difference is slight, the implications could help determine how our solar system evolved. We found that Earth, the moon, as well as Martian and other meteorites which are samples of asteroids, have a lower concentration of the O-16 than does the sun," said Kevin McKeegan, a Genesis co-investigator from UCLA, and the lead author of one of two Science papers published this week. "The implication is that we did not form out of the same solar nebula materials that created the sun -- just how and why remains to be discovered."

And so we propose the scenario above. As a rule the most probable hypothesis is that for which the odds are the highest, and the explanation the simplest. We think we nailed it, but it will be interesting to see what other hypotheses surface and if there is any way to settle the question with a high degree of confidence. We are all interested in our ancestry, and that goes for our solar system too.

PK

From Africa
to the Moon,
the Human
Epic, told in
footprints,
Continues
to the Stars!



Our Goal is
Communities
on the Moon
involving
large scale
industrializa-
tion and
private
enterprise.

Objectives of the Moon Society

include, but are not limited to:

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

Our Vision says Who We Are

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

Moon Society Mission

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

Moon Society Strategy

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

Interested in having input? Any member may ask to join the Leadership Committee and attend our Management Committee meetings held twice monthly. You may even express opinions. Decisions are often made by consensus, so this input has value. Write president@moonsociety.org

Meet Ken Murphy



New Moon Society President

By Peter Kokh, Editor and Secretary

The best way to introduce Ken Murphy is with his own words. We suggest you read this first:

<http://www.outofthecradle.net/archives/2011/03/throwing-my-hat-in-the-ring/>

This 3-part video gives a sense of how he feels about things relevant to the Moon Society's direction:

<http://moonandback.com/2011/06/16/moonandback-interview-with-ken-murphy-part-1-outreach-for-space-awareness/>

<http://moonandback.com/2011/06/17/moonandback-interview-with-ken-murphy-part-2-cislunar-space-and-the-business-case/>

<http://moonandback.com/2011/06/18/moonandback-interview-with-ken-murphy-part-3-the-children-of-earth/>

You will also find enlightening clues in his candidate statement, published in the May issue of MMM, #245, page 10, column A.

Ken chaired NSS's 2007 International Space Development Conference in Dallas and has built and maintained "Ken's Lunar Library" at:

<http://www.outofthecradle.net/categories/lunar-library/>

Ken's home page is: www.outofthecradle.net ●

Report on ISDC 2011, Huntsville, AB

By Ken Murphy and Dave Dunlop (attending)
And Peter Kokh (commenting)

[From the Minutes of the June 1st Management
Committee Meeting on ASI-MOO]

Ken Murphy and Dave Dunlop reported on the
Moon Society's presence at ISDC 2011 in Huntsville.

Moon Society Hospitality Party at ISDC 2011

Ken: "The party went very well. We had the hospitality party on the first night, and the party went on till 2 am". There were a lot of younger folks at the parties, from networks like NASA Academy, ISU alumni, and Yuri's Night. No one signed up on the spot, but there was interest expressed. I put out some handout materials on LCROSS and LRO and other Moon-related things, and some old Ad Astras. I didn't get names and addresses: an overlooked detail. ... handouts were put up at the Moon Society display. The SBSP display wasn't that hard to put up, and I have it in my storage unit here in Dallas. I'll compile an e-mail list."

"A great deal of interest was expressed in lava tube projects. I think the youngsters want to do some rappelling in space suits."

Dave: "Well the party was a huge success and whatever Ken's party formula is, it should be bottled and used at every forthcoming ISDC. The room was packed and especially with young SEDS members. It was crowded, hot, and many spilled out into the hallway which made the party even more visible. Since this was the first after-session party, it put us on the map socially and was in my estimation more of a social impact than our nicely stocked booth."

Ken: "Having all of the alcohol selections be Moon-themed was a key touch. One NASA Academy alum mentioned that Apollo was conspicuous by its absence."

University of Luna Awards

<http://www.moonsociety.org/about/awards.html>



Dave: "We presented a University of Luna Award to Paul Spudis and Tony Lavoie for Paul's blog post "Can we afford to Return to the Moon?" and their paper "Mission and Implementation of an Affordable Lunar Return".

<http://blogs.airspacemag.com/moon/2010/12/can-we-afford-to-return-to-the-moon/>

http://www.spudislunarresources.com/Papers/Affordable_Lunar_Base.pdf

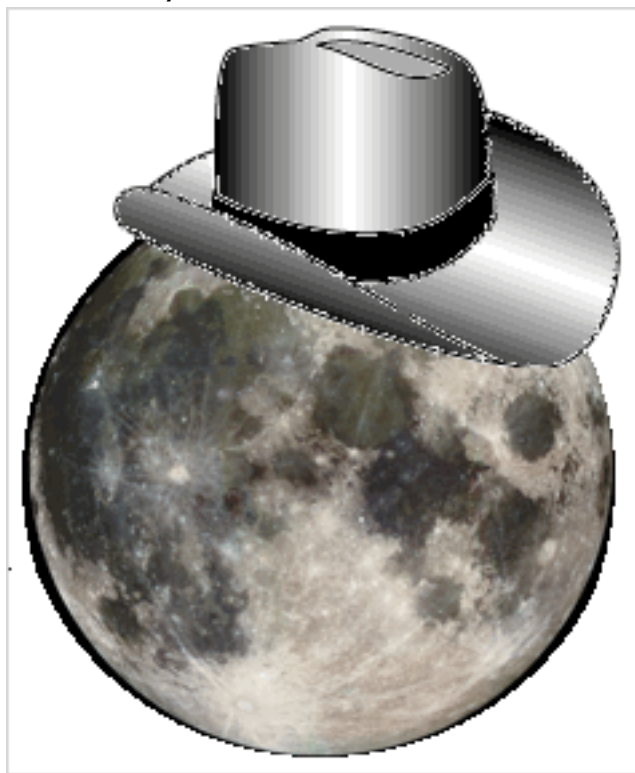
Dave: "We got a nice picture of Ken, Paul, Tony and myself with the award. Paul seemed all the more delighted when he realized that the award contained a print of Pat Railings' personally signed "Moon University."

Ken on the University of Luna awards: "They look classy. Very nice! The Pat Rawlings personal signature is a great touch."

Dave: "We also had occasion to present a University of Luna award to the head of the JAXA (Japan) Washington D.C.L. office and explained to him what the award was and why it was given my the Moon Society. He seemed very appreciate and indicated that he would get the award to the right parties in JAXA. Unfortunately he pointed out that we had misspelled the name on the certificate so I indicated we would correct this and send it to him at the JAXA Washington office."

Peter: "While that Rawlings print does look like a "moon" university, it is named "space university." Ken remarked "ISU does want a campus on the Moon eventually." Peter added "But of course, and I hope to be teaching there! But I can only guarantee my availability for another 30 years or so!"

Black Cowboy Hats?



Ken: "Between Dave and myself we may have started a tradition of black cowboy hats for Moon Society folk." Dave added "Well I think is is good to have a branding gimmick. I have had a black cowboy hat for a long time (Flying J vintage) and of course this was Ken's brand at the 2007 ISDC."

ISDC 2011 Huntsville Report Continued

[Dave:] So we went around with the black cowboys hats saying were the Moon Society good guys in the black hats. Brad Blair of the Space Resources Roundtable also has a black cowboy hat and will be part of our Lunar Good Guys Black Hat campaign." Peter added, "Sounds like logo stuff to me!" Ken Murphy says, "A Full Moon with a black cowboy hat perched on it?"

Peter: "Time to give the Lunar Frontier a "western" feel!"

Ken: "Not western, Frontier. Artist Phil Smith has some interesting work in that regard."

Peter: "Love it. Has the "can do" feel and "frontier bravado." Definitely worth working up. "

www.moonsociety.org/images/cowboy_moon.gif

Dave: "Well the Moon is after all the "High Frontier" so we can put a Little American spin on it with the black cowboy hats but encourage many to join our brand. What's wrong with a little sizzle. The Wild Wild Moon! It gets across the frontier spirit."

Peter: "Ken and Dave both wore black cowboy hats at ISDC in Huntsville and we have been thinking of a full moon with a cowboy hat cocked to one side as a secondary logo. We might sell logo stuff on Cafe Press"

Space Solar Power at ISDC

Dave: "We also had another nice photo opportunity at the Moon society booth. John Mankins and Nobu Kaya from Kobe University in Japan were present. Ed Kiker of Kepler Space University had a model of a JAXA astronaut with a Japanese flag posted in the regolith, raking a lunar crater to create a Japanese tranquility garden. Ken represented the MS, I represented the NSS, and John represented the US and Nobu Kaya represented our conjoint interest in the development of Space Solar power. This is part of the Kalam-NSS initiative for Space Solar Power." ■

Welcome to our newly elected Officers and Directors!

President Ken Murphy

Vice-president Paul Banyai,

Treasurer Dana Carson

Secretary Peter Kokh

Directors: Bryce, Johnson, Jason Tuttle, Ron Brooks

Congratulations on your election!

Chapters & Outposts

June Reports

Moon Society Phoenix Chapter

<http://www.msphx.org>

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

Contacts: Craig Porter portercd@msn.com

Chuck Leshner: chuckmiester999@yahoo.com

Meeting the 3rd Saturday of the month

Moon Society Phoenix' next meetings are on

Saturdays July 16th, August 20th, Sept 17th

Meeting on Report Sat., June 18th

- 1) Seven members present plus two guests who asked to join the Chapter at the end of the meeting.
- 2) There was a demonstration of the **revamped Chapter website** by Don. The demonstration was very impressive and included features that we had seen before and several new features. Included will be a calendar, a members' page, links, The **Tranquility Community College** feature for up-/down-loading presentations for use by members of our Chapter & other Chapters in educating others & other features. <http://www.msphx.org/index.php/tranquility-community-college/>
 - Mike has regained our Domain name and renewed it and was been authorized to use money from the treasury to do this.
 - We offer **items for sale** on the website, books by members, Shirts and any other item that is desired, profit from the sales will be used to support the website and the Chapter.
- 3) We are in the process of **designing a logo shirt** for the Chapter. The logo will appear on the front of the shirt and the back of the shirt will have Moon Society Phoenix and our web site address. Mike Clark a guest turned member of the Chapter is doing several logos for submittal to the Chapter for selection.
- 4) We will be **converting our presentations to Power Point** or Audio-Visual presentations for ease of use. Currently in conversion are (1) Disaster Strikes, (2) Industrialization of the Moon, (3) Lunar Ground Transportation, (4) Telepresence racing, (5) the Hydroponics Unit for the Small Settlement and others are currently in planning.
- 5 we are examining the possibility of building **small table top demonstrators for several projects**,
 - 1) a small Rail "Gun",
 - 2) a Mass Accelerator,
 - 3) a Solar Demonstration Kit and others.
- 6) Don Jacques' book (Pamphlet) on "**The Homestead Project**" is available through AZ Publishing Services, LLC, Scottsdale, AZ USA - \$1.99 - www.azpublishingservices.com.

July Reports

Moon Society St. Louis Chapter

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

Contact: Keith Wetzel <kawetzel@swbell.net>

Next meetings – Aug 17th, Sept 21st, Oct 19th

Meetings 3rd Wed monthly at Buder Branch Library
4401 S. Hampton, in the basement conference room

The July 20th meeting of the St. Louis Chapter of the Moon Society was involved with the showing of "Transcendant Man", a documentary about Ray Kurzweil and his expectations for the technological singularity. Mark Rode, Bob Perry, Dave Deitzler, Tom Kulhman, and Karl Strasman attending. The Buder Branch Library graciously provided an audio/visual cart and Bob played the video on his laptop. The DVD is available from Amazon and other places

<http://www.amazon.com/Transcendent-Man-Ray-Kurzweil/dp/B004MYOWYU> More info:

<http://www.charlierose.com/view/interview/11558>

Moon Society St. Louis July Report Cont.

Charlie Rose with Ray Kurzweil, the subject of the documentary, and Barry Ptolemy, the documentary producer. An overview of the primary concept is at :

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

A brief discussion followed about the future getting here faster. For example, Bob's laptop is about five years old and is, essentially, ancient, but can do many, many things. Mark mentioned that he builds servers and sells them on eBay. One of his recent sales was to a biology PHD who had a near super computer built with a half a terabyte of main memory so his program could work on his database without having to go back and forth to his hard drive. Remember, the space shuttle design was set when Nixon was in office and the first shuttle space flight was in 1981 – somewhere along the line, NASA decided to just use laptops in the shuttle instead of upgrading its computers.

Moon Society Phoenix Chapter

<http://www.msphx.org>

Contacts: Craig Porter portercd@msn.com

Meeting the 3rd Saturdays of the month

NEXT: August 20th, Sept 17th, Oct 15th

Our Web Site is up and running and waiting for input from the members, articles, pictures, events and other items as appropriate. www.msphx.org

Chapter Shirt Logos are going to be voted on and location of logo or logos. The questions will be decided by a majority vote of the Chapter. If there is no clear majority there will be a run off between the two highest vote getters. Color style of shirt will be decided by a follow-up ballot with the option to purchase as many shirts as desired.

Presentations for the "Tranquility Community College" section of the web site can now be accepted for posting; the format can be PowerPoint, Video, Slide Show or PDF. There will be a location for Short Stories, Papers and other items. Visit the site and learn about its capabilities.

I am currently working on the "Disaster Strikes" presentation. I am also working on the "Lunar Ground Transportation" presentation. Felix is working on the "Industrialization of the Moon" presentation. Don is also working on his presentations.

Projects I am beginning work on are a "Rail Gun" Demonstrator and a "Mass Accelerator" Demonstrator for the Table at conventions and such. Demonstrators will be low powered so they don't blow holes in the ceiling but can still demonstrate the principles involved.

We discussed the development of a "Manifesto" for the Chapter to excite people and draw new people into the fold by letting them see what we really stand for. We will be discussing this on line by e-mail or on our Facebook Page "Moon Society Phoenix", which is currently closed to everyone except members and invited members. Craig D. Porter President

Moon Society Houston Chapter

<http://www.moonsociety.org/chapters/houston/>

Contact: Eric Bowen eric@streamlinerschedules.com

The Houston Chapter's next regular meeting is scheduled for **Monday, Sept 19th** in the conference room of the Bay Area Community Center at Clear Lake Park.

July 18th meeting report: we met at Bay Area Community Center in Clear Lake Park. Larry Friesen spoke about his participation in the ApolloCon SF convention held in the Houston area last month; he sat on five program panels and was the moderator for one of them. Marianne Dyson also participated in the event.

Moon Society member Craig Beasley spoke on his personal project: ARDAT [Accelerated Research & Development Academic Track] programs. He is working with local universities to implement a program, which would allow undergraduates to get hands-on practical experience with a space-oriented research & development project that the student would develop as a graduation thesis project, preferably in conjunction with industry. This proposal is still in the developmental stages and Craig is actively soliciting input and help from any interested Moon Society or NSS members. To learn more about this project, send your message to Craig in care of the CLANSS/MS chapter via email to eric@streamlinerschedules.com

Chapters & Outposts Map (North America)

www.moonsociety.org/chapters/chapter_outpost_map.html

Chapters & Outposts Events Page

www.moonsociety.org/chapters/chapter_events.html

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

www.moonsociety.org/chapters/chapter_outpost_map.html

Moon Society Nashville Outpost – Central Tennessee

Contact: Chuck Schlemm cschlemm@comcast.net

Bay Area Moon Society, CA Outpost – South Frisco Bay

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

Contact: Henry Cates hcate2@pacbell.net

Moon Society DC Metro, DC–MD–VA Outpost

Contact: Fred Hills Fredhills7@aol.com

Milwaukee, WI Outpost (MSMO)

www.moonsociety.org/chapters/milwaukee/msmo_output.htm

Contact: Peter Kokh kokhmmm@aol.com

NSS Partner Chapter News - pp. 17-19

Oregon L5 (Portland), Lunar Reclamation Society
(Milwaukee), Minnesota Space Frontier Society
(Minneapolis–St. Paul), San Diego Space Society

Moon Society DUES with *Moon Miners'* Manifesto

Electronic MMM (pdf) \$35

Students/Seniors: \$20

Hardcopy MMM: U.S./Canada \$35

Elsewhere: \$60

Join/Renew Online - www.MoonSociety.org/register/

Checks, Money Orders, Membership Questions

Moon Society Membership Services:

PO Box 940825, Plano, TX 75094-0825, USA

GREAT BROWSTING

SPACE TRANSPORTATION

<http://www.space.com/12171-space-planes-winged-spaceships-evolution-infographic.html>

<http://www.slashgear.com/spacex-breaks-ground-on-launch-site-for-falcon-heavy-rocket-15165356/>

<http://www.slashgear.com/nasa-signs-agreement-with-united-launch-alliances-to-mod-atlas-v-rocket-to-send-astronauts-to-the-iss-19165956/>

<http://www.space.com/12376-nasa-space-shuttle-program-facts-statistics.html>

<http://in.news.yahoo.com/chips-carried-space-test-kind-spacecraft-105853703.html>

From Paris to Tokyo in 2.5 hrs – EADS Hypersonic
<http://www.youtube.com/watch?v=8h1PE7StoDE>

New Strategies for Exploration and Settlement
<http://www.thespacereview.com/article/1860/1>

Human spaceflight for less:
<http://www.thespacereview.com/article/1861/1>

NASA's X-Hab: Inflatable Loft Competition
<http://www.spacegrant.org/xhab/2011>

Debate over Shuttle Legacy
http://www.usatoday.com/tech/science/space/2011-06-27-shuttle-atlantis-last_n.htm

INTERNATIONAL SPACE STATION

<http://www.foxnews.com/scitech/2011/07/26/private-spacecraft-plans-first-docking-with-international-space-station/>

ISS to test technologies for human missions beyond
http://www.aeromorning.com/en/news.php?id_news=51982&numnews=25

ROBOTICS & SPACE SOLAR POWER

<http://www.astrobio.net/pressrelease/4068/justin-the-remote-controlled-space-android>

Degree of latency needed to perform telerobotics
<http://www.thespacereview.com/article/1877/1>
<http://space.alglobus.net/papers/TowardsAnEarlyProfitablePowerSatPartII.pdf>

LIFE SUPPORT

<http://zeenews.india.com/news/space/nasa-s-research-could-help-humans-colonize-space-721762.html>

Now we can print solar cells on paper!
<http://web.mit.edu/newsoffice/2011/printable-solar-cells-0711.html>

PLANET EARTH

<http://www.space.com/11930-nasa-launch-aquarius-satellite-ocean-saltiness.html>
http://old.news.yahoo.com/s/ac/20110627/us_ac/8707515_nasa_finds_ways_to_avert_effects_of_solar_storms_on_earths_infrastructure

<http://www.ibtimes.com/articles/188318/20110728/nasa-discovers-trojan-asteroid-in-earth-orbit.html>

Is Earth Getting Full? – (Opinion Piece)
<http://www.nytimes.com/2011/06/08/opinion/08friedman.html>

MOON

http://www.space-travel.com/reports/LookingatthevolatilesideoftheMoon_999.html

http://www.space-travel.com/reports/CMUandAstroboticTechnologyCompleteStructuralAssemblyofLunarLander_999.html

http://www.space-travel.com/reports/Parts_of_moon_interior_as_wet_as_Earth_upper_mantle_999.html

ESA's proposed Lunar Lander and search for water
www.spaceref.com/news/viewpr.html?pid=33715

Race to the Moon Heats up for Private Firms
http://www.nytimes.com/2011/07/22/science/space/22moon.html?_r=1

Could we have afforded a return to the Moon? (Satire)
<http://scienceblogs.com/pharyngula/upload/2011/07/moonvafghanistan.jpeg>

MARS

http://www.marsdaily.com/reports/Materials_for_Mars_999.html

<http://www.space.com/11907-mars-history-martian-illusions-human-delusions.html>

[http://www.marsdaily.com/reports/New_solar_System_formation_models_indicate_that_Jupiter_foray_robbed_Mars_of_mass_999.html](http://www.marsdaily.com/reports/New_solar_system_formation_models_indicate_that_Jupiter_foray_robbed_Mars_of_mass_999.html)

www.vadvert.co.uk/science/15226-nasa-research-offers-new-prospect-of-water-on-mars.html

<http://www.space.com/12397-mars-gale-crater-curiosity-rover-landing-site-photos.html>

To Replace the Shuttle, a Mission to Mars: Zubrin
http://edition.cnn.com/2011/OPINION/06/29/zubrin.mars/index.html?hpt=hp_c2

Mars Exploration Magazine
<http://www.exploremars.org/mem/>

OTHER PLANETS

<http://www.space.com/12003-venus-mysteries-cosmos-universe.html>

<http://www.allvoices.com/news/9395727-nasa-cassini-unlocks-saturns-secrets-top-10-pictures>

Hubble finds 4th moon orbiting Pluto
www.esa.int/esaSC/SEMNGVCT5QG_index_1.html

ASTEROIDS

<http://www.space.com/12079-asteroids-5-reasons-explore-space-rocks.html>

Dawn enters orbit around Vesta
http://www.nasa.gov/mission_pages/dawn/news/dawn20110716.html

Vesta Fiesta: August 5-7th
http://blogs.nasa.gov/cm/blog/NES_Teachers_Corner/posts/post_1303402928270.htm

ASTRONOMY

<http://news.ninemsn.com.au/technology/8269237/new-telescope-may-link-us-to-alien-life>

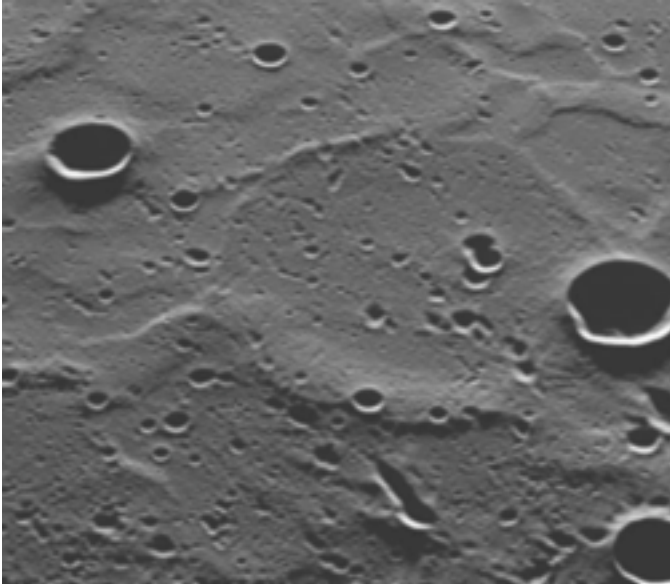
<http://www.spacenews.com/civil/110706-nasa-budget-cancel-webb.html>

EXTREME LIFE

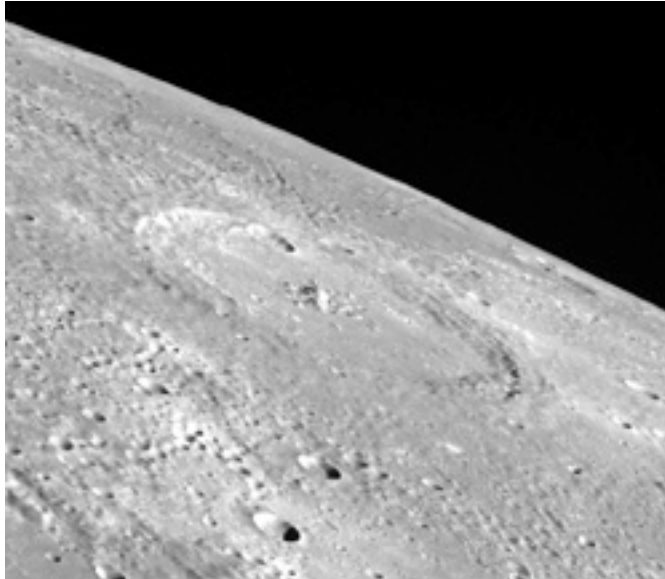
<http://www.newscientist.com/article/dn20534-goldmine-worm-shows-animals-could-be-living-on-mars.html>

MMM PHOTO GALLERY

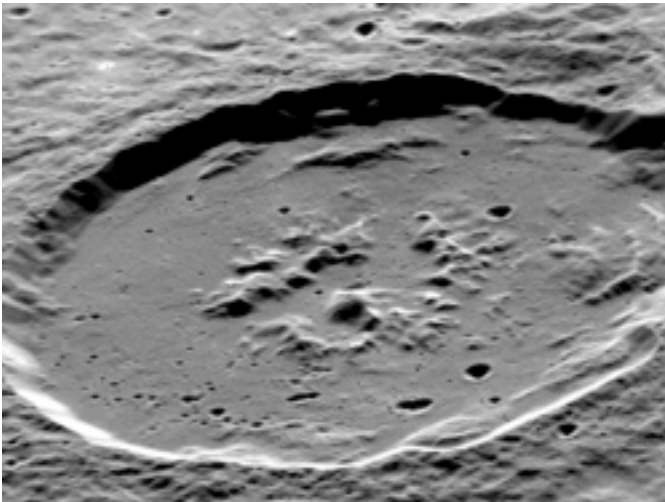
<http://www.space.com/11952-latest-photos-mercury-nasa-messenger-probe-part2.html>



smooth area near north pole – 60mi across at bottom



Verdi Crater



Atget Crater



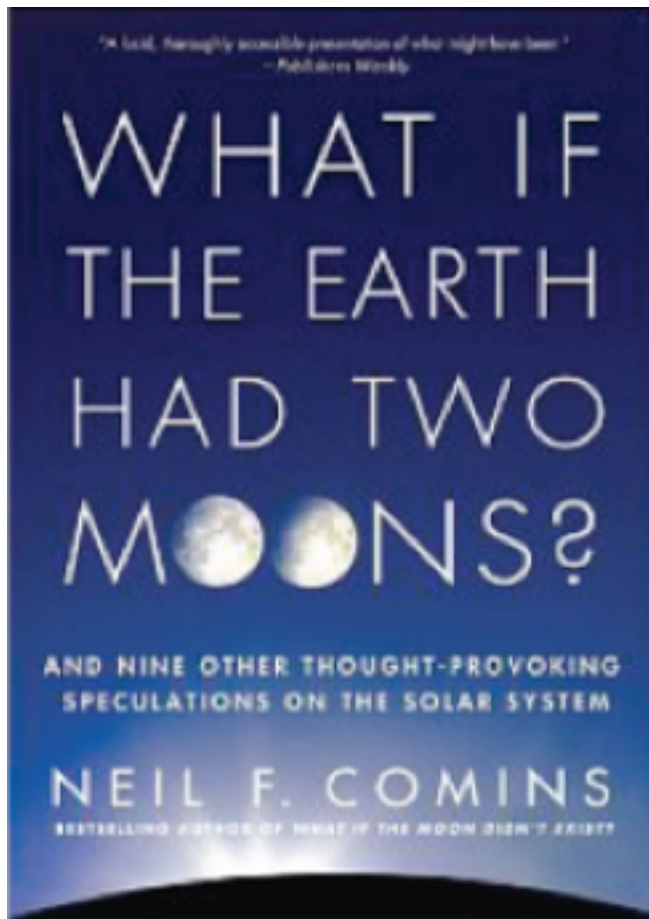
Curiosity against a Mars Background – watch Videos:

<http://www.ibtimes.com/articles/170543/20110628/nasa-next-mars-rover-in-action-space-alien-ufo-mars-science-laboratory-animated-video.htm>



“**Justin**” is a new German-built Space Android that can be controlled by a joy stick or by a human wearing “an exoskeleton wearable robot – a combination of arm and glove with electronic aids to reproduce the sensations a human hand would feel.”

<http://www.astrobio.net/pressrelease/4068/justin-the-remote-controlled-space-android>



What if the Earth had Two Moons?

By Neil F. Comins – Review by Peter Kokh

Available from <http://www.amazon.com/>

By asking “What If” questions, we are challenged to reexamine our assumptions, and come to a new appreciation of “What Is.” The author is quite adept at this format, and has earlier published “What if the Moon didn’t Exist?”

The Two Moons question is just the first of several such essays in this book: Here is the full list.

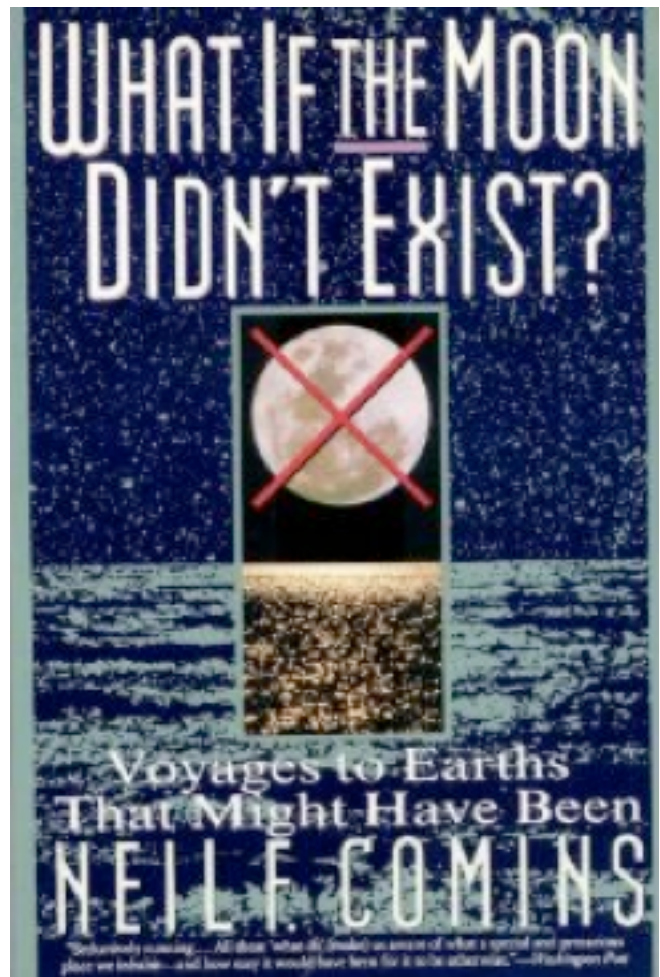
- What if the Earth had two Moons?
- What if the Earth were the moon of a massive planet?
- What if the Earth orbited a less massive sun?
- What if the Earth had a thicker crust?
- What if the Moon orbited Earth in opposite direction?
- What if the Earth had two Suns?
- What if the Earth had a twin orbiting on the opposite side of the Sun?
- What if Andromeda Galaxy collides with Milky Way?
- What if Earth formed closer to center of our galaxy?
- What if the Earth formed in the distant future?

Hardcover: 304 pages – **Language:** English

Publisher: St. Martin's Press; edition March 30, 2010

ISBN-10: 0312598920 – **ISBN-13:** 978-0312598921

Birger Johanson of Umea, Sweden had given me this book. Much appreciated! I highly recommend it. ▣



What If the Moon Didn't Exist?:

Voyages to Earths That Might Have Been

By Neil F. Comins – Review by Peter Kokh

Available from <http://www.amazon.com/>

This is Comins' first essay into the world of “What Ifs” and it asks the most interesting question of all. The Moon's tides by creating larger and more extensive tidal pools than those the Sun can rise (its proximity outweighing the puniness of the Moon's mass) have almost certainly accelerated the development of Life on Earth. Its phases gave early man a convenient clock: the month. And that cycle drives biological cycles of many animals, including women.

Our world, Earth, would be a very different place without the Moon. And unlike the other planets, which do not orbit Earth, but only the Sun, the Moon is clearly a part of Greater Earth, and an essential part of Earth as it has come to be. It is *an Eight Continent across another kind of Sea*, and the next goal in **mankind's epic intercontinental saga “Out of Africa,”** and providing the leap into our next **InterPlanetary** phase, with an **InterStellar** phase still in the distant future.

I highly recommend this book to all of us who try to foresee, and make real, the place of the Moon in mankind's future.

Paperback: 336 pages **Language:** English

Publisher: Harper Perennial (January 1995)

ISBN-10: 0060925566 **ISBN-13:** 978-0060925567 ▣



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WI 53201

www.lunar-reclamation.org

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

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LRS News

- **Annual Summer Field Trip HAS BEEN CANCELLED** -: Saturday, August 13th to the Milwaukee Metropolitan Sewerage District for a tour of Jones Island facilities has been cancelled. There will be no tours other than Monday-Friday except for Saturday, September 24th, for which reservations are not needed.

- **Peter interviewed for documentary on the Moon:** On Sat. July 9th a crew from Toronto Canada arrived and video-taped Peter at many locations including at the Northern Cross Observatory at Harrington Beach State Park. Carol Nelson, Charlotte and Gene Dupree and Dave Dunlop were there for that occasion Videotaping continued the next two days. They hope to finish in January.

- **Our annual December Anniversary/Holiday Party** – this year #25! - will be on Saturday December 10th :
 ✓ **A PIZZA POTLUCK:** this year everyone is requested to bring a 12" pizza (non-rising crust, please!) of whatever variety they wish – we will have at least 2 pizza ovens on hand, along with paper plates, etc. You may bring beverages also, as you like.
 ✓ **EXHIBITS** and take-home materials as usual
 ✓ The Science-Fiction film “Paul” if DVD is out

LRS Upcoming Events

NO MEETINGS JULY OR AUGUST

Field Trip: Metro Milwaukee Sewerage District
On Jones Island, Saturday, August 13th

Next Meetings Saturdays: 1-4 pm

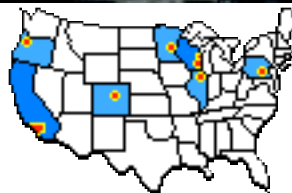
Sep. 10th - Oct. 15th – Nov. 12th – Dec. 10th

LRS Meeting, Mayfair Mall, Garden Suites Room G110

AGENDA:

www.moonsociety.org/chapters/milwaukee/meetings.htm

>>> SciFi Horror Film “Apollo 18” opens 09.02 .11



**News & Events
of NSS
“MMM” Chapters**

Space Chapter 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
August 20th, September 17th, October 16th, November 20th

MINNESOTA



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

David Buth (w) (612) 333-1872, (h) (763) 536-1237

Email: info@mnsfs.org

www.mnsfs.org/

Calendar: MN SFS 2009 Past & upcoming chapter events
www.freemars.org/mnfan/MNSFS/2010-12-Review/

We held a “Last Shuttle Launch Party” at Scott Shjefte’s in Brooklyn Park the evening of July 8th, and then held a “Last Shuttle Landing Party” on July 20th with a sleep-over ‘til 7am, again at Scott’s.

Through the years, shuttle flights have been a major focus of MN SFS outreach efforts, the chapter fielding a major display for every one.

ILLINOIS

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

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

WISCONSIN



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

c/o Will Foerster 920-894-2376 (h)

astrowill@tcei.com

SSS Sec. Harald Schenk hschenk@charter.net

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

[<http://www.tcei.com/sss/>]

• We meet the 3rd Thurs even # months 7-9pm
At The Stoelting House in Kiel, WI

• October 21st - December 10th Milwaukee LRS Party

COLORADO

Denver Space Society
(FKA The Front Range L5 Society)

1 Cherry Hills Farm Drive
Englewood, CO 80113

<http://www.angelfire.com/space/frl5/>

Eric Boethin 303-781-0800 eric@boethin.com

Monthly Meetings 6:15 PM on Tuesdays
October 12th, December 9th

Englewood Public Library, Englewood, CO 80110
1000 Englewood Parkway, First Floor Civic Center

PENNSYLVANIA



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

c/o Earl Bennett, Earlisat@verizon.net

856/261-8032 (h), 215/698-2600 (w)

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

<http://phillypasa.blogspot.com>

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

Next Meetings Saturday, Aug 13th, Sept ?, Oct ?

The PASA Report for June 2011

Meeting dates and location: Our next meeting will be on July ninth at the Liberty One Food Court, on the second level of the building. This will be from 1-3 pm.

June Meeting Notes: our June meeting had some highlights of the 2011 ISDC, by Dennis Pearson, with images of several talks and the Chapters Assembly.. Lots of material, in several books he brought from the event, on Solar Sail propulsion and "Astronaut Training" (A.K.A. the Vomit Comet flights) that Mitch enjoyed seeing.

There was quite a bit on civilian commercial plans including the Branson habitat(s) and launch opportunities in the near future. Dennis also brought first hand reporting on the devastation in Alabama from the extreme weather in the South in May. He reports that the 2012 ISDC will be in Washington next year. Yeah!

Larry reviewed our website and some problems he had with a new and improved Internet controll language called HTML5. It was causing access problems and even blocked the possibility of viewing our site. Larry began making fixes with "Chrome" and has been able to open the site to public browsing again. He also noted a good number of hits on our Facebook site that was available during this period.

Dotty brought material on the new Intrepid space exhibit that will include "Enterprise"! The other big (really) space exhibit is called "The Exploreum Hall" which has had recent upgrades. Dotty also noted the coming, in September, of the MAKEFEST at the Queens Museum of Science. This is the east coast version of the event that brings people together who build various science and technology projects that includes robots and rockets as well as many other things that can be created because of our advancement in personal tools of all kinds. Should be fun! And more local color of course.

Mitch brought the Enquirer, our paper, on the last flight of Endeavor. He also brought us a large number of Ad Astras, supplied by H.Q., and will have them available at upcoming events. We have nothing scheduled for the summer, but Mitch may have a rabbit for us. We may go to Speedwell Village in New Jersey for a rocket event there, but that has not yet been arranged. This site was also where the telegraph was invented. Mitch pointed out that our July meeting is on the day the last shuttle is to be launched (Atlantis). We did not talk of an August or September meeting yet.

Earl brought material from the March/April Amsat Journal, which included reports on the ARISSAT-1 free flying space transponder to be launch from the Space Station. This report, by Anthony Monterio (AA2TX), was about the deve-lopment of the flight

package of the software-defined radio. This system was not heard during the April Yuri Gagarin first flight commemoration, but here may have been a communication problem that kept the transceiver from working as desired. Much other material. I also reported on the fun event of Balticon in May, with a very extensive hard science track that included virtual Reality and Rehabilitation at the V.A. (not an exact title), several talks on space exploration, by principals involved with the research, and additional talks on Mass Driver and Launching Loops, as well as one on VASMIR that was a bit skeptical on near term use (the title of that one was "VASMIR to Mars – Are You Kidding?" by Dr. Robert Terry. And did I forget the guest of honor? Hardly.

We managed to meet **Ben Bova** at several points, including his keynote address/ talk, and a panel with a new format that he was part of (a "flash panel" with rotating members and the topics). This was included Dr. SETI also, who brought his latest book on that topic (Dr. SETI is also known as H. Paul Shuch, who was deservedly on the panel with NSS Governor Bova). A great event and great people.

Lastly: in the July/August issue of Analog Science Fiction and Fact, there is an interesting article entitled "So long Proxima Centauri" on the clock that is ticking for the "closest star". With Kepler "seeing" many stars and the light curve changes caused by small companions, it's only a matter of time before we may catch an object nearer to us than Centauri. It will probably not be by Kepler but by other craft design for this sort of task: The W.I.S.E. craft will be able to pick up brown dwarfs to 75 light years (radiating at 450 Kelvin) and 10 light years for objects at 150 ("cold but not dead"). This would include objects like Jupiter! We live in wonderful times.

Submitted by Earl Bennett

PASA Report for July 2011

Meeting Date and Location for August: We will meet at the Liberty One Food Court on Saturday, August 13th between 1 and 3 p.m. We'll start planning for fall events and I'll talk about a presentation (on SETI) I will be doing. We may also have a speaker who attended the Mars Society Conference (preliminary).

Larry told us that some of us might experience problems going to our, and other, websites: with the upgrade of the web language to HTML5 there are problems that occur when using older browsers. He suggests the use of Explorer 7 (at least), Google Chrome, or Firefox, to match what the web now runs on. He asked that if we send event pictures we pre shrink them. He is going to put meeting time and location on our front page after a meeting request.

Dotty brought material on a few museum events at the Franklin Institute, and we'll look forward to her report for August and the Fall. She did bring in the Franklin Institutes schedule for July 8: the Institute had a special event for the Atlantis launch that morning.

Mitch brought the first of several special issues of The Futurist Magazine, which will highlight space, with Moon colonization and development as a major feature. A group called the Lunar Ring, from Japan, is featured. Also, as an inset to this piece, is Dr. David

Criswell's description of a lunar power system for beaming energy to Earth. Dr. Criswell has been writing on this for some time, and his past reports should be looked for. The main article is Patrick Tucker, and there is another piece on why we need Lunar colonies by Joseph E. Pelton. This was the May/ June issue. And then there was material from **Ad Astra!** This was the Summer issue, and includes: "**Going back to the Moon; Who's doing the heavy lifting?**" by John F. Kross. We will have to see if the U.S. is willing to put the money into one, or more, of the proposed designs, or the fabrication of any, of the mentioned possibilities. (Maybe we should pull a Soviet: reuse an already working design?). And: **Affordable Exploration**, and **Lunar Resources: Unlocking the Space Frontier**, by. Gordon Woodcock and Paul Spudis, respectively. And more.

Earl brought several fond farewells to the Shuttle program that appeared in Wired Magazine and Science News. The group wondered just what we are going to do about the future of American space flight, especially if the Branson Space Hotel is put up in the near future, and the Virgin Galactic flights start soon after. Right now we are going on the Russian Transit Vehicle, but, maybe, we'll have a Dragon in our future (having gone to Drexel University I like the Dragon). Our member Steven was surprised at the idea of an inflatable station in view of all of "that junk up there" even if it has foot thick walls.

Also of note: Thanks to an invitation from the Philadelphia chapter of MENSA, orchestrated by Pete Stevens of that group, and with the assistance of Michelle Baker of PASA, gave a talk on SETI. Due to unusually bad weather (3" of rain that afternoon) there was limited, but interested, attendance. The talk was to move the audience toward involvement personally in the quest. There were a number of questions, starting with one that needs further research by me, and went on for some time. The concept of the Dyson Sphere, both in possible construction and how it could be "seen" was explained, with O'Neil Cylinders used as elements of the Sphere ("millions & Millions" of them).

Also noted was Nikolai Kardashev's concept of levels of civilization, which might set up signaling systems and beacons that would let other civilizations know they were open to communication. Closer to our space exploration agenda: the concept of a relay space craft (the FOCUS mission) that if sent to 550 AU might give us a great return for the large (for us) effort: the possibility of listening in to everyday communications between aliens and their local colonies or, and this might be the best outcome, the discovery of an "inter-stellar internet" where only those who have left the cradle of their home worlds could find the network connection signals. This would put the probe at about 10x the distance from the Sun as the object formerly known as the planet Pluto. This, and other, talks were started as a result of a request to do a talk at the PHACT Forum in September via an introduction provided by H. Paul Shuch, Director Emeritus of the SETI League, to Eric Krieg of PHACT (The Philadelphia Association for Critical Thinking). Enough!

– Submitted by Earl Bennett.

Photos from recent PASA activities



CALIFORNIA

SDSPACE.org

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

Meeting the 2nd Sunday monthly

Next Meetings: Aug. 14th – Sept 11th - Oct. 9th
 2:30 to 4:30 pm

Serra Mesa Branch Library 9005 Aero Dr, San Diego

July SDS News

At the Saturday July 16th **South Park Walkabout**, SDSS contributed its second annual **Space Travellers Emporium**. A special Emporium feature this year was an informal discussion and signing by Dan Linehan for his newly released book *Burt Rutan's Race to Space*. Dan also wrote *SpaceShipOne: An Illustrated History*.

We also brought out our **Mars suit** and our **Mars Astronaut** walked around greeting people and was available for photos. We'll have the Mars rover yard and special Emporium sales all night.

SDSS gave out 4 awards to students at this year's Greater San Diego Science and Engineering Fair.

CALIFORNIA

OASIS

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

Events Hotline/Answering Machine:(310) 364-2290

Odyssey Ed: Kat Tanaka –

odyssey_editor@yahoo.com

<http://www.oasis-nss.org/wordpress/>

oasis@oasis-nss.org

Odyssey Newsletter Online

<http://www.oasis-nss.org/articles.html>

Regular Meeting 3 pm 3rd Sat. each month

Next Meetings: Oct 16th 17th, Nov 20th, Dec 11th

Information: OASIS Hotline, 310/364-2290; website.

August 20, 3 pm –OASIS Board Meeting

Home of Craig and Karin Ward, 1914 Condon
 Avenue, Redondo Beach, CA

Sept. 17, 1 pm – OASIS Board Meeting, at the Home of
 Steve Bartlett and Tina Beychok,
 7108 East Peabody, Long Beach, CA

Sept. 17, 3:30 pm – OASIS LECTURE SERIES –Cassini
 Lecture by Trina Rey – Location TBD –

**Oct. 7, 3:30 pm OASIS LECTURE SERIES – Not Just a
 Rocket Scientist – Location TBD**

Nov. 19, 3pm – OASIS Board Meeting at Home of Steve
 Bartlett and Tina Beychok, 7108 East Peabody, Long
 Beach, CA 90808

Nov 25-27 – LAX Marriott – LOSCON 38

<http://www.loscon.org/38/>

"Where's My Flying Car?"

Come join is for this annual science fiction con.

Writer GoH: John DeChancie

Artist GoH: Aldo Spadoni

This year's theme is, of course, *SCIENCE*

Science GoH: Rick Searfoss, USAF Colonel, USAF
 Retired. Searfoss became an astronaut in July 1991.
 He served as pilot on **STS-58 COLUMBIA** (October 18
 to November 1, 1993) and **STS-76 ATLANTIS SHUTTLE-
 MIR SPACEHAB** mission (March 22-31, 1996), and was
 the mission commander on **STS-90 COLUMBIA Final
 SPACEHAB** mission (April 17, to May 3, 1998).
 Searfoss retired from the Air Force and left NASA in
 1998. (Prior to the ISS Era)

Dec 10, 3 pm OASIS Board Meeting,

Holiday Potluck to Follow – Home of Bob Gounley
 and Paula DelFosse, 1738 La Paz Road, Altadena, CA

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

Moon Miners' MANIFESTO

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