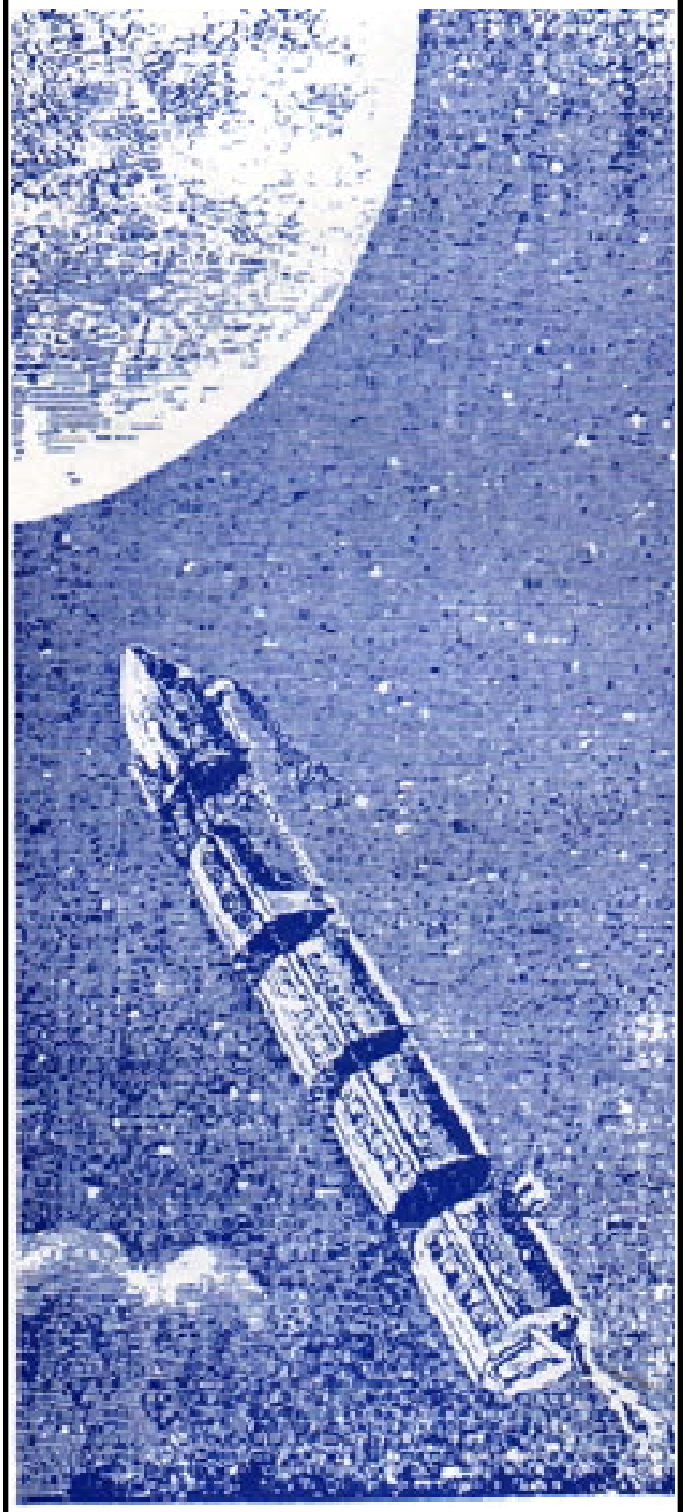
Moon Miners' REVIEW
& Moon Society Journal



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Hindering Access to Space

By Dave Stuart <DSTUART@prodigy.net>

[The original was circulated by email 5/20/02 to a list of twelve persons. Comments by those responding follow this essay, edited to fit the available space. Printed in *Moon Miners Review* with the express permission of the author and of all respondents.]

The State of the Present Impass

Over the years there has been much discussion as to why traveling to and living in Space has not become a reality. Many comparisons of Space development have been made to other historical milestones, as the 'discovery' of the Americas, or the opening of trade routes to the far east, or the opening of the US West, or the rise of air travel. But much of that comparison seems to miss the changed nature of today's human affairs.

Most of those past developments have initially been orchestrated by a few individuals, usually of wealth or power, with a few simple goals [as finding gold, or spices, or making trade contacts, etc.] . Those goals or actions rarely impacted more than a few dozen folks until long after the first pioneering efforts. The reasons for the first actions of those developments never foretold the results that transpired as both society and culture shifted with the impact of those historical milestones. As the various events were unfolding, many of the educated and/or powerful realized various broader potentials and exploited them to try and gain some advantage, either for commerce or power.

An additional element of those past developments was that the impact was initially of limited scope and did not affect very many other societies or countries. Then with later development, trading empires arose and countries fought wars over the unfolding, unforeseen potentials that were emerging.

In today's world, most leaders and many citizens are aware of actions and reactions that ripple throughout the globe. As recent events have shown, even small groups can have a large effect on the world community over a short time period. As a result, nearly all new technologies and changes are examined in a national or ethnic or cultural context as to consider what advantage that group may gain, or what disadvantage that group may have if that technology is in the hands of an adversary .

In this broad context let us examine the development of Space. Initial concepts of traveling to Space were theoretical or literary, but methodology nearly always used some form of propulsion that utilized a military device, namely the rocket or cannon. Thus, nation states and their military were always involved in and often directed or controlled the development of vehicles that could reach Space. Even in the guise of civilian control, the US and Soviet programs were highly integrated with their military to form a national political agenda. In examining this process we would see this to be a normal human association since any society wants to maintain an advantage over their neighbors, especially when it comes to developments that could give other societies a lethal, military advantage over their own.

And, as it turns out, nearly every method and tool to develop and access Space can be utilized by an opponent as part of a military operation.. Satellites can look down on any part of the world, or listen in on nearly any phone or data conversation. Rockets that deliver people or satellites could also deliver any kind of chemical, biological or explosive devise to any part of the world - with no way to stop it. So, if a national leader is charged with protecting their citizens and nation [and/or themselves] then any technology that they have control of that could deliver these devices they would naturally limit access to, restrict information about, and prevent their adversaries from obtaining. This legitimately being done and spoken about in order to protect themselves, their nation and their citizens.

With this situation, which I believe closely describes the current state of the world, any country that has the technology to enter Space would, and arguably should, try and keep it from as many other nations as possible for self protection. And even where other nations have some of that ability, leaders would make it very clear that any nation could easily become victims of that same technology and that they have no defense against it, so should not share or sell that technology least it be used against them.

Under these perceived threats of sharing or releasing Space technologies, few leaders would allow public or private control or, worse yet, the unregulated and uncontrolled utilization of those technologies. Thus, we find an incentive in hindering access to Space in order to maintain the established regulatory and political control. Additionally, any person, group or business would be considered a potential source of uncontrolled Space ["military"] technology. Very few developments in history have been in this position, where such unrestrained potential development would have a positive and/or negative global impact over such a short time period. [Only nuclear and electronic/computer developments come to mind.]

Posing the Question - So, what situations would reduce this hindrance to entering Space?

1. Remain in this nation/state domination of tightly controlled Space [and military] development. A very real path, but this would yield an agonizingly slow development for entering Space.
2. A mutual realization of the vast potential benefit from Space. The possible recognition by all leaders, from national to local to business, that the potential for benefits from Space would be worth more to them by the relinquishing of the military development side of the Space development effort.

Sort of the 'enlightened self interest' view [positive viewpoint] or framed in the context of history's previous 'Mutually Assured Destruction' [MAD] view [negative viewpoint]. As desirable as this action might be, the reality of human history and temperament relegates this to a highly improbable development. Few nations, or persons, have been able to self regulate for long time periods, much less expect all others to do the same.

3. True international group[s] that would examine all aspects of emerging Space developments and limit that portion that would yield a military application potential. Similar in concept to the 'arms control inspection groups' that have been used in nuclear and biological control agreements. This, however would require a global inspection group under some form of international cooperation, unfortunately even the United Nations in its best days has not reached such a state of agreement. Unless a unprecedented breakthrough in global cooperation happens, this scenario is not likely either.

4. Development of a missile defense system, by a few or numerous nation/states, that would nullify the Space related military technology threat from adversaries. This path, while highly wasteful of money, creativity and resources, could yield the conditions where many groups and businesses would be allowed to develop methods of entering and living in Space with reduced oversight by the political leaders. In other words, the 'security' of the missile defense system could allow the loosening of the controls and regulations concerning Space technology development. Of course other nation/states would need to have similar missile defense systems in order to maintain a balance of power, similar to the old 'M.A.D.' balance of power.

I am trying to envision other methods to regain the momentum for entering and living in Space, but have not encountered them yet.

[addressed to email recipients] If you, the enlightened Space enthusiast community have other pathways to circumvent the world nation/state hindrance to entering Space - Please bring them forward for discussion and action.

Dave Stuart

Comments of others in order posted

From: Rich Brown <rab@freemars.org>

The wealthy individual/group model still holds, I think. Tito and Shuttleworth made it to orbit on the strength of their wealth. As they've shown us, part of the money is needed to pay for the flight and part is evade National powers trying to prevent it. Fortunately, $$$s, if you have enough of them, work in both areas. If Bill Gates decided he wanted a personal space program enough to fund it out of his own pocket NASA could do little to prevent him. At most, they could prevent him from doing it from within the US.

Then there's China, which marches to a drummer only it hears ... http://news.bbc.co.uk/hi/english/sci/tech/newsid_1997000/1997747.stm China can certainly manage the '60s era technology it takes, and have the example of knowing it really is possible. - *R B*

From: Christopher Erickson <christopher.a.erickson@medtronic.com>

First: this is a great bit of thought, Dave.

I spent some time looking into Columbus last year, and I'm pretty familiar with the nature of exploration by the British in the 1600's (±100) from having the maritime archives of Britain a few miles down the road (loch) when I lived in Scotland.

Queen Isabella and her cronies didn't have spare cash for Columbus' venture. They had to really be sold. When you look at the dinky boats that Columbus had, and the small crew - not to mention that there was no minimum wage, it's hard to figure how the ruler of a country couldn't have the spare cash. We are mostly taught that monarchs swam in treasure, but the large treasure rooms didn't exist. I believe that Bill Gates provides a comparable character to these rulers. He's rich if he doesn't use it. He isn't sitting on a pile of gold. Once he sells the stock he sub-divides Microsoft, and the single entity dissolves. Monarchs had property and possessions, but cashing them in dissolved their power. Why would Queen Isabella bet the farm on Columbus ?

The need for Spain, France, England, and Portugal to developed trade routes of their own was due to the rise of the Ottoman (Turkish Moslem) empire. The Ottoman were able to restrict the flow of Silk and Spices to one or two ports in Italy, and they grew wealthy.

Something rarely noted is that, in the decade before Columbus sailed, two separate Portuguese expeditions had found, first: the horn - or southmost point of Africa, then a route to India. There was no need to risk an attempt at a direct westward route. Portugal isn't very big. They had a strong maritime talent, but, with the exception of Lisbon, I don't recall there being any other major maritime port - Portugal take the brunt of the Atlantic, and Lisbon sits up one of the few navigable rivers. The Horn of Africa, the Southern route to India, the discovery of America by westerners, the Straits of Magellan, the fist circumnavigation of the globe, were all performed or funded by the Portuguese. They claimed and settled an immense amount of the new world - but, a new world hadn't been anticipated, so was not a motivating force. They weren't wealthy, and they still aren't. So, *why would* Queen Isabella bet the farm on Columbus?

I would like to conclude with noting one more thing. I don't feel strongly that we are being

hindered from getting into space, any more that we are being hindered from setting up a cruise line to anywhere, and registering in another country, so to avoid paying taxes. ESA was going to shut down the NASA monopoly before Ariane was built, but they haven't now that it's flying. Sea Launch, Kistler, the various ex-Soviet system partnerships, India, China, Israel, Brazil, Conestoga, Orbital Sciences; all of these entities are going to straighten things out, right ? Some of the countries don't like us and aren't going to give up a gold mine to make NASA happy. Even Israel, who receives so much aid from the US has never let us lead them by the nose. I'm beginning to suspect that if those in the know knew of a cheap answer, it would be flying somewhere. - *CE*

From: Curtis Snow <curtis@baloney.com>

Okay, you asked For It ! I`ll just note that as I start to write my response I have NASA TV on listening to briefings on the next shuttle flight to ISS to change out the crew (Expedition 5) and continue construction operations... very appropriate.

On the many comparisons of Space Development to other historical milestones. Of course! It is the only handle most of us have and given the nature of our social communication network systems ("priesthood" to "passive mass") it isn`t too bandwidth consuming. The global village isn`t just a catchy book title but a social reality (while *not* a political reality.)

On the point that “most of those past developments have initially been orchestrated by a few individuals, usually of wealth or power, with a few simple goals ...” Yes...we all have our agendas and won`t hesitate to move to forward them. I find it interesting that last night I bought a book* and started reading that has some interesting things to suggest along these lines. It is a look at several eras of human history (mostly in the 20th Century) where new things came along and disrupted social life. The book makes exactly your points: there are phases to these cycles ("punctuated equilibrium" in systems speak) * "Ruling The Waves - Cycles of Discovery, Chaos, and Wealth from the Compass to the Internet" - Debora L. Spar

On the point that “nearly all new technologies and changes are examined in a national or ethnic or cultural context as to consider what advantage that group may gain, or what disadvantage ... “ I must interject that just because these analyses are done doesn`t mean that the conclusions are anywhere near "correct." History is littered with examples of mistakes and stupid political choices by the deciding elites, often based on political/religious taboos and venial emotions. "We" (space activists/fanatics) should always ask ourselves as to what perspectives/ viewpoints make "sense" for analysis and not blindly accept the ones of the dominant paradigm; they are, often, wrong. Since "we" are (by definition) the cutting edge of the human community on this topic "we" should always be sensitive to considerations of the whole community, something our "competition" (why "waste" resources on space exploration ?) can ignore and will always do so.

On the point that “nearly every method and tool to develop and access Space can be utilized by an opponent as part of a military operation ...” I add: *All* tools can be used for military advantage given an appropriate situation. Let us NOT pussy foot around about military behavior; military logic dictates death to the enemy and little else (it may be only death to their social systems instead of their persons but it remains death/disruption.)

On your suggested options:

1. (Remain in this nation/state domination of tightly controlled Space [and military] development) I can only add: "Those who make peaceful change impossible make violent change inevitable" - attributed to J.F.K. This applies to all systems ... "punctuated equilibrium" - again the point being that it won`t continue - rigid stability, that is. Note the news on the Chinese Lunar program, for instance.

2. (A mutual realization of the vast potential benefit from Space.) I insert:"space is the moral equivalent of war for Earth" - moi.
(see www.emory.edu/EDUCATION/mfp/moral.html or http://chomsky.arts.adelaide.edu.au/person/DHart/ETexts/War/WilliamJames/MoralEquivalentWar1906.html to understand what I am suggesting)

3. (True international group[s] that would [snip] [are] not likely either.) I comment: at least not under the current mindset(s) anyway.

On the search for other scenarios - As much as I don`t like saying this I have to be honest. "We" will head into space when enough individuals decide, for whatever reason, that we must do so (critical mass.) I think, and have for a long time, that "we" (the human community) have some painful experiences ahead of us *before* "we" decide it is a "good idea." As long as corrupt political elites and their egocentric agendas have the endorsement of a critical mass of individuals (particularly the technical elite) "we" are *not* there yet. All this does *not* mean I think it it will be several generations before that happens ... remember systems and their "punctuated equilibrium." Any moment/event could catalyze this.

Often I think of a short story by Ursula Le Guin, "The Day Before the Revolution" when contemplating all this. *One never knows* when ... *beforehand*.

On Rich Brown’s point about Bill Gates. I agree. We used to talk about this when I worked there [Microsoft] (perma-temp ya know !)..."if only BillG..." I think the problem is mostly that the system is structured to, mostly, weed out the types "we" are hoping/looking for. Don`t give up hope though, because there are folks out there with big dollars

that have "the [space bug] virus."

On Rich's comment about China, I reply that having lived through the first "Space Race" I can only hope Chinese behavior ignites a second one.

On Chris Erickson's points about Queen Isabella. "We" should remember that Spain had just come into being and that this King [Ferdinand] and Queen were a couple of political necessity; each represented one side of the newly created state and therefore the choice to sponsor Columbus was a way to tie the pieces [Castille & Aragon] together through grand action by the new nation-state without a long drawn out period of infighting amongst the individual elites. On Chris's question "*Why would* Queen Isabella bet the farm on Columbus?" I toss out cohesion of a new nation-state, power, prestige, wealth. We`re primates! As to the Portuguese, almost all of their explorations were driven by one man, Prince Henry the Navigator.

Finally, when enough individuals decide the human community needs to "do space" it will happen. Most of the human race is focused on trivial personal issues cause that`s what keeps them that`s got "in the money." Not that I am suggesting "we" should give up or anything like that - just don`t get too emotionally cranked up over our "slow pace." Things could change tomorrow or next month. You just never know when dealing with non-linear loosely coupled dynamic systems.

Go see the new IMAX movie "Space Station" and get jazzed (regularly...) - *CS*

From: Christopher Erickson
<christopher.a.erickson@medtronic.com>

Curtis concludes his comments on Dave's essay: "when enough individuals decide the human community needs to 'do space' it will happen." This sentence is very important. No matter the name on the headline, nothing moves in society until society is leaning toward a move. We tend to think that great auritors or thinkers are a cause, yet look at how many great auritors have struck a tone in each of us, without any great movement being started. Look at how many idiots are able to stir up the local lemmings. I remember someone calculating how many Moon missions could be bought with the money dumped into video games each year. The problem is that the masses prefer the video games. The masses are going to spend several X-43s seeing Star Wars this month. [By the way,] does anyone else see a possible allegory to Islamic extremists in the clones?

The masses don't study aerodynamics, or help define aircraft regulations, but they fly. They don't collect in parking garages to choreograph synchronized dance routines, but they'll buy Pepsi if Brittney Spears does. The masses don't invest much time and energy into Space exploration, but a few of them with the money will find away to get there. - *CE*

From: Scott E. Shjefte<ses@skypoint.com>

"Very few developments in history have been in this position, where such unrestrained potential development would have a positive and/or negative global impact over such a short time period. [Only nuclear and the electronic (computer) developments come to mind." - Dave Stuart

Hi Dave, Getting into the discussion kind of late but the above is a specific little area where I have read a lot and thought a little about. The future is a bit scary considering the new areas technology development may be taken. In the recent past, current, and short term future history -- *lots of other* possible significant positive and negative global impacts. What come to my mind is:

1) *Nanotechnology* (just ask Eric Drexler)
2) Artificial Intelligence
3) Cheap Fusion Power (cold fusion may really be possible, or maybe the high pressure cavitation surface tension forces can get us to cheap fusion)
4) Genetic Engineering (if nothing else the Star War's Clone Wars other stuff is really scarry)
5) Controlled "drugged" population (just one far out example - neuter the aggression out of men, starts slow with just the sex offenders then grows to felons then to traffic violations then to those who object then to all males because they might do something)
6) Robot automated weapons (programmed killing machines - this is what the current Secretary of Defense is saying is needed to fight terrorism and replace systems like the manned Crusader howitzer)
7) Large scale brain washing technology
8) George Orwell's Brave New World of applied surveillance (guess what it is already here, will we and democracy survive it?) and
9) Don't forget the dangers of self-replicating machines converting the whole solar system into a mass of machines
10) Creation of a black hole that eats the Earth

Need *for deep thought!* Some of the technologies above are in very active development ..... Some more space oriented stuff includes:

11) Solar energy from space 12) Asteroid mining
13) Alien contact/psychological impact/new technologies impact 14) Lunar/L5 colonies
15) Highly accurate low cost undetectable high energy orbital weapon systems (you know - a LASER, like in that 007 movie)
16) etc., etc., etc. (there are more things in heaven and Earth, Horatio...) Some that have happened:

17) The U.S. GREEN [agricultural, not environmental] revolution, now available world wide!
18) Factories, assembly lines 19) Electricity/Lights
20) Radio/TV 21) Movies/"Hollywood"
22) The Printing Press 23) PC Computers
24) also as you noted Nuclear Power/Weapons
25) Democracy - *SS*

from Peter Kokh <KokhMMM@aol.com>

The Threat of Military Space Operations

Having been charged with editing all of this exchange, I have had the luxury of time. But I think that had I to respond immediately, my response would be no different.

First, I agree with Dave Stuart that there is real grounds for worry that *if and as* the arms race is reignited and expands to include Space Activities as an integral -- not merely auxiliary -- theater of operations, the U. S. and N.A.T.O. Militiary may so constrain commercial operations as to preclude any hope of profitability.

This would be a 21st Century extension and magnification of the arrogant "military-industrial complex" that Dwight D. Eisenhower was so concerned about. At stake is the right to launch and the right to put things in orbit. Let us hope that Civilian power and authority succeeds in remaining at the top in the United States (what would freedom be worth if we had to sacrifice that primacy to save it?) and in other democracies. Arrogant Paranoia is an occupational hazard of those entrusted with our security. That is one horn of the dilemma we forget at our peril.

Sadly, it is in the United States, self-touted as the bastion of democracy, that this temptation to military ascendancy over civilian goals is greatest. We can expect the Chinese to follow our lead -- (and that would be our fault.)

The Goal of a Critical Mass of Public Support

Despite the known fact that I have immensely enjoyed public outreach about Space for over fifteen years, I engage in it without the usual hope, or illusion, that a critical mass of public support can be mustered, a groundswell that will force administration and congressional dolts to come to reason and institute dynamic space programs that will "get us somewhere." The hope that drives me is rather to raise the general level of understanding and thereby increase the chances of encouraging latent individual interest and talent able to go further.

"We?" It's not in the cards. The vast majority of voters and/or those who make their voices heard are far more concerned with immediate needs and short term personally relevant goals. Even if we get a majority to agree that space development is a good thing, in an era in which the tax pie would seem to be decidedly limited and where, as a result, *unfortunate* choices must be made, space will never be among the winners. The cause of the "Space as National Policy" fans has been doomed from the start, despite the very great dedication of many talented people. Their efforts are better spent pushing for economic and tax incentives, eroding unnecessary regulation, and in general getting government -- and bureaucracy! -- out of the way of non-socialized space initiatives and efforts and enterprises. There *are* pioneers on this track, and we laud their industrious efforts.

The Tycoon Gambit

Get Bill Gates to do it! Or Jeff Bezos! Or some other nouveau billionaire of the high tech / dot.com era. The problem with this hope is that it does not stand inspection. Firstly, most of such wealth is in the form of stock values, and selling so much stock to reinvest in a space enterprise perceived as risky and dubious would devalue it on the spot. But even if such immense caches of personal wealth were liquid enough to be useful, it is absurd to hope that some tycoon would put them to the cause of space -- unless!

These fortunes were made by wisely putting money to work in search of quick return on investment. Investing in space would be something quite different -- tying up capital in endeavors that just maybe, some day far off, might earn a profit, or at least break even. Such investments would be heroic, to the point of making the Tycoon in question appear as a latter day *Don Quixote*, tilting at some science-fictional Windmill in Space. The Tycoon would loose personal respectability in the financial world, a mortal blow to any other more mundane enterprises he might wish to undertake.

Unless! The only way to attract a Tycoon is with a plan that has a good chance of making money in the real term. That means that *step one is not to find the right tycoon, but to find the right business plan.* And here is where we can help. Stop the "let George do it" daydreaming and let's do the hard work to help identify step by step, self-terracing individually profitable near term enterprises that -- frosting on the cake -- may lay the foundations for a follow on step.

Consensus has nothing to do with it. It has had nothing to do with the crescendo of the computer age. Money, one step at a time, each step laying the foundation for segue development, creating products enough people want to buy, majority vote unneeded! Energy from space is a long shot, because the up-front capital required is impossibly large. Tourism, on the other hand, is something that can start small, pay its own way, and mushroom to a point where everything else is needed precisely to serve this market: including lunar industrialization, including development of space-based energy. Show me the money, the Tycoon will ask. We have to look where the money is now, not where it might be fifty years down the pike. Vanity products (ashes and archives) will not do the trick. Tourism has the potential.

Spin-up, not Spin-off

Spin-off is the most pathetically effete, ineffectual, and useless argument in the enthusiast's arsenal. We need to develop business plans to earn money now from the terrestrial applications of those technologies we need later, on the space frontier. That's how to get consumers, not taxpayers to foot the space development bill. Yes, the same people, but not the same thing. So let's get it right and let's roll. - *P K*

Adventures in Astronomical Research

By Robert D. McGown <r_mcgown@email.msn.com>

The research and writing collaboration by leading amateur astronomical and scientific writers on the Biographical Encyclopedia of Astronomy (BEA) has been a monumental undertaking. It has taken over one year to generate over 1000 essays profiling top astronomers and scientists from the 19th century all the way back to the ancient Greeks.

Prof.r Thomas Hockey, Univ. of Northern Iowa, has led this effort and been responsible for assembling all the volumes of astronomical research into a set of encyclopedias to be available for schools and universities sometime in the spring of 2003 in hard copy and from a fee based Internet database.

Conducting research --There are two types of research: primary and secondary. Primary research uses sources which are the evidence left behind by participants or observers during a historical event or time period. Examples of primary research are diaries, journals, speeches, interviews, letters, manuscripts, or research reports. Secondary research interprets or analyzes an historical event or personality. It is at least one step removed from the event. This research is based upon primary research and can include opinions and con-clusions (subjective or objective). It generally has a bibliography listing the primary resources used. Examples include interpretive articles or documents, periodical indexes, abstracts, textbooks and encyclopedias.

The Internet has made conducting research easier in some respects because one can get to primary research directly from university archives. However, reliability is paramount when searching on the Internet. The search for reliable sources requires scanning the results of powerful search engine algorithms that access over three billion Internet pages. On my Internet searches, I found primary and secondary research documentation in a variety of different languages from sites around the globe. To find enough reliable references to assist with writing my assigned seven biographies, I focused on multi-language searches, sometimes translating foreign web sites with translation software applications. I also used subscription databases that produced some positive results. However I found the free, natural language search engines available on the Internet among the most productive.

Special Libraries -- Some special libraries associated with Lowell Observatory in Flagstaff and NOAO in Tucson, Arizona, provided me valuable primary research material. Peter Hingley, Royal Astronomical Society Librarian, was consulted for information on certain British astronomers. Private collections such as the comprehensive one owned by Portland, Oregon high school physics teacher, Michael Meo, were extremely helpful. Letters and e-mail were the primary source of communication to request research material from university and college libraries as well as from the Royal Astronomical Society in London. University archives found on the Internet at Harvard, Carleton and Heidelburg proved invaluable.

Astronomers Profiled -- I was honored to be one of the amateur astronomers and scientists that Hockey asked to contribute to the Encyclopedia. I wrote biographies on 7 historical astronomers, c. 1,000 words ea.

Solon Irving Bailey: a prominent American astronomer who lived in the late 1800's and early 1900's and was known primarily for his discovery of the class of RR Lyrae variable stars - red giants. RR Lyrae stars vary in brightness by radial pulsations. As the star contracts the surface heats up and brightens; when it expands it cools and dims. The mechanism is the same in each RR Lyrae so the absolute magnitude of each one is similar, and is a useful tool (candle) for determining distances. Bailey was also very influential in the later brilliant career of Harlow Shapley.

William Radcliff Birt: the most influential British scholar in the study of the Moon in the 1860s and 1870s, he founded the Selenographical Society and Selenographical Journal in 1878. He was also one of a select group of astronomers who observed, charted and labeled the unusual lights which rose and fell in intensity around the lunar crater Plato. A crater on the moon bears his name.

Dr. Henry Draper: considered one of the pioneers of astronomical photography, he was first to photograph the star Vega in 1872 and the Orion Nebula (M42) in 1880 on an 11-inch refractor. He studied at the City University of New York, completing the course in medicine in 1857, before he was old enough to graduate. He obtained his MD in 1858, spending the preceding months in Europe, where his interest in astronomy was aroused by a visit to the observatory of the Third Earl of Rosse - Parsonstown, Ireland. On his return to New York he joined the Bellevue Hospital and was later appointed professor of natural science at the City University in 1860.

Reverend T. E. R. Phillips: graduated with a Bachelor of Arts degree from St. Edmund Hall, Oxford, England in 1891, he was also ordained as a minister in the Church of England in 1891 and served as the curate of the Parish of the Holy Trinity at Taunton. Later in life, he became passionately interested in astronomy. In fact, just three months before he died, he was recognized as an eminent amateur astronomer in the field of planetary observation and was awarded an honorary degree of Doctor of science from the University of Oxford.

Jean Louis Pons: born to a poor family in Peyre, France, he did not make a mark on the astronomic community until 1801, when he logged his first discovery of a comet on 11 July. Curiously, the discovery he shared with Charles Messier was

Messier's last and just the beginning of Pon's comet hunting. He had to share that discovery with Charles Messier who found it a day later using a 2-in. achromat refractor. He is known today as an avid comet hunter with a total of 36 comets discovered or co-discovered by him, with 26 are credited to his name.

Karl Wilheim Reinmuth: was known as the world's most successful asteroid hunter. As Director of Heidelberg Königstuhl Observatory for 43 years, Dr. Reinmuth discovered 378 asteroids, or 'little planets' as they were called in those days, in the area between Mars and Jupiter. Reinmuth succeeded Dr. Max Wolf, another famous asteroid hunter, who founded and directed the Königstuhl Observatory and served as professor of astrophysics. Wolf used wide-field photography to study the Milky Way and used statistical treatment of star counts to prove the existence of clouds of dark matter.

Herbert Cooper Wilson: with a Ph.D. in astronomy from the University of Cincinnati was hired in 1887 to teach math, physics, and astronomy and to assist in the editorship of the Messenger at Carleton College, Northfield Minnesota. Carleton College is home to the Goodsell Observatory built in 1888, which houses a 16.2 inch Brashear refractor in the main dome and an 8 1/2 inch Alvan Clark and Sons refractor. In 1890, the Brashear refractor was the twelfth largest in the world. In 1911 he was responsible for encouraging a group of amateur astronomers into founding the American Association of Variable Star Observers, currently the world's largest variable star organization. He was also known for his lantern presentation "A trip to the Moon."

Lessons Learned -- Writing these seven biographies was a rewarding and enriching experience. I found information in unexpected places and learned fascinating details about little known astronomers. It is exciting to think that my contributions to this very important collection of biographies will be used by students and researchers in the years to come, bringing alive the power of the written word. "It often happens that a discovery deep in the seeming abyss of library is as exciting as a find in the depths of space." This quote from David Levy's book More Things in Heaven and Earth, says it all.

It was highly satisfying finding information from diverse sources and being able to piece together the life and contributions of an otherwise 'obscure' astronomer, who when examined carefully, turned out to be an important piece of the historical astronomical picture puzzle. One of the lessons learned is that we might be the next 'obscure' astronomers (amateur or otherwise) who make the newest piece of the astronomical picture puzzle fit. We need to keep the thrill and mystery of astronomical discovery alive, so that those who come after us will still want to explore and learn about the wonders of the universe, a never-ending journey. **<RDM>**

http://www.moonsociety.org

Please make NEWS submissions to
David Wetnight at newsmonger@asi.org
Other submissions: 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 cooper-ation 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 Moonbase 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®

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The Moon Society Presence at ISDC 2002

by Arthur P. Smith <apsmith@ridge.aps.org>

A few of us from the Moon Society were able to attend the National Space Society's 21st annual International Space Development Conference (ISDC) this year at the end of May in Denver, Colorado. As a co-sponsor of the conference we received some recognition; our main duty was organizing the Moon track which was all day Saturday, May 25.

Aside from the lengthy sessions on space law (the conference chairman for 2002, Wayne White, is a space lawyer) the main sessions from my perspective were on asteroids, the Moon, propulsion systems, and of course, Mars. The law talks were interesting for me, having almost no background knowledge.

The asteroid stuff was also quite interesting including a lunch talk by Clark Chapman. Peter Worden commented that asteroids are about the only thing in space that combine our interests "for fear, for greed, for curiosity" and make them likely near-term targets for missions.

Getting to meet Robert Zubrin and the Mars Society people was fun. A bunch of us "Moon" folk sponged off the Friday evening free food they sponsored, while pointedly staring out the window at the near-full Moon on display! The conference happened to coincide with a NASA announcement of finding significant evidence for a lot of water on Mars; there wasn't anything as spectacular to report from the conference sessions on Mars at ISDC this year.

The Moon session was the main one I was there to see. Unfortunately the propulsion track was in parallel, which pulled away Dale Amon (1) among others. Marianne Dyson (2), Niklas Jarvstrat (3), Gordon Haverland, Chip Proser and Paul Blase were the Moon Society members who contributed talks; Gordon also helped me out with the "freebie" display table where we left a bunch of Artemis and Moon Society papers and leaflets. Niklas wore an Artemis Project T-shirt on Sunday (Mars track day)... so I think we were noticed!

Marianne's talk was on the basics of the Moon (we had an infusion of girl scouts listening to her opening talk!), and Gordon's was on some fundamental materials issues we'll need to address in any self-sustaining colony. Chip's talk was on ideas for handling the media; one of our problems seems to be that the Moon has this "been there, done that" image; it seems boring, so the media have no interest.

Paul van Susante talked about some designs for big infrared telescopes on the Moon, probably in the south polar regions; he has a relatively inexpensive and very impressive design for a robotically constructed initial telescope. Niklas also focused on the south pole, looking at the requirements for a fully self-sufficient lunar colony (this related to Gordon's ideas - anyone up to learning the blacksmith trade?).

Paul Blase gave an update on TransOrbital's status, with TrailBlazer getting ever closer to a real launch, probably early in 2003 now. Bill Mook presented a "new approach to lunar travel", which consists of funding the whole thing through accumulation of prepaid spots for private lunar tours; he seemed very serious and committed to the plan; I won't be too surprised if he actually succeeds!

The controversy of the day was reserved for Richard Steiner's proposal to designate the Moon in its entirety as a "world heritage site", preserved from development and industrialization. We'd actually gotten some publicity beforehand with a Wall Street Journal article on Friday morning; their "poll of the day" was on the question of whether the Moon should be developed or not (last I heard about 2/3 were in favor of development). The WSJ article was in turn posted on the MSNBC web site, and there seemed to be a bit of a ripple effect with the issue raised on various bulletin boards, web logs, citations in the National Review, and the like. Leonard David also reported on the ISDC for Space.com, with one article on the Moon session and another on the asteroid sessions; in both cases of course the scary controversial stuff was the highlight!

In actuality, the 20 minutes given to Steiner's talk and the 30 minutes of discussion that followed were very civil, and most of what he said about the beauty of the Moon, tourism, science, etc. were agreed to by just about everybody. He may actually make some headway in a proposal to designate Tranquility base as a Heritage site.

There was lots more at ISDC: space business, art, inflatable habitats, the military role, robotics, and of course law and NSS structure and programs. I most of all enjoyed meeting for the first time so many people interested in space deve-lopment, and particularly the other Moon Society members. Thanks to everybody who helped make it a great event! **<APS>**

NOTES:

(1) Dale Amon was chair of ISDC '87 in Pittsburgh and currently resides in Ireland where he runs Village Networking Limited. http://www.vnl.org -- Dale is also an accomplished Irish folk musician.

(2) Marriane Dyson [www.mariannedyson.com] is a writer with many credits. Her latest book, Home on the Moon, is due out in 2003 from National Geographic, aimed at children. Her previous book, Space Station Science (Scholastic) also aimed at children, won the prestigious Golden Kite Award for best non-iction book of '99. Marianne is also a director of the National Space Society, and chaired ISDC '99 Houston. Marianne also counts science fiction writing among her many other talents.

(3) Niklas Jarvstrat [http://ilewg.jsc.nasa.gov/ILEWG/register/jarvstrat.html] is working on a Moon project [www.ims.org/projects/project_info/moonisru.html]

Meandering Through The Universe

A Column on the Cooperative Movement on the Space Frontier © 2002 by Richard Richardson

Here are a couple technologies which, though there are no guarantees, could prove to have very significant roles to play in the settlement of space and the utilization of its resourses. The first is *direct mental control* of machines and systems via the detection of electronic and magnetic fields in the brain. The second is *Quarn* and the technology by which it is produced.

"Direct Mental Control" of machines?

On the program *Talk of the Nation: Science Friday* on National Public Radio back in March, I believe, there was a discussion of research in which animals were able to control a pointer icon on a computer display purely by thinking. Sensors detected the changing electric and magnetic fields in the animals' brains and were able to successfully translate that to positioning information. That is only a first step, but a *very* significant first step. Basically, if the same thing is done with humans then almost any and every imaginable task could be accomplished via "direct" mental control, using computer driven control systems to interface between the sensors detecting the raw brain signals and the machi-nery which is actually carrying out the desired work.

One way of doing this is exactly as was done with the animals ... controlling a pointer icon on a computer screen. [I'm sorry, I don't remember what kind of animals they were, as I failed to write it down.] Of course, selecting things on a computer interface (and it need not necessarily be a visual interface) is very inefficient for many kinds of tasks, but if pointer control can be done reliably, then how long can it be before more versatile direct brain to computer interfaces are possible. And even with the limitations of point and click interactivity, there are very many tasks which can be accomplished quite well. Such tasks as turning things on or off, directing a moving object right, left, up, down, backwards and forwards, and changing levels or rates of things all are functions which are amenable to this early stage of the technology of direct brain interface.

Probably the most direct, obvious, and community enhancing applications would be to aid those with physical handicaps. In space settlement settings, for quite some time, economic considerations will make it very important that everyone be as productive as possible. It will be an unaffordable luxury to deny handicapped people the opportunity to contribute to the overall productivity of their space community. Even if the community could afford to push those with handicaps aside, is that the kind of society we want? Wouldn't it be better to facilitate their involvement in the productivity of the community, anyway, just because it is the right thing to do, and because it is what we would want for ourselves should injury or disease render us handicapped?

"Quarn" for frontier food?

Also on National Public Radio's program *Talk of the Nation: Science Friday* there was a discussion back in March or April of something called *Quarn*. Towards the end of April, Bryce Walden of Oregon L5 (an NSS chapter) posted to the chapter's e-mail list an article by David MacFarlane on the same subject.

So, what is Quarn? It's the trade name of a fungus grown (intentionally) in huge vats. Why would anyone want to grow huge amounts of fungus? For food, of course. And human food, at that. Sounds pretty appetizing, doesn't it?! Well, according to the host and guest for that particular segment of *Science Friday* as well as others, this particular fungus, when processed into a meat substitute, is eaten *and enjoyed* by many Europeans. And it does have some important virtues. First, and most important, the reports are that it does indeed taste good. Also important, Quarn has no fat and is high in protein. Fat is a fairly essential part of a human diet, but it is far easier to eat healthy amounts of fat if it has to be *added* in order to achieve the right amount rather than having to fight a constant battle to limit the amount ingested.

Since I'm curious about this fungus food, I'd like to request that if any readers have ever tried Quarn, they contact me at *spacecoops@aol.com* or drop a line to *Moon Miners' Manifesto* about its flavor, texture, color and other characteristics.

Of course, I'm not writing about this product just out of curiosity or because I merely find it interesting. Actually, I'm fascinated with its potential as a locally produced food stuff for space communities. Quarn is grown in vats, which means that it doesn't require fields of carefully balanced ecosystem components and all the complication and unreliability which that imposes. In fact, it uses space vastly more efficiently even than relatively high tech solutions such as hydroponics.

Additionally (though I don't have all the information necessary to be entirely sure), Quarn production (at least the fungus growth stage) likely is a fairly efficient process for turning raw materials into harvestable product. Many plants and animals require symbiotic relationships with other organisms and a considerable degree of organic material in their diets. Most fungi have similar needs but at a simple enough level that it might be quite a bit easier to recycle appropriate wastes back into the production stages of the food cycle. And if nutrient recycling is simpler and more efficient then it will probably take up less room, use less energy, require less maintenance and be less expensive to operate. All of those are critical to enabling a space community to be and remain viable.

And there is no reason to believe that it ends

with one measly meat substitute. History tells me that given a good starting point — a fake meat made from fungus which tastes good to a significant percent of the population and which meets most or all of the stringent criteria for a demanding application (space settlement food, for instance) ... that given so propitious and desirable a starting point, it is extremely likely that a vast range of both similar and very different end products will eventually be teased from both the original raw materials and processes as well different but related raw materials and processes. This is exactly what has occurred with controlled fire (steam, internal combustion, jet, and rocket engines, welding and brazing, etc.), the wheel (tires, gears, bearings, etc.), and controlled electromagnetic wave generation (broadcast media, GPS, radar, lasers, microwave ovens, etc.) — to name but three technological realms which illustrate my point. So, given the need of early space communities for efficient and versatile food production processes and their parallel need for efficient and versatile processes to meet all their other survival needs as well as to produce trade goods, Quarn could be a propitious new twist on an ages old technology leading to whole new commercial empires based on products not even imagined yet. Ultimately, to judge the utility of Quarn and related products and processes, the proof will be in the pudding ... er, uh, the vat of fungus.

But don't misunderstand. I am not suggesting Quarn and/or other vats full of fungus are, or ever should be the sum total of our food supply. As Bryce Walden points out in the e-mail I mentioned earlier, there are two major concerns which are not addressed by any single food source: 1) nutritional balance and range, and 2) supply hardiness. There is still a great deal which is not know about nutrition, regarding both diet and sources of nutrients. Only a widely varied diet is likely to provide reasonable protection from disease caused by unsatisfactory nutrition.

One need look no further than the Irish potato famine to see the danger of too limited a diversity of food sources. Failure of the potato crop led to widespread suffering and death from starvation as well as tremendous civil upheaval. If we don't want the same thing to happen in our space communities we need to take reasonable precautions. One of those precautions is to make sure that we have strong, vibrant, resilient ecologies in our space communities and a wide diversity of food sources, all (or at least, most) of which have their own sub-redundancies.

We also need a wide variety of flavors, textures, appearances, and preparation styles of foods to play their part in establishing an environment which facilitates psychological health. There is reason to believe that Quarn or something like it could play a significant role. It would only be a piece of the puzzle. Nonetheless, the more pieces in place, the closer we are to the big picture. **<RRR>**

Mail For MMM

Nitrogen Partial Pressures in Biospheres

In my sample ISSUE of Lunar Enterprise Daily, *Monday / 3 June 2002 – Weekend Edition, it noted:.*

"Peter Kokh points out that of all elements essential for life, nitrogen is in shortest supply on Moon; recommends adapting to lower air pressure;"

As you know, studies have shown that nitrogen is essential for protein formation in plants. And since you point out that nitrogen is rare on the Moon, but essential for agriculture, it would seem that understanding the partial pressure requirements for nitrogen fixing bacteria, which reside in nodules on some few important plants such as red clover and soybeans, is important.

Achieving the requisite availability of nitrogen to plants under varying partial pressures (in order to minimize the importation of nitrogen or nitrogen fertilizers) implies that we will want to examine how to optimize not only on a low level of nitrogen overall, but more importantly for agricultural production, on optimizing the partial pressure requirements for nitrogen fixing bacteria. I am unaware of studies into that constraining regime, but it could encourage higher partial pressures for nitrogen.

Have you seen any data for this to steer you toward lower partial pressures?

The general area of FACE studies for elevated CO_2 especially into root microbial effects now underway for climate change is germane to this investigation I would think:

http://www.google.com/
search?hl=en&q=elevated+CO2++C%3AN

e.g. http://www.nrel.colostate.edu/
projects/soil/EGB/EGB.html

Darel Preble, SSPW

EDITOR'S REPLY:

In the article in MMM #154, I am proposing a modest reduction in the partial pressure of Nitrogen. The evidence that this works in irrefutable.

On the Bolivian, Peruvian altiplano around Lake Titicaca and La Paz, microbes *DO* fix nitrogen. And the partial pressure of Nitrogen there is about 60% of what it is at sea level.

Now it would be interesting to experiment in pressure chambers to see how low we can go and still get satifactory nitrogen fixing yield.

As I am unable to pursue such experiments personally, I confined my arguments to what is clear fact in actual established high altitude environments here on Earth.

Good luck with your project! *Peter Kokh*

Mars Society Australia Works for Mars

http://www.marssociety.org.au/

About the Mars Society Australia

Mars Society Australia (MSA) is an incorporated non-profit organisation. It is part of a worldwide movement, and its goals are:

1. Broad public outreach to instill the vision of pioneering Mars.
2. Support of more aggressive government funded Mars exploration programs around the world.
3. Conducting Mars exploration on a private basis.
4. Encourage Australian participation in education, industry and government and individuals.

The MSA is undertaking comparative research and testing surface exploration strategies and technologies in renowned Mars analogue locations. Our vision is to position Australia for participation in the eventual establishment of a human presence on Mars, and to make Mars more real as a place for people everywhere.

MSA has chapters in all six states and two territories, plus New Zealand.

MarsSkin

http://www.marssociety.org.au/marskin.shtml

Introduction

Project MarsSkin aims to design, produce and test analogue mechanical counter pressure (MCP) space suits which, will behave in a near identical fashion to the real MCP suits which may one day be worn on Mars. The intention is produce suits which may be used in Mars analogue research projects undertaken in Australia and internationally.

The Mechanical Counter Pressure (MCP) Suit

The Mechanical Counter Pressure Suit (MCP) is an alternative space suit technology which has many superior qualities to the gas-pressurisation technique that has been used unanimously on all space flights to date.

An MCP suit would differs by exerting pressure on the body using form-fitting elastic garments. Webb and Annis published the concept and early experiments of a MCP suit in 1967, and in 1971 described the first demonstration that highlighted the many advantages of the MCP approach. MCP garments were found to offer dramatic improvements to gas pressurised suits in reach, dexterity and tactility due to the replacement of stiff joints and bearings with light, flexible elastics. Further advantages included safety (a tear or hole would remain a local defect rather than cause a catastrophic puncture), lower suit costs and vastly reduced weight & volume. MIT conducted flexibility tests with basic MCP elastics during the mid '80's and found MCP gloves to be measurably superior to gas-pressurised gloves.

The success of the original MCP suit, the considerable advances in textile technology for fibers, yarns, textile creation and automated knitting machines, and the continued drawbacks of gas pressurized EVA suits have prompted new interest in the development of a MCP glove and suit. Honeywell (LA), University of California, San Diego, and Clemson University have conducted physiological and design testing on gloves and arms.

MCP, though less proven as the gas-pressurization technique, is an innovative design offering many features which make it clearly superior as a Martian exploration spacesuit. MSA acknowledges this fact and therefore seeks to be involved in the study and development of MCP EVA suits through Project MarsSkin.

Personal Life Support System

The Personal Life Support System (PLSS) consists of the container(s) and systems which support and augment life and the mission during extravehicular activity (EVA) including power, cooling, communications, lighting, drink supply, control interface and status indicator. The PLSS group is based in Melbourne.

Helmet

The helmet is essentially a clear dome with several ancillary items/systems (see communications page) attached on the interior and exterior. The helmet group is based at the University of Sydney.

Layers

The MarsSkin suit will consist of three layers

1. a cotton comfort layer
2. an analogue power layer, which shall be snug and form-fitting to replicate the mechanical counter pressure on the skin
3. an outer layer to serve as a dust cover.

The Layer group is based in Perth and Melbourne.

Analogue Communications

http://www.marssociety.org.au/comms.shtml

SAFMARS

SAFMARS (Store and Forward Mars Analogue Messaging System) envisages using the proposed JAESAT satellite and other Low Earth Orbit (LEO) satellites operating in the amateur radio frequencies (AMSATS) to establish a low-cost email-based communications system. Using portable ground stations, researchers at Mars-analogue sites in Australia (e.g Mars-OZ) and potentially on other continents will be able to communicate a range of data types (emails, images, monitoring data). See the original SAFMARS Operational Concept Definition (pdf) (1.08 Mb). It is anticipated that this system will have a web interface to encourage public participation and awareness.

Tools and Applications for Martian Exploration and Research (TAMER)

The Software Engineering Research Centre at RMIT (in association with the Smart Internet Technology CRC) are interested in *the infrastructure required to support the work of a small group of researchers and explorers on Mars.* The solutions must minimise the impact of the extremely hostile environment and the long highly variable delays in communication on the explorers.

The project currently includes a tool and infrastructure to search for information, a tool to support the recording of experiments/exploration, a tool to manage a changing mission plan and a tool to manage large volumes of electronic correspondence.

Our aim is to produce an infrastructure, tools and devices that can be used in the Mars Analog Programs of the Mars Societies. Some of the work is related to, but currently independent from, work on the Mars Exploration (MEX) project.

Mars Analogue Helmet Systems

The U. of Sydney's Faculty of Engineering as part of it Advanced Engineering Program will be tasking a group of young engineers to design and construct a Mars Analogue Helmet System for Project MarsSkin. A team has been formed of five 1st year students and 2 supervisors. This system will incorporate some of the latest technology in the fields of wearable computing and image recognition and will be used in EVA activities during Operation Red Centre as an integral part of MarsSkin-1. The helmet is being developed under the guidance of Dr Craig Jin from the School of Electrical Engineering, PhD student Teewoon Tan and MSA member Michael West.

Mission Support

In a real Mars mission, mission support functions as the primary channel of communication between researchers in the field (at the base, on rover trips or EVA) and their technical and general support teams on earth. A Mars mission control will face constraints which differ from those experienced in lunar and earth orbit missions, including substantial delays in transmission time, and much longer mission duration. The realistic undertaking of simulated Mars missions on earth requires the formation of a parallel mission support team, operating in a similar role. An F-Mars Mission Support Team based in Colorado has operated for several field seasons, supporting the Mars Society's Devon Island analogue research station, with another group serving as the MDRS Mission Support Team for the first Desert Research Station field season this year.

Analogue Rover Project

http://www.marssociety.org.au/marsupial.shtml

Introduction

Humans will be sent to Mars to explore, and one of the ways in which they will do this will be using rugged, all terrain vehicles. The requirements of Martian rovers will differ from those used in the lunar landings in a number of ways. They will need to be capable of undertaking long overland journeys, contain pressurised living quarters and be robust enough to operate for periods of years.

What is an optimal crew size for such a vehicle? How much internal space within the vehicle

needs to be pressurised? How small can a vehicle be to undertake long distance traverses of +200km? What are the optimal exploration strategies? To date, little research has been undertaken into such issues.

In 2000 the International Mars Society Rover Initiative (MSRI) provided3 teams with seed funding to commence design and construction of working Mars pressurised rover simulation platforms, which could be used to investigate these kinds of questions. Two teams were from North America, the other was Mars Society Australia (MSA).

The vehicles are being constructed to undertake *human factors* research. For this purpose, they are not required to be entirely custom made structures with the exact engineering tolerances and sophisticated internal life support systems a real Mars rover would require. (They are being built on the chassis of commercially produced road vehicles and will run on standard petrol engines.) Instead, they seek to realistically simulate the *spatial* and *operational* characteristics of such vehicles, with air locks, work, living and storage spaces. They will be trialed in carefully planned, simulated cross-country expeditions, which will test the effectiveness of each design configuration in different mission scenarios. Differences in design between the Toronto Rover, the multi-million dollar Michigan Rover and the Aussie rover will enable valuable comparative studies to be undertaken.

Project Marsupial

The Australian analogue rover project, Project Marsupial was formulated with a longer term vision to develop a family of such rovers and provide Australians which could contribute to the design database for future real Mars rover vehicles.

Now based in Freemantle, Western Australia, the project has entered a new era with the purchase of a new Forward Control Landrover which will serve as the basis for a Mars analogue rover. The new vehicle will be called simply the "Marsupial rover" and will supercede the Mitsubishi L300-based "HOP".

The FC Landrover has a distinguished history as a rugged 4WD military truck, emergency ambulance, expedition and safari transport. The purchased vehicle is a Series IIA. It is licenced, but will need some repair work before being ready to drive. The Project Marsupial team expects to commence that work in March. We intend the Marsupial rover to be driveable on public roads, since this will greatly enhance its useability.

More funding is now required to sucessfully complete the overall project to MSA standards. For this reason, we have decided to separate the project into stages, with each stage being commenced only when enough money has been raised to complete it.

Stage 1, already begun, concerns the purchase of a suitable vehicle chassis, and its refit and modification for use as the Marsupial rover.

Stage 2 will be the design and construction of a plastic body to make the machine into an eye-catching, yet functional Mars rover. Most importantly it must effectively serve our needs as a test vehicle for trying out exploration strategies, equipment tests and plausible surface operation scenarios during Operation Red Centre.

Stage 3, accordingly, will complete an interior fitout of the vehicle. This will involved the purchase and installation of interior lighting, communications station, storage cabinets, bunks, spacesuit lockers, sink and toilet facilities. In effect, the vehicle will turned into a self- contained camper, ready for travel across the simulated Martian landscape.

Stay tuned for details of planned Marsupial rover scenarios during Operation Red Centre.

Human Factors

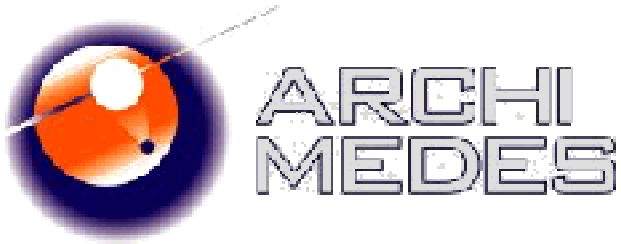
http://www.marssociety.org.au/human_factors.shtml

"Human factors" has been an important consideration in US, Russian and other space programmes to date. Particular issues have included the impact of microgravity on human biological systems, design of living quarters, and group interaction in confined spaces. These issues are even more important when considering the long duration space flight, communication lags and hostile environment to be faced by explorers on Mars.

A number of areas of human factors research are currently under consideration by MSA:

- testing on the proposed Mars-OZ site at Arkaroola
    - habitat design
    - crew interaction
    - crew selection
- techniques for measuring human performance variables such as
    - attention
    - fatigue
    - situation awareness
- human-machine interaction, seeking to integrate with and enhance current MSA projects such as
    - the Mars Analogue Helmet Project and
    - the TAMER project
- consultation on the helmet *heads up display* system to facilitate fast, intuitive mechanisms
    - for retrieval and display of visual information
    - communication between explorers
    - teleoperation of robotic or semi-robotic exploration vehicles
    - and monitoring of crew health.

Consultation is currently underway with several university departments regarding collaborative research into human factors issues in exploration of Mars. Further details will be added as they become available. **<MSA>**



from marssociety.org -- June 14, 2002

The **Mars Society Germany**, supported by numerous companies, universities and the German Space Agency DLR, is currently leading an effort to design, build and fly Germany's first interplanetary mission; **a super-pressure balloon born aerial reconnaissance survey of the planet Mars.** The mission, known as *Archimedes*, will fill the current gap between orbital and surface missions, and combine long-range mobility of planetary dimensions with close up surface measurements and imaging.

Besides being a technology demonstrator, the proposed craft will perform unique scientific experiments. Being a super pressure balloon it will have the ability to make close up images of the surface from an oblique perspective, probe the weak residual magnetic field from its position beneath the ionosphere, and use an atmospheric science package to provide for in situ measurements of local pressure, temperature and humidity. The instruments include a high resolution planetary camera provided by DLR Berlin, a magnetometer provided by TU Braunschweig and a meteorology package provided by the Finnish Meteorological Institute. These sensors have a total weight of C. 600 g without electronics, and are suspended beneath a 15 m diameter balloon in a small gondola of 4.3 kg.

The vehicle will enter the Martian atmosphere and decelerate. Subsequently, a drogue chute will be deployed at around Mach 2 that will bring the vehicle through the sound barrier and decelerates enough for the deployment of a larger, the main parachute. The system will drop its nose cap forward in flight, suspended by a bridle forming an instrument that senses ground contact. Once ground contact is acquired, a set of solid rocket motors will decelerate the flight system even further (to around 1-3 m/s) so that a semi hard impact may be achieved.

When the vehicle itself hits the ground, the parachute suspension rope is cut, allowing the parachute to be jettisoned by the remaining fuel in the SRM. This prevents the parachutes from covering the vehicle. Once this has been accomplished, the vehicle will open up by folding out three panels, with the inflation system, the gondola and balloon envelope left in the middle. The gondola is thus exposed to sunlight and can recharge its batteries. Ground controllers will now be able to monitor the vehicle's health and wait, if necessary, for conditions that allow for balloon envelope inflation.

If the command is sent, a smaller pilot balloon will be inflated that pulls up the main envelope, which should be slightly larger. Once this is inflated as well, it will climb to unfold the gondola suspension bridle. Now the gondola is released and the balloon may climb to its service altitude.

This is the design reference scenario. The major issue here is that it is necessary to find a way to automatically deploying the envelope on the ground without having the material ripped due to ground contact. Another option to be researched is to use, instead of a pressure vessel, some way of chemically bonding the hydrogen in order to have it less volatile during cruise, and thereby eliminate a heavy object from the mission.

Issues are that the process must guarantee for a clean hydrogen gas, must be safe and simple and function in the Martian environment, and be lighter than the equivalent amount of gas with it's high pressure storage system. Along with these questions, various entry vehicle shapes are currently being researched, balloon material options are being studied and transport arrangements with AMSAT on board their P5-A space craft are being negotiated.

The institutions other than the Mars Society Germany so far involved are the AMSAT Germany, Technical University of Stuttgart and the University of the Armed Forces in Munich. The team is led by the two project manager Hannes Griebel and Sven Knuth from Mars Society Germany.

A complete report on the design and progress of the Archimedes Mission will be presented at the Fifth International Mars Society Convention, August 8-11, 2002 University of Colorado, Boulder. An 8 mg pdf file report, *in German*, is available at:

http://www.marssociety.de/downloads/balloon/report_lowres.pdf

Listening to the "Winds of Mars"

"Winds of Mars" is the first recording ever made based on information collected from the surface of a planet other than Earth. It was produced by assigning wind sounds to a flow pattern, using data collected from the 1997 Mars Pathfinder Mission.

Available on-line for $17.99 for CD and $12.99 for cassette, at www.windsofmars.com the CD's and cassettes have become a good fund-raiser for organizations.

If the Mars Society is interested in using Winds of Mars for fund-raising or as an incentive for new members, sponsors, etc., we are able to offer library rates of $9 per CD and $6 per cassette.

We are pleased to send samples on request.

Kelvin W. Miller, Publisher <kelvin@primarius.com>
Music Crest Productions Tel 612.338.5461
141 South 7th Street Fax 612.338.4769
Minneapolis MN 55402

SETI@home Report

From The Planetary Society

3.7 million people and counting!

That;s the astounding number of people who have signed on to participate in the incredible SETI@home Project, a bold experiment that directly involves them in the search for life beyond Earth.

In the last three years, SETI@home has linked together ... more than three million private computers, in essence making it the largest computer in the world! This "supercomputer" is hard at work crunching the numbers in search of the signal that could be the first proof of intelligent life beyond Earth.

When The Planetary Society first agreed to take on sponsorship of SETI@home, we knew we were taking a risk with an enormously complex and ambitious software project. But we saw the tremendous possibility for public involvement, so we took the risk that no one else would.

SETI@home is not just about being directly involved in the adventure of exploration. -- .it's about having a real shot at making the history books. After all, the day we discover life on another world is a day that will be remembered always. It will be marked as a pivotal point in human history, the instant that humanity's isolation in the cosmos disappears forever.

Without financial support from interested individuals, we simply would be unable to undertake such rewarding projects. You can help continue this remarkable project by making a contribution at:

https://planetary.org/donations.html

Louis D. Friedman Executive Director
The Planetary Society

[P.S. Ifyou donate on the Web through PayPal, your contribution is matched dollar for dollar by PayPal, doubling the size of your donation. Whether you already have a PayPal account or not, just click on the PayPal button and follow the instructions. Include your address in the "Ship to" box.]

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The Lunar Reclamation Society, Inc.

PO Box 2102
Milwaukee
WI 53201

www.lunar-reclamation.org

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

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(* LRS Board Members)

LRS NEWS

• **Field Trip to M.A.R.S:** As this issue goes to press several LRS members are planning a field trip to Chicago, Saturday July 20th, to tour the new 3rd Mars Analog Research Station on display at Adler Planetarium before its disassembly for shipping to Europe (Iceland.) Members of Wisconsin Mars Society and Sheboygan Space Society were invited to join us.

LRS Next Meeting

Saturday, September 14 th, 1-4 pm

LRS Chapter Meeting, Mayfair Mall, Garden Suites **Room G110** (lower level, NE part of Mall) near ground-level entrance below General Cinemas

Collaborating Milwaukee Area Space Groups

Moon Society of Milwaukee c/o Peter Kokh
414-342-0705 - KokhMMM@aol.com
http://chapters.asi.org/milwaukee/
MSM currently meets jointly with LRS

Wisconsin Mars Society c/o Matthew Giovanelli
7133 West Wells Street, Milwaukee, WI 53213
414-774-8952 - chooy@execpc.com
http://chapters.marssociety.org/usa/wi/
WMS usually meets at address above on 3rd Sat. 1pm
contact Matt by phone or email address above

U.S. CHAPTERS

NSS
Chapter Events
MMM
7 Chapters Strong

Space Chapters HUB Website:
http://www.nss.ac/hub/

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)

NEW URL http://pasa01.tripod.com

Note : PASA is now on the tripod.com system

• **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.

• **Scheduled PASA activities:** Regular monthly meetings ***Sunday,*** **August 18th** - *location TBD (see note below)*, and **Sat., Sept. 21st.** Call Earl Bennett or Mitch Gordon 215-625-0670 to verify all meetings from Earl Bennet <EarlBennett@erols.com>

• **June Meeting Report:** We had a few less people than normal this time due to various commitments but had a guest drop in. *Janice Guidotti* is interested in space colonization and has expressed her opinions on terraforming Venus. Her training is in medicine and she is presently working on I.T. courses.

We had an informal discussion on the discovery of planets around *55 Cancri* in the constellation Cancer. In revue: the importance of this discovery was that it is Jupiter size and at the right distance to be a part of a planetary system like ours. Earths are presently undetectable at present but big planets alter the properties of the parent star (orbit, rotation rate,etc) and these effects are seen.

We also talked of our insurance status, we are covered as an N.S.S, paying for our postal box and members renewal.John Ashmead who was a speaker at Balticon on time travel in novels. renewed.

Hank Smith gave us news on a possible change of location for the *Philadelphia Science Fiction Soc.* which has me for quite some time at a University City location. *Mitch Gordon* asked if *The Ethical Society* location that *The World Future Society* uses could possibly serve as at least a temporary gathering place. Hank will bring this up to the board of P.S.F.S and thanked Mitch. For the Fall/Early Winter: Hank would like ideas for the science tracks at *Philcon* which will be held in *December* this year. He can be reached at <hankscifi@hotmail.com>

Mitch Gordon reported on the upcoming (August) elections of regional coordinators for N.S.S which was enabled via a ballot insert in *Ad Astra*, the NSS publication. He also gave us a look at this May/June issue which was mostly on Mars. Mitch also reported that *The World Future Society Philadelphia Chapter* will have a meeting on July 10th at Barnes & Noble at Rittenhouse Square on "Ending Poor Planning Rules for Quality Communities". Ten days later, the main event: the World Future Society Convention (wfs.org) in Philadelphia. Mitch has been busy helping organize this event but found time to write an article for the June *Futurist* magazine.

Earl Bennett gave two short reports: the first on the activities of *Firoz Rasul* whose ongoing entrepeneurship has led to the developement of *Fuel Cell Technology* for application on Earth. He has worked long and hard on both the engieering problems *and* the finance and customer identification and development areas. His company, *Ballard Power Systems* has formed alliances with several automakers to develop electric vehicles.This is from the June *Buisness 2.0*.

The other publication was *The Industrial Physicist* forJune/July with serveral good papers. *Laser Fabrication of Glass Miicrostructures* by William Hansen et al on current developements including the fabrication of spacecraft assemblies from photo ceramic ("glass") won. The authors are working on *Pico Satellites* (~100 grams) and only 5cm cubed. The glass parts are bonded together to form the various channels and fuel tank elements for a micro thruster unit. The control electronics (Silicon) can be bonded directly to this assembly and you have the heart of a free flying tiny spacecraft (which can orbit a larger body such as the I.S.S or the Shuttle. Getting to use tools like Free Electron Lasers as shop equipment sounds great too!

Note on our August Meeting: We may meet at the Hyatt on Penns Landing for our August meeting. Feedback Please! This is a Sunday meeting.

ILLINOIS

Chicago Space Frontier L5

610 West 47th Place, Chicago, IL 60609

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

Call Larry for MEETING INFORMATION

Minnesota Space Frontier Society

c/o Dave Buth, 5120 Ewing Avenue North, Brooklyn Center, MN 55429

Dave Buth (w) (612) 333-1872, (h) (763) 536-1237
(612) 375-1539 (Jeff Root)
Email: mnsfs@freemars.org

www.FreeMars.org/l5/index.html

Next Meeting -- No info as of press time: **Radio City Inc. 2663 County Road I**, Mounds View, Mn. 55122 (763) 786-4475 -- back meeting room. It's north of I694 just off of County 10, between Long Lake and Silver Lake Road, not Hwy. 10, close by, which runs along I-35W. You must be on *County* 10. For more directions or to add to Agenda call: (612) 333-1872

From Dave Buth <dbuth@freemars.org>

June Meeting Report: The June meeting was Sunday, June 30th at 5pm at Centre Village Party Room, 433 So. 7th St., downtown Minneapolis. We discussed the upcoming *Convergence* science fiction convention primarily, the weekend of July 5 - 7, 2002 at the Radison South. The Science Room, hosted by MNSFS and Minnesota Mars Society, with our displays, was in Plaza 1 and we had Programming as well.

Also on the agenda were website reworking, a display at the Mall of America, our Annual Report to NSS, a U of M program and many other topics.

From Ben Huset <benhuset@skypoint.com>

Boy Scout Camporall 2002

I've put up a web page with photos from the Viking Council BoyScout Camporall 2002, at which volunteers from the Minnesota Astronomical Society, Minnesota Space Frontier Society, and the University of Minnesota Department of Astronomy helped out.

http://www.freemars.org/mnfan/mas/bsa-2002/index.htm

Thanks to everyone who helped out!-- Jeff Root, Mpls

CONvergence Report: Lots of Pictures: www.freemars.org/mnfan/convergence/2002/index.htm

We featured the following attractions:

- Videos showing past MAS and MN SFS events
- Recent videos from space station alpha.
- Recent videos of shuttle landings to compare the landing simulators to.
- Models of ISS and shuttles and HST
- Video of Views of Earth from space.
- Computer display: current Space Station location
- Shuttle Landing Simulators / certificate if land ok
- Several PC/mac Planetarium Programs
- 3D star model of nearest 27 star systems.
- 3D cards/viewing glasses of constellations, planets
- 10" Dobson Telescope
- Large Fabric Comet
- Coloring Sheets of various space stuff .
- Scale solar system model
- Various handout flyers from sponsoring groups
- Lots of space models past to future.
- Rover Cam
- Capt. Plywood

Who were those unmasked individuals who made this event great? For MN SFS there was :

- David Buth brought those great models of the Space Shuttle MMU, Shuttle-C, Shuttle, and Shuttle with ESA spacelab module, and HST, And helped with setup, staffing and takedown.
- Ben Huset: Person wrangler, Also brought 3D Star Map, DVD player with Earth views DVD,created video tape for video slide show, created/printed coloring sheets and ISS Crew 5 handout and STS landing certificates, ISS Model, Moon and Mars globes, helped with setup, staffing, web imaging, and takedown.
- Rick Weller brought his computer system with shuttle landing simulator and helped with setup, staffing the shuttle landing simulators training many future shuttle pilots and takedown.
- Rich Brown: MN SFS display cases keeper and display staffer.
- Craig Borchard : Helped with setup and staffing.
- Tom Greenwald : helped with Staffing / takedown.
- Michelle Rockne-Semkow : helped with staffing.

For MAS there was :

- Lynn Hefferrnan worked in a number of different capacities. plus takedown.
- Ben Huset -- see info above

People who contributed stuff but couldn't be there in person:

- Dan Fish sent old copies of astronomy maga-zines and other flyers, an iMAC computer / Starry Night
- Art Johnson lent us his video projector
- Bob Bonadurer contributed shrunken solar system and handout materials.
- Wayne McCloud contribed his computer and video hardware to make the Video slide show
- Seth Shostak contributed the SETI Posters
- Kevin Buth: Model Builder and keeper
- Thor Olson: 3D Star map cards

Thanks everybody. -- *Ben*

Astronomy Day Report: MAS and MN SFS hosted a one day Astronomy Day event at Mall of America on June 21st, 2002 as part of the Mall's Family Fun Friday series. For a few quick pics see: http://www.FreeMars.org/mnfan/mas/MOA-2002/

We featured the following attractions: Starlab (mobile planetarium), Video Wall showing past MAS events, Models of ISS and shuttles, Video of Views of Earth from space., Computer display of current location of Space Station, Shuttle Landing Simulators with certificate if you land it ok., Several PC/mac Planetarium Programs, 3D star model of nearest 27 star systems., 3D cards with viewing glasses of constellations and planets, Display on Light pollu-

tion with 'proper' street light shield., 10" Dobsonian Telescope, Coloring Sheets of various space stuff., Large Fabric Comet, 6" f/12 refractor telescope, Demonstration of how lunar phases work., Various handout flyers from sponsoring groups

Many people contributed to the success of this event. For MN SFS David Buth, Ben Huset, Rick Weller, Craig Borchard, and Tom Greenwald made the same contributions as for CONvergence (see report above.) George Anderson helped with setup / staffing.

For Mall of America there was MOA Events rep Maggie Williams (great trouble shooter)

For MAS: Doug Brown, Event Wrangler, ran the event and brought his great 6" refractor scope. Greg Haubrich brought and staffed the Starlab planetarium, and gave many planetarium shows. Charles Ellis watched the telescope exhibit for, what seemed, forever. Kudos to him for hanging in there & helping at teardown. Jackie LaVaque worked several stations. John Treadwell manned an informa-tion table and talked to many people. He also brought his PC system with Cartes de Ceil and his 10" Dobb telescope. Ben Huset also worked many stations. Paul Wright showed people how Moon phases worked. His wife made a "Moon on a stick" [very Minnesotan] for kids to walk around to show how the Moon's phases change as it goes around Earth. John Marchetti gave planetarium shows until his voice was raw and his exit pupils were the size of manhole covers from being in the dark for so long. It was a real superstar effort! Dave Olmstead stopped by and helped with keeping the kids from climbing all over the tele-scopes. Lynn Hefferrnan worked in a several different capacities and takedown. Victor Heiner filled in where he could.

Many contributed stuff but couldn't be there in person: Dan Fish sent old copies of *Astronomy* magazines and other intro flyers and an iMAC com-puter with Starry Night sw. Art Johnson lent us his video projector. Bob Bonadurer contributed 200 FREE tickets to the Minneapolis Planetarium and handout materials. Wayne McCloud contributed his computer and video hardware to make the Video Wall Video. Seth Shostak contributed the SETI Posters. Kevin Buth, Model Builder and keeper. Rich Brown: MN SFS display cases keeper. Thor Olson, 3D Star map cards

Thanks to everyone for a great effort!

OHIO

Cuyahoga Valley Space Society

3433 North Ave. Parma, OH 44134-1252

c/o George F. Cooper III, Phone 216-749-0017

E-Mail: geocooper3@aol.com [new]

☞ Monthly Meetings, the 4th Thursday each month

7-9:15 pm, Parma Regional Library

NEXT MEETING DATES: **AUGUST 29, SEPT. 26**

CALIFORNIA

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

P.O. Box 1231, Redondo Beach, CA 90278

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

Odyssey Ed: Craig Ward - cew@acm.org

E-mail: oasis-leaders@netcom.com

http://chapters.nss.org/oasis

Odyssey Newsletter Online

http://www.geocities.com/CapeCanaveral/Lab/4005/articles.html

> Regular Meeting 3 pm 3rd Sat. each month

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

AUG 17th -- Business Meeting, Redondo Beach

SEP 21st -- Business Meeting, Pasadena

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 Tuesday of the month at **7-9pm**

AUG 19th Stoelting House, 309 Indian Hill, **Kiel**

SEP 15th Foerster Academy of Dance, **Sheboygan**

OREGON

Oregon L5 Society, Inc.

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

voice mail / FAX (503) 655-6189

http://www.OregonL5.org/

Allen G. Taylor <allen.taylor@ieee.org>

Bryce Walden <BWalden@aol.com>

(LBRT - Oregon Moonbase) moonbase@home.com

☞ Meetings **3rd Sat.** each month at **2 p.m.**

Bourne Plaza, 1441 SE 122nd, Portland, **downstairs** NEXT MEETINGS: **AUG 17, SEP 21**

NAME _____ √

STREET _____ √

CITY/ST/ZIP _____ √

PHONE #S _____ √

○ $35 **NATIONAL SPACE SOC.** dues + **Ad Astra**
○ $20 NSS dues if under 22 / over 64. *State age* ___
600 Pennsylvania Ave SE #201, Washington DC 20003

Join **The Moon Society** - dues address on page 9
- **For members residing in the U.S & Canada:**
  Printed **MMM** delivered by postal mail: **$35**
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- **For members residing in other locations:**
  Printed **MMM** delivered by postal mail: **$60**
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Member Dues -- MMM/MMR Subscriptions:
Send proper dues to address in chapter news section

=>*for those outside participating chapter areas* <=
○ $18 **Individual Subscriptions to MMM/MMR:**
Outside North America ○ $50 Surface Mail --
Payable to "LRS", PO Box 2102, Milwaukee WI 53201

LUNAR RECLAMATION SOC. (NSS-Milwaukee)
○ $18 reg. ○ $24 family ○ $15 student/senior

CUYAHOGA VALLEY SPACE SOC. (Cleveland, OH)
○ $15

CHICAGO SPACE FRONTIER L5
○ $15 annual dues

MINNESOTA SPACE FRONTIER SOCIETY
○ $20 Regular Dues

OREGON L5 SOCIETY
○ $25 for all members

O.A.S.I.S. L5 (Los Angeles)
○ $18 regular dues

PHILADELPHIA AREA SPACE ALLIANCE
○ Annual dues for all with MMM $20, due in March or $ times each quarter before the next March

SHEBOYGAN SPACE SOCIETY (WI)
○ $15 reg., ○ $10 stdnt, ○ $1/extra family memb "SSS" c/o B. P. Knier, 22608 County Line Rd, Elkhart Lake WI 53020

Moon Miners' REVIEW # 31

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