

THE MARS QUARTERLY



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Mars Arctic 365 Phase 1 Mission a Success



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On the Cover – FMARS hab with tri-color Mars flag

FROM THE FLIGHT DECK

As many of you know, the Mars Society recently launched phase 1 of its Mars Arctic 365 (MA365) project, resulting in the successful refitting/resupplying of the FMARS station in northern Canada. This was a vital first step in preparation for the planned one-year Mars surface simulation mission, expected to begin in the summer of 2014.

According to a member of the MA365 science team, "The one-year Mars simulation on Devon Island will serve as one of the most reliable Mars analog studies conducted to date and will involve true isolation and real challenges lasting 365 days, where science, organized by some of the world's leading experts, will cover topics ranging from human biology to geology to climate research."

In order to accomplish the MA365

mission, the Mars Society has taken upon itself a major challenge – to raise an estimated \$1 million to cover the extensive costs involved in the one-year simulation. We clearly need your help, our members, our friends, in order to raise this substantial amount.

Please consider donating today! Contributions can be made via our web site (www.marsociety.org) or by mailing a check to The Mars Society, 11111 W. 8th Avenue, unit A, Lakewood, CO 80215 (U.S.A.). For those in the U.S., remember that the Mars Society is a registered non-profit organization, so gifts are tax-deductible.

MA365 is a major step in the direction of humans-to-Mars. Be part of this historic endeavor!

Michael Stoltz, Editor



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Mars Arctic 365 Phase 1 Mission a Success



Crew of MA365 (Phase 1)

The Mars Arctic 365 (MA365) Phase 1 mission, organized by the Mars Society, was successfully completed in late July 2013. Led by veteran Mars Society Steering Committee member Joseph Palaia and including Adam

Nehr, Justin Sumpter, Barry Stott, Garrett Edquist and Dr. Alexander Kumar and supported by experienced pilots Richard Sugden and Richard Spencer, journalist Jim

Moore and Mars Society senior management, the crew completed the key essential mission objectives and returned safely to civilization.

Departing from Idaho on July 8th, the mission spearhead, composed of Palaia, Nehr and Sumpter, reached the Flashline Mars Arctic Research Station (FMARS) located in the polar desert on Canada's Devon Island on July 10th. Supported by and eventually joined by the others, the team set

about refitting and improving the facility, which had been dormant since 2009.

Among the tasks executed were the revival of two on-site diesel generators and the delivery of a sophisticated

new "Carnot" diesel generator purchased courtesy of Association Planète Mars, the French chapter of the Mars Society. As such, there are now a total of three working

diesel generators available at FMARS, as well as a gasoline-powered backup. In addition, the crew reactivated the satellite Internet communication system and tested a new satellite phone system donated by Iridium. A large, powerful four-wheel drive ATV capable of hauling heavy payloads across rough terrain and provided at a sharp discount by Arctic Cat was brought in, along with an ATV trailer. The station's old ATV trailer was made

operational again as well, assuring redundant ground transport capability.

During the visit, the structural condition of the FMARS facility was assessed and found to be in excellent shape. The station's electric, water and waste disposal systems were all successfully reactivated. A new induction cooking range was installed, and other interior fixtures were also refurbished. On-site stored food supplies were assessed, with most found to be sound and the rest disposed of.

Outside the FMARS hab, a berm to enable secondary containment of large quantities of fuel was built and stockpiled with diesel fuel. Two new airstrips were opened up to help assure good logistic support of the station despite unfavorable crosswinds, snow or other nuisances that might impede operations were the mission restricted to just one airstrip. A weather station, useful for both climate research and support of mission operations, was installed and activated. Large amounts of additional equipment from U.S. and Canadian

MA365 is a plan to simulate a one-year Mars human surface exploration mission at FMARS.

Aerial view of FMARS hab



suppliers were also transported to Resolute Bay, where it will be stored over the winter and ready for rapid deployment to FMARS in the summer of 2014.

Commenting on the success of MA365 Phase 1, crew commander Joseph Palaia said, "Our team completed the critical mission objectives we had set out to accomplish. We plan to return to FMARS at the beginning of next season to deliver more equipment and supplies and complete preparation of the station for the Mars Society's historic one-year expedition."

MA365 is a plan to simulate a one-year Mars human surface exploration mission at FMARS. The mission crew will conduct a program of field exploration in one of the most Mars-like environments on Earth, while operating under many of the same operational constraints as an actual Mars mission. In the course of doing this, crew members will learn a great deal about which methods,

technologies and tactics will work best on the Red Planet. Furthermore, they will do this while dealing with the stresses that come not only from isolation, as the Mars500 crew experienced, but also cold, danger, hard work and the need to achieve real scientific results, and thus truly begin to explore the critical human factor issues facing Mars exploration. Nothing like this has ever been done before.

The preparatory Phase 1 of the MA365 mission has now been completed. Phase 2, which will include final refitting operations followed by the initiation of the one-year Mars simulation, is expected to begin in July 2014. A call for crew volunteers for the MA365 Phase 2 expedition will be issued shortly by the Mars Society.

A gallery of photos taken by the MA365 Phase 1 crew has been posted on the mission's new web site (www.ma365.marssociety.org). Also a complete report on July's MA365 expedition and plans for the one-year

simulation mission were presented at the 16th Annual International Mars Society Convention in August. To watch the full video presentation, please visit the International Mars Society's page on YouTube.

While the first phase of MA365 has been completed, the bulk of the mission lies ahead of us in terms of planning the one-year Mars simulation and raising the necessary funds to carry out this important endeavor. Plain and simple, we need your help, your financial backing! Supporting the MA365 project can be done by contributing online via our web site (www.marssociety.org), donating by sending a check to: The Mars Society, 11111 W. 8th Avenue, unit A, Lakewood, CO 80215 or serving as a corporate sponsor of the mission. Join others who have already contributed to MA365 and help make this mission a historic success!



A Red Flag on the Red Planet: China's Mars Ambitions

By Ben Evans



Xinhua News

At 2:16 a.m. local time on November 8, 2011, the desolate steppe of Baikonur, Kazakhstan, shook to the roar of rocket engines. A Ukrainian-built Zenit-2SB vehicle thundered into orbit carrying the Russian Fobos-Grunt spacecraft, destined to perform a landing on Mars' large moon, Phobos. Also aboard was a small, 250-pound probe known as "Yinghuo-1" ("Firefly" or "Luminous Fire"). The latter was China's long-awaited first mission to the Red Planet and rode "piggyback" on the main Fobos-Grunt spacecraft.

For the Chinese National Space Administration (CNSA), the launch was a huge leap for the world's most populous nation. Only eight years earlier, China became the third discrete state to launch its own astronaut and in 2007 and 2010 placed its Chang'e 1 and 2 probes into orbit around the Moon. With Mars as the next step, it seems that the possibility of seeing the Red Flag on the red surface of the Red Planet is by no

means far-fetched.

China's red dawn received a significant push in March 2007, when Sun Laiyan, director of the CNSA, signed a co-operation accord with his counterpart Anatoli Perminov, head of the Russian Space Agency. Its provisions called for joint exploration of the Mars system and included specific language for the assembly and launch of Fobos-Grunt and Yinghuo-1. Over the next two years, the Chinese craft – a cube-shaped box, measuring 2.5 feet wide by 2.5 feet high – gradually rose from blueprints at the Shanghai Academy of Space Flight to actual hardware and in October 2011 it was transferred to Baikonur for integration with Fobos-Grunt and the Zenit, ahead of launch.

According to SpaceDaily, "Yinghuo-1 was a fairly low-cost and low-key way for China to begin its planetary exploration program" and "if the program is treated as an exercise in starting such a program, it should be considered a success". After

insertion into low-Earth orbit, the combined spacecraft would have been boosted onto an 11-month trajectory to reach the Red Planet in October 2012. The minutes, hours and days after launch, however, created a chain of events which would spell catastrophe. Two orbit-raising maneuvers by Fobos-Grunt failed to occur and it soon became obvious that the whole mission was lost. The spacecraft ignominiously fell back to Earth and burned up in the atmosphere in January 2012.

It was a devastating blow for China's Mars ambitions. Yinghuo-1 would have spent at least one full Earth-year in orbit around the Red Planet, investigating its plasma and magnetic field environment, studying ion-escape processes and mechanisms, making occultation measurements of the Martian ionosphere and observing sandstorms on its red-hued surface. To accomplish these scientific ends, it was equipped with a compact payload of ion and electron analyzers, a mass spectrometer, a magnetometer, a radio-occultation sounder and a high-quality, dual-camera imaging system with 660-foot resolution.

With the demise of Yinghuo-1, little has come to light about specific future Chinese missions, whether piloted or unpiloted, to the Red Planet, but there has been lively discussion about a Mars orbiter (and possibly lander) to be despatched in the 2016-2018 period. If flown, it will ride atop a Long March-3B rocket from the Xichang Satellite Launch Center in southern Sichuan Province. Budgetary provisions for China's next Five-Year Plan have left the mission poorly defined at present, but an August 2011 paper from the Chinese Academy of Space Technology (CAST) has yielded some tantalizing detail.

The paper suggested that the "mother ship" would be a multi-faced spacecraft, operating from a highly elliptical, high-inclination orbit of 85-95 degrees, and charged with performing

chemical and mineralogical analyses of the planet's surface and atmosphere. Meanwhile, a stationary lander would conduct several days of ground operations, with particular focus upon the identification of subsurface water ice and in-situ monitoring of the Martian climate. In line with the stated requirements of China's current Five-Year Plan (2011-2015), the CAST paper highlighted the benefits of international participation in the lander and scientific instruments for the orbiter. It has been suggested that Chinese and European Space Agency (ESA) tracking and communications assets will be utilized on the mission.

The 4,400-pound orbiter is expected to take the form of a three-axis, spin-stabilized "bus", powered by gallium arsenide solar arrays and lithium-ion batteries. Its instrument suite – if approved – is impressive in its scope and offers great promise for an exciting mission of exploration. It includes a CCD camera, surface-penetrating radar, infrared and gamma ray spectrometers and high-energy and solar wind particle detectors.

After reaching Mars, a little under a year after launch, the spacecraft will enter a "capture" orbit, which will be gradually reduced in altitude to permit the deployment of the 40-100-pound lander. Protected by a rigid "aeroshell" heat shield, the battery-powered lander will plunge into the Martian atmosphere at an estimated 10,500 mph and will descend to the surface, touching down somewhere in the northern hemisphere. The "semi-soft" landing will be accomplished via parachute. Although the lander itself will most likely be a stationary platform, as opposed to a mobile roving vehicle, and should endure for no more than three to five days on the surface, its success would be a huge shot in the arm for China's aspirations in deep space.

In the wake of its role in support of

the lander, the orbiter will maneuver itself into a "science-gathering" orbit, with an altitude of about 186 miles, to prepare for up to two Earth-years circling Mars. Nowhere in the CAST document is there any specific mention of Chinese astronauts journeying to the Red Planet, although the scientific agenda for the orbiter

hints at the scouting-out of suitable landing sites and the identification of water ice reserves, both of which would provide beneficial information for a human mission.

Still, outside of

government control, interest in deep-space exploration and footprints on Mars among China's 1.35 billion people is strong. Two years ago, Wang Yue, an instructor from the China Astronaut Research and Training Center, participated alongside three Russians and two Europeans on the 520-day final segment of the "Mars-500" isolation experiment. Operated in an experimental facility on the outskirts of Moscow, the six crew members spent almost 18 months – from June 2010 until November 2011 – testing systems and procedures and facing some of the obstacles which might someday face a human crew, heading into the unknown, bound for Mars.


It is true that China lacks an official focus upon a human expedition to the Red Planet, but the rapid rate with which this communist nation has developed its own human space program and raised it to fruition – launching its first astronaut in October 2003, performing its first spacewalk in 2008 and occupying its first experimental space station in 2011-2012 – has been truly dramatic and breathtaking to behold. With a "modular" space station firmly scheduled for launch into orbit by 2020, and lunar bases sometime thereafter, there is little reason to doubt China's resolve. And there is equally little reason to doubt that a Chinese citizen will stand on the

blood-red plains of Mars, clutching a blood-red, yellow-star-spangled, banner, at some stage in the future.

The nation's fixation with Mars intensified somewhat with the ongoing "Mars One" initiative to establish a permanent, reality-TV-funded human colony on the planet by 2023. According to People's Daily Online, by April 2013 more than 600 Chinese applications to participate in the mission had been received, out of a total of around 20,000.

At a governmental level, U.S. President Barack Obama expressed hopes two years ago that co-operation with China was one possible route to the Martian surface. "When the time comes for humans to visit Mars," said White House science adviser John Holdren in testimony before the House Appropriations commerce, justice and science subcommittee, "it's going to be an extremely expensive proposition and the question is whether it will really make sense...to do it as one nation, rather than do it in concert."

Whatever reality the coming years and decades bring, it can be asserted with absolute certainty that our first piloted voyage to Mars – whether to orbit the planet, to land on its surface or to explore one of its moons, Phobos or Deimos – will be several orders of magnitude beyond anything hitherto attempted in terms of challenge and risk. Technologically, culturally, politically and financially, the mission will elevate our species to a new level. For when humans set foot on Mars, their journey will represent something far longer, more difficult and more arduous than even Project Apollo achieved.

There will be flags and footprints, of course. Maybe those flags will include the Star-Spangled Banner, or the Russian tricolor, or the red field and five gold stars of the People's Republic of China. Maybe all three flags will one day flutter together, alongside the emblems of other nations, against a stark red landscape. Maybe not. But when we do arrive on Mars, our mission to get there will have already delivered untold riches, for it will have firmly established us – for the first time in human history – as a true spacefaring civilization. 

...interest in deep-space exploration and footprints on Mars among China's 1.35 billion people is strong.

Mars Society Seeks Student Help to Design Inspiration Mars Mission



[l to r] R. Zubrin, D. Tito & T. MacCallum

During the 16th Annual International Mars Society Convention in Boulder, Colorado in August 2013, the Mars Society announced the launch of an international engineering competition for student teams to propose design concepts for the architecture of the ground-breaking Inspiration Mars mission, which intends to send a spacecraft piloted by two astronauts on a round-trip flyby of the Red Planet in 2018. The contest is open to university engineering student teams from anywhere in the world.

Inspiration Mars Executive Director Dennis Tito and Program Manager Taber MacCallum were present at the convention for the announcement. "Inspiration Mars is looking for the most creative ideas from engineers all over the world," said Tito. "Furthermore, we want to engage the explorers of tomorrow with a real and exciting mission, and demonstrate what a powerful force space exploration can be in inspiring young people to develop their talent. This contest will accomplish both of those objectives."

Also commenting on the new contest, Mars Society President Dr. Robert Zubrin said, "The Mars Society is delighted to lead this effort. This contest will provide an opportunity for

legions of young engineers to directly contribute their talent to this breakthrough project to open the space frontier."

The requirement is to design a two-person Mars flyby mission as cheaply, safely and simply as possible. All other design variables are open.

Alumni, professors and other university staff may participate as well, but the teams must be predominantly composed of and led by students. All competition presentations must be completed exclusively by students. Teams will be required to submit their design reports in writing by March 15, 2014. From there, a down-select will occur with the top 10 finalist teams invited to present and defend their designs before a panel of six judges chosen (two each) by the Mars Society, Inspiration Mars and NASA. The presentations will take place during a public event at NASA Ames Research Center in April 2014.

Designs will be evaluated using a scoring system, allocating a maximum of 30 points for cost, 30 points for technical quality of the design, 20 points for operational simplicity and 20 points for schedule with a maximum total of 100 points. The first place team will receive a prize of \$10,000, an all-expenses paid trip to

the 2014 International Mars Society Convention and a trophy to be presented by Dennis Tito at that event. Prizes of \$5,000, \$3,000, \$2,000 and \$1,000 will also be awarded for second through fifth place.

All designs submitted will be published, and Inspiration Mars will be given non-exclusive rights to make use of any ideas contained therein.

"If this [Inspiration Mars] mission happens, this will completely change everyone's thinking, within NASA, within Congress, within the public at large, as to what a human Mars mission is. Is it part of our world, or is it part of the world of the future? Right now, NASA's thinking has humans to Mars being part of the future. It's not part of our reality at all. ... This is a chance for a breakthrough," declared Dr. Zubrin.



Further information about the Mars Society may be found at www.marssociety.org.

Further information about Inspiration Mars may be found at www.inspirationmars.org.

To inquire about possible involvement in the Inspiration Mars design contest, please email us at: inspiration@marssociety.org.

Highlights of the 2013 Mars Society Convention



Held at the University of Colorado in Boulder this past August, the 16th Annual International Mars Society Convention was a resounding success. A mixed group of 350 people, close to being a record for the annual event, attended the four-day conference. These included scientists, journalists, space advocates, policymakers, students, and teachers, as well as members of the general public. A first for the Mars Society, several hundred people watched the conference's plenary talks live via the Internet (all of which are currently posted on the Mars Society's YouTube page). Serving as the convention's keynote speaker was Dr. Steven

Squyres of Cornell University, who gave an update on NASA's Mars Exploration Rover mission (Spirit and Opportunity). In addition, Dr. Squyres was the recipient of the 2013 Mars Pioneer Award, honoring him for his tremendous contribution to the exploration of the Red Planet.



Dr. Steven Squyres receiving Mars award



Students at STEM program



NASA's Dr. James Reuther



Good attendance at convention



Zubrin, MacCallum & Tito with Mars flag



Dr. Robert Zubrin at conference



Debate on future of Mars exploration



Volunteers at display table

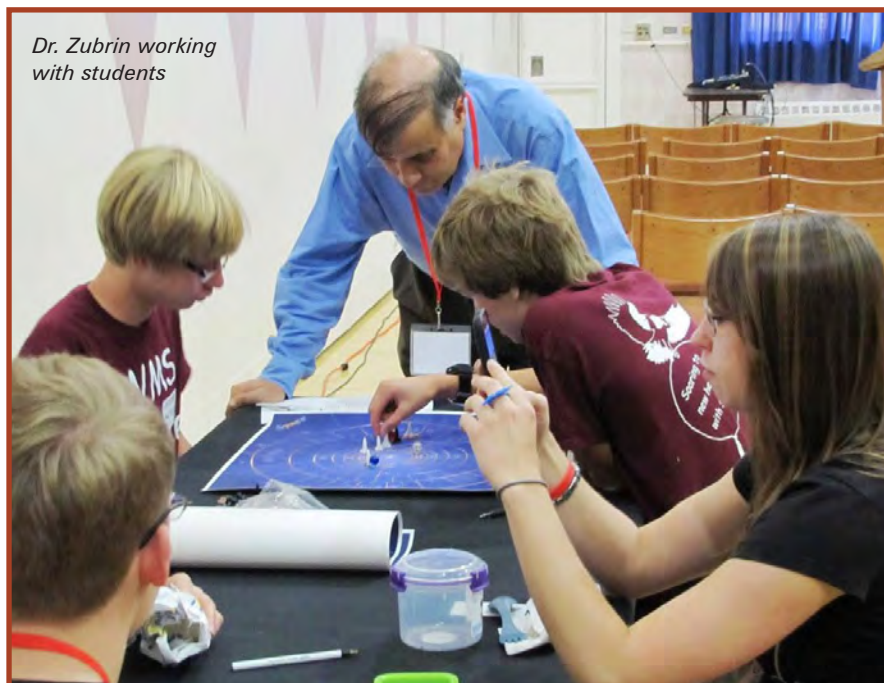
Mars Society Holds STEM Education Program in Boulder

by Nicole Willett

On Saturday August 17, 2013, the Education Division of the Mars Society hosted the 2013 STEM Education Event. The event was held concurrently with the 16th Annual International Mars Society Convention at the University of Colorado in Boulder. The purpose of the event was to promote interest in Science, Technology, Engineering, and Technology (STEM) education and potential careers, with a focus on young students. There were several speakers who presented a variety of STEM topics.

Chuck McMurray, the Mars Society's Deputy Director of Education and head of the organization's youth rover project, had a model rover on display and gave a presentation that launched the Youth Rover Challenge (YRC) for the 2013-14 school year. The YRC is a national challenge for middle and high school students to build a Mars Rover using the Lego Mindstorm technology. This competition is an essential predecessor to the Mars Society's University Rover Challenge. Participating students will compete in two levels, either junior varsity or varsity. During the competition students will be allowed to upload data and videos on the Youth Rover web site (www.youthrover.org). They will be able to see the videos and uploaded information from other YRC teams. Once the deadline is reached, the YRC Director will hold regional competitions and the winner is scheduled to be announced at next year's International Mars Society Convention.

Chris Nie from Colorado University's Students for the Exploration and Development of Space (CUSEDs) was also on hand with several volunteers. His group brought a number of activities for the students to participate in. Some activities were developing space related postcards, stomp rockets, Alka-seltzer rockets, Mars rock geology, space mining, and crater



Dr. Zubrin working with students

formation. Christine Fanchiang, also a CUSEDs member, had her XHab project on display. The focus of this project was the study of space diet and nutrition, robotics, and in-space plant growth.

Bruce MacKenzie of the Mars Foundation gave a detailed presentation about Mars settlement and how schools can educate students using hands-on activities, displays, and mock Mars habitats. Bruce and Seth Sinnemma also brought a 3-D printer, showing audience members how this new technology works. This device is expected to be a key tool in helping Mars pioneers produce habitats and other essential products on the surface of the Red Planet.

Bob Bruner loaned the Education Division a few wonderful displays. The first was a called Earth Rocks Found on Mars. These were analogs of rocks and minerals that we know to be found on Mars. The next display was a grouping of books that are all about Mars from the past century or two. This was a beautifully laid out arrangement. My favorite display was called Life on Mars in a Box. It

included Earth minerals and Martian meteorites. The purpose was to show how it is possible that life could have travelled to Earth from the Red Planet.

Astronaut Abby, a 15-year-old from Minnesota, presented her touching story about her efforts to promote STEM science, as well as her recent visit to the former Soviet Union to witness first-hand the launch of a Soyuz rocket to the International Space Station. Abby's goal is to be the first astronaut on Mars.

Local teacher Vicky Jordan brought her students from Wellington Middle School in Boulder that worked on the 100,000 foot balloon project. A team of ten students in grades 6-8 spent the entire school year studying atmospheric science. They cooperated with scientists to help them ask appropriate questions for their experiment. The students also launched two balloons with payloads and continue analyzing the data.

The Boulder-based kindergarten class that won the MAVEN art project brought their winning displays. Their teacher, Jill Williams, proudly spoke about her students and their



participation and triumphant win of the MAVEN art project. Carol Kendall from Acres Green Elementary School

inspirational talk about the importance of STEM education, adding "If we don't adequately inspire our children

in Boulder brought a project that her students created called Red Planet: Read, Write, and Explore! This project was intended for students in grades 3-5.

Dr. Robert Zubrin, President of the Mars Society, joined the STEM program, giving a very

to pursue STEM careers, we will continue to fall behind the rest of the world. We must not let that happen." Dr. Zubrin also spoke with individual students on hand, taking time to explain some of the displays and science-based games.

The 2013 STEM Education Event was a wonderful experience for the dozens of students and parents who attended. Participants learned a lot about STEM education, while having fun. Promoting STEM paths and careers is a huge undertaking. If other organizations collaborate and participate, we can help our children to have a solid foundation of scientific literacy, creating a ripple effect around the world and benefiting all mankind.

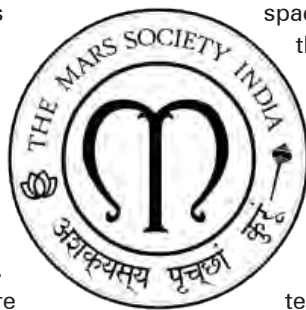


Chapter Close-Up: India

by Varun Sudarsanan

Mars Society India (MSI) was founded in January 2012 by Dhruv Joshi, an alumnus of the Indian Institute of Technology Bombay. Dhruv, together with the then Project Managers of IIT Bombay's student satellite programme, launched the society chapter at the Nehru Planetarium, Mumbai, paving the way for a rejuvenated community of space enthusiasts in the country.

IIT Bombay, the premiere institute for science and technology in the country, is currently the chief patron of MSI. Interestingly, the establishment of the society was right at the time when India was formulating plans to initiate a mission to Mars. Based in IIT Bombay, the society currently comprises a few undergraduate students from IIT Bombay and IIT Delhi. The expansion process is well underway to broaden its reach across the scientific community in the country.



MSI endeavors to be a platform where the immense potential in India's students can be brought to the forefront and directed towards promoting the country's ambitious space missions. The focus, therefore, is on building innovative indigenous technologies to advance the space and planetary exploration capabilities of all mankind. The side-benefits to humanity as the technologies trickle down are also of great interest.

To realize this aim, MSI has undertaken a Student Mars Rover Project, with the motivation of getting hands-on experience with the technologies at play in a rover. This project, with a dedicated team of 25, is in the prototyping phase; the team expects to take part in the 2014 University Rover Challenge held annually by the Mars Society in Utah.

Currently headed by Varun Sudarsanan, a third year

undergraduate student in Aerospace Engineering at IIT Bombay, MSI has also built ties with Mars Society Australia and Australian-based Saber Astronautics in order to test the prototypes from the Student Mars Rover Project at MARS (Mars Analogue Research Station) in Arkaroola, Australia. This collaboration is expected to develop into an annual program with an extensive interchange of knowledge and technological expertise between the two countries over the years.

MSI is also planning an event in collaboration with the Nehru Planetarium, Mumbai. Scheduled in October 2013, when India's first Mars initiative, the Mars Orbiter, will take flight, this event is expected to be graced by stalwarts from India's space science community.

The future seems to be a gleaming red for the Indian space scene with a rekindled love for the Red Planet. MSI hopes to be a major part in these missions headed to Mars and beyond.



"Martian" Skies in Sharper Focus

by Peter Detterline

The Astronomy Team met for the first time this summer at the Mars Desert Research Station (MDRS) in Utah. The mission was to familiarize the new team with the Musk Observatory, fine tune the polar alignment of the telescope, hook up the observatory so it can be operated from inside the hab, produce training videos, and take lots of pictures of those beautiful dark "Martian" skies.

The refit crew consisted of me as the astronomy lead; Gary Becker and Randy Dunning, who work on telescope maintenance and Capcom; John Barainca and Tricia Smedley, who work with education and public outreach; and Haritina Mogosanu, who leads the education and public outreach efforts for the group. Haritina was not able to attend, but was our support person during the refit mission. We were also blessed with two other people who joined our group: Sarabeth Brockley, who did the training videography, and Ginger Fiore, who worked with education and public outreach. It was an amazing group of people, and we accomplished a lot of our mission objectives.

The number one priority was making certain that the telescope works correctly. The polar alignment of a telescope is crucial in that an inaccurate alignment prevents long exposure astrophotography. Gary and I spent most of two nights performing a long procedure to adjust the mount accurately. Today, it has a better polar alignment than ever before: the proof is in the images. On the telescope mount, there are a series of red knobs that are used for polar alignment. We ask that those knobs be left alone so that every crew astronomer has an



accurate alignment for taking astrophotos.

As pleased as we were with the polar alignment, we were frustrated with connecting the observatory to the hab. We had internet connectivity

The Musk Observatory is primed and set to give you unparalleled views visually and photographically "from Mars" to the stars.

issues throughout our mission which remained unresolved: the computers would speak to each other, but the delay between them was so long that it was unproductive and unusable. Currently, therefore, you

cannot run the observatory from the hab. This will have to be addressed at another time.

We overcame our share of other problems. The main generator was out, so we had to use the backup which produces less energy. Gary said that it was like playing Apollo 13: for example, we couldn't have the air conditioner and the refrigerator going at the same time. Also, Randy discovered a problem with the observatory shutter on our second to last day. It was a wedge that had

gotten jammed in a very hard to reach location. We set out a plan, gathered some parts from town, and had a repair in place before we left. I have to say that dome closes better and more securely than ever.

When I think back on the summer of 2013 at MDRS, there are numerous moments that make me proud. At the top of the list is that I am truly blessed to work with some wonderful people who are excited about the night sky and the prospects of travelling to Mars. The Astronomy Team solved problems together and brainstormed new ideas and goals for the future of the Musk Observatory. It was wonderful working with the talents and enthusiasm of Tricia, who took the lead to present our work with John at the International Mars Society Convention in Boulder in August. Tricia, Randy, and Haritina also signed up for work parties and World Space Week in October. And we had a special public outreach social with people from the nearby town who came out to see the Musk Observatory.

So astronomers, get ready. The Musk Observatory is primed and set to give you unparalleled views visually and photographically "from Mars" to the stars.



My Experience at URC

by Chuck McMurray



Attending and participating as a judge at this year's University Rover Challenge (URC) was for me part vacation and part entirely new experience, a dramatic departure from the humdrum daily life of a technology consultant. It was an eye-opening venture into the world of telerobotic rovers, held in the only place on Earth I've been to that's easily mistakable for the red plains of Mars.

Boarding the flight to Utah had me wondering what would take place over the next few days. Would it involve treacherous, sun-baked days in the desert, or would it be delightful? My destination offered no promise of cellular reception or even electricity, for that matter, so my expectations were low. But I was a volunteer judge and had made the commitment, regardless of the inevitable sunburn and sweat.

I landed on Wednesday afternoon, the day before the competition was to kick off. Salt Lake City Airport was quiet and carried far less traffic that I'd encountered in Chicago a few hours before. The subsequent four-hour drive offered sights that can only be enjoyed with the naked eye. I'd seen pictures and satellite views, even studied topography maps to see where I'd be living for five days, but the reality of the terrain was breathtaking. It was one of the most bountiful, beautiful moments in nature I've ever experienced, topped only by my honeymoon in Hawaii many years ago.

I finally arrived at the MDRS habitat,

just before sun down. It was so exciting to be such a Mars and space fanatic, to then be standing right in front of one of the only two active outdoor Mars simulation environments on Earth. I stood outside the rental car, in awe at the size of the cylindrical home and the emptiness of the environment surrounding it. I was then greeted by my new friends whom I would spend the next several days with, who came from all walks of life and from all over the globe.

I went inside, feeling privileged to set foot into the MDRS Hab, which has hosted NASA officials, scientists, journalists and students over the past ten years. Climbing up to the living quarters on the second floor, I picked the second center bunk behind a door that must have contained at least 400 stickers and names of those who had lived and slept there, sometimes for days or weeks at a time, conducting Mars simulations for the sake of science. The night continued with an exploration of the Hab, various planning and introductions, and a magnificent view of the night sky. Being an avid astronomer and standing in the desert next to a Mars habitat with almost zero light pollution is an experience that is hard to replicate.

The morning of the Challenge began by packing up the rented U-Haul truck with generators and supplies, checking radios, and loading up everything that would make up my office in the desert for the next 12 hours. My cooler was packed with water, snacks and Red Bull

to keep my wits sharp.

Off we went, bouncing along a lumpy desert trail to the designated site, nearly half a mile north of the Hab. I learned that U-Haul truck suspensions aren't built very well for the terrain of the desert road that connected us.

We set up the truck at the north site, building sun shelters for the teams gassing up the generator, and running orange extension cords so that the contestants could connect their computers and other radio and telemetry equipment. My fellow judge Andy, dressed in desert clothing and sunglasses, thankfully brought many years of judging experience from prior University Challenges, walking me through the potential pitfalls of the day. It was helpful to know what to expect and how to operate once the teams arrived.

The rest of the wait time was used for setting out the astronaut mannequins for the mission that the rovers would be operating that day. At various points I would stop and stand still, hearing a silence that I've never experienced before, and looked up to find blue skies that looked like something out of a picture book. The stillness and ancient look of the untouched desert floor is an incredible reminder of what Earth was like before the modern age. I took nearly a thousand pictures in the four days that I was there.

Around 10 a.m. the Oregon University team was the first to arrive,

with the “Astronaut Drop” mission being the first of four field objectives they would complete. The rules in field are segmented to give teams 25 minutes to setup and weigh-in, followed by 45 minutes in the field to execute the mission. The objective for the “astronaut supplies drop” was to take the GPS coordinates provided on arrival at the site and pace their rover through four locations approximately a quarter of a mile away from the base of team operation, with no line of site to the objectives.

The rover would arrive to the astronaut and drop four pre-loaded packages for each astronaut, spaced about 800-1000 feet apart. The terrain offered little to desire in terms of simplicity, as it was sandy, rocky, and littered with the type of small cliffs that you might

encounter at the edge of a crater. The only things the teams were allowed to see before arriving onsite were internet-based maps and topography satellite-captured images. Team members were not allowed to look out beforehand.

The teams fought against harsh, wind-blown sand, an unforgiving, blazing sun, and a desert floor as hard as concrete to anchor their telemetry antennas in.

Once a team was ready to begin, I would walk off behind the truck, pull the cord on the generator and start the clock. The team of roughly thirteen students worked furiously but methodically to set up equipment, clean camera lenses, and start testing the software and connections. Computers booted up, and the electric rover came to life. After weighing the rover to ensure it met limitations, they loaded it with its field drop packages. The media showed up to capture various shots and interviews from around the site.

The one thing I learned about robots is that the sand, heat, and bumpy roads of the desert en route to the test sites aren’t very kind. The team started experiencing some antenna and telemetry issues (a common problem

in this event), which only hurried the pace of problem solving and discussions amongst the various team members. The issue was resolved after some troubleshooting, but rover batteries had suffered during the wait. The team completed the task successfully, but not before dealing with further issues that nobody could



T.Serge

have predicted.

Over the course of the long, dry, hot day, more teams showed up and worked to complete their assigned tasks. The second mission operating simultaneously at the north site was the panel maintenance task, made up of a solar panel and various switches that simulated a dust-covered solar power generator that needed to be cleaned. The task was a combination requiring two add-ons to each rover: a dexterous arm with fingers and electric probes, and a device to clean off the sand covered panel. The teams were required to drive the robot about 1/8 of a mile, read the instructions through the camera, test the voltage at the panel, turn two toggle positions to different positions, clean off the panel with a device, test the voltage again, and then flip the switches back into their original position.

Tensions spiked when the robots got within an inch of the panel, with the clock ticking away. It was akin to watching a golf game in the green when the putter was seconds from deciding a win or loss. Photographers stood silently, only feet away, to catch the final moment when the task was completed. Even then, the rover would have to have enough battery to scurry back across the finish line to log its

official recorded time.

The Hyperion team from Poland took the trophy, with a total of 493 out of the available 500 points. The win was well-deserved because not only had they endured a long journey across the ocean, but they also faced tougher testing requirements due to differences in radio allotments between Poland

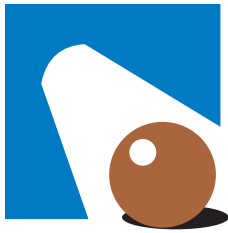
and the US: they had to build and test on a totally different system, then upon arriving in the US they had to change over to an FCC-approved band not authorized for use in Poland. Then, of course, was the added expense of shipping the robot, which can be in the excess of \$5,000 US dollars. But it all proved worthwhile, since they came and cleaned the clocks of nine other teams. Their robot was nearly flawless in operation, their teamwork

impeccable and their problem-solving skills unmatched. And on top of all of it, they were polite as well as bilingual. I heard that after the trip they got to enjoy Las Vegas, which hopefully was as fun as they expected.

The four-day event wrapped up at MDRS. There were great laughs and lots of chatter at the post-event barbecue. The row of rovers looked almost like a car show, and the winners were announced with a crowd of almost 100 people cheering for everyone. The teams all worked hard and represented their schools with pride and excellent sportsmanship. And Kevin Sloan and the team put together an impressive quality event that it was an honor to be a part of. The Mars Society should be very proud to host such a competition.

Overall my experience in the URC was both educational and refreshing, minus an occasional sand grain in the eye or broken robot surrounded by sad, puzzled faces still hoping for a victory. I look forward to next year’s event. Until then, the executives will be working to improve everything that they can so the programs continue to improve. Rumor says we might have as many as ten international and ten domestic teams registered.





Leonard David, Space Journalist

by Kerri Beauchesne (Part 1)



L. David

Leonard David has been writing about space for more than fifty years. He's met Chuck Yeager, Carl Sagan, most of the Mercury 7 astronauts, and a wide array of other space celebrities. And just recently, he co-authored *Mission to Mars: My Vision for Space Exploration* (National Geographic, 2013) with none other than Apollo 11 veteran Dr. Buzz Aldrin. Over the decades, David has emerged as a prominent member of the space community, one of those rare beings who can understand both the science and the politics behind the missions and make it comprehensible for the rest of us. The Mars Quarterly sat down with him to look back on his career, which has spanned the entire Space Age, and to get his perspective on our future in space, including the role of Mars.

David was born in the same year the first pictures were taken from space, with a camera mounted on a V-2 rocket shot from the White Sands Missile Range in New Mexico. Four years later, National Geographic ran an article about the project, including a fold-out panorama – the very first picture of Earth from space. Four-year-old Leonard David pored over that

picture, entranced. Just a few years later, the USSR officially launched the Space Age with Sputnik, its tiny, trailblazing satellite. Eleven-year-old David thought in awe, "My God, we're really going up; we're exploring." He recalls this as a major focal event in his life. Soon thereafter, he began collecting news about space and producing his own newsletter, each copy painstakingly written out by hand. He then marched up and down his street, hawking it to neighbors for a nickel a copy. His career in space journalism had begun.

As the years passed, he avidly read whatever he could find about space – magazines like *Aviation Week* and *Space World* – and frequently wrote letters to the editor. His first real journalistic paycheck came early in the 1970s when the magazine *Air Progress* published an article he wrote about the future of airships. At the time, there was a surge of interest in ballooning and high-altitude platforms, but debate about their feasibility was fierce, a fact reflected in the reader comments. The more articles he published, the more he grew to enjoy the questions and comments readers would send in. In fact, he began occasionally embedding questions in his articles regarding details that were eluding him. "I've gotten emails from scientists and researchers," he said. "You might be surprised that so many people are willing to help you."

Not all of these "helpers" are credible, of course. "Sometimes you get the kooks and the pseudo-science guys alongside the professionals," David said. "Then you have the company people trying to push the company idea. They've got their own agenda, which is fine; sometimes they're right on. But you just have to be wary of everybody's comments." He learned over time to fact-check carefully and to get multiple sources when possible, but it's a balancing act

between thoroughness and the all-important deadline. "When I push the 'send' button," he said, "99.9% of the time, I think that's the best I can do. In my mind, I always have more questions, but I don't want to dig myself into a hole." Dealing with evasion and deception are a more delicate matter. "Some people try to hide things, lie, put something over on you that you've got to be somewhat aware of," he said. "I guess in the big picture of writing, I don't think we have enough investigative reporters out there, with the diligence to root out the truth." In the end, though, it's more about the big picture. "There's always a next article; I can clarify later, if necessary," he said. "I'll stand by what I've written in total. If you cherry-pick one article and say, 'He said 6 volts and it was only 4,' okay, I'm guilty; I've missed something."

Although private companies are performing an increasing amount of space work in the United States, most of the stories still come out of NASA. Before a mission, David will usually go out to NASA's Jet Propulsion Laboratory (JPL) to interview the engineers working on the project and talk about the odds of success. "Engineers are worried about everything, as well they should be," said David. "They become so convinced that this thing won't work that I leave the interview thinking, 'This is going to be a disaster.' But time after time, they've succeeded." And those mission-accomplished interviews are among the highlights of David's work. "When I go back and talk to the same people to ask why the mission succeeded, it's amazing to hear the great things people are capable of when they really want to achieve something," David said. "They're under pressure to pull off a mission, and when they succeed, the liberation factor is just enormous."

The tragedies, on the other hand,

have been heartbreaking. The loss of the space shuttles Challenger (1986) and Columbia (2003), each with a crew of seven, still haunts the space community today. David remembers each with a heavy heart, especially Columbia. "I went down to Johnson Space Center in Clear Lake, Texas, and talked to engineers off the record," he said. "People were distraught, walking around with scars, thinking they had caused the accident, had done something wrong." The terror and destruction of those minutes of re-entry cling to the recovered debris, which now rests in the Vehicle Assembly Building at Kennedy Space Center in Florida. Although the room is now closed to all but researchers, David was allowed in with other members of the media in 2004. "I think out of all the things I've ever done, the most emotional was to walk into that room," he said. "It's a morgue. Seven people died in this tragedy. It's very touching and emotional to look at the hardware and realize that it's left over from a mission that went totally awry."

As crucial as it is to ensure the safety of every human being we send into space, David believes that the shuttle disasters may have swung the risk aversion meter too far into the red. Most of the proposals for sending people once more beyond low-Earth orbit (LEO) have timelines that far exceed the one set by President Kennedy when he first vowed to send Americans to the moon, even though

we are far better equipped now in terms of technology, data, and know-how. At some point, David said, "We have to realize that we've been putting hundreds of people into orbit already," on the International Space Station (ISS). "I won't say it's become routine, but we've shown the odds are not so bad." He compares it to airplane travel, which was once considered far too dangerous for everyday use. "You get on the airplane, which is really a suborbital flight with peanuts and crying babies, and expect to get where you're planning to go. Human spaceflight to me is a natural evolution of that." He hopes that private enterprises such as Virgin Galactic will help to normalize spaceflight in the public imagination and shore up support for manned missions. But public or private, the US must somehow rebuild its space transport capacity. When talking to the public on his recent book tour with Buzz Aldrin, David discovered that, "The thing that irks people the most is that we're buying seats on a Russian spacecraft to the tune of hundreds of millions of dollars. It's not a happy scene – no shuttle of our own, no way to put astronauts up. Even NASA in its political quagmire feels the sting."

Tragedy and risk aversion alone do not explain the faltering of political will regarding the space program, however. David remembers the nationwide excitement in the early days. "It's hard to understand unless

you lived through it," David said, "but the context of the times was important. I grew up when the Soviet Union represented this huge space race. But it was less a race to space than it was a race between communism and democracy. You might say that we lost the political will to push ahead the moment Neil Armstrong's boot touched the surface of the moon." When that happened, the perception was that we had won, that we had proven the supremacy of capitalism. Having accomplished that mission, the political will drained away into other projects and concerns. "We had plenty of other Apollo missions that were planned and could have happened, but it all fell off the table," he said. "In some ways, the intention to use the moon as a real stepping stone into bigger, broader action items, including going to Mars, got truncated."

See the next issue of TMO for Part 2, which includes David's key role with the Mars Underground and his thoughts about the future of Mars.

Leonard David is currently Space.com's Space Insider Columnist as well as a contributing writer for several publications, including Space News and Aerospace America. He has also served as editor-in-chief of several magazines, technical consultant on several documentaries, and consultant to NASA on various projects. He has received numerous prestigious awards for his work in the field.



News Brief

Location of 2014 Mars Society Convention Announced

The Mars Society is pleased to announce that the 17th Annual International Mars Society Convention will be convened next year in Houston, Texas from August 7-10, 2014.

Details regarding the special four day conference, including speaker list, itinerary and registration information, will be published on the Mars Society web site (www.marssociety.org) early next year.

Help promote Mars advocacy by joining us!



News Brief

Learn about Mars via Red Planet Radio Podcast

The Mars Society launched its new Red Planet Radio podcast on July 1, 2013 with the latest news about Mars exploration, planning for a humans-to-Mars mission and Mars Society activities and events. Chuck McMurray, the Mars Society's Deputy Education Director, serves as host of the monthly online program.

To listen to the Red Planet Radio podcast, visit our web page at: www.radio.marssociety.org.

THE MARS SOCIETY is a 501(c)3 tax-exempt non-profit organization with headquarters in Colorado, USA, committed to furthering the goal of the exploration and settlement of the Red Planet, via broad public outreach to instill the vision of pioneering Mars, support of ever more aggressive government funded Mars exploration programs around the world, and conducting Mars exploration on a private basis.

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