http://chapters.marssociety.org/youth/

The Martian Chronicles

The Mars Youth Group: inspiring and informing youth about Mars.

Issue 2
March 2000

Contents

Dear Reader,

this is the newsletter of the **Mars Society Youth Group** and the **MIT Mars Society Chapter**.

With this newsletter we hope to inspire youth about Mars exploration and the human settlement of the Red Planet in the near future.

Please distribute freely!!! If you would like to regularly receive this publication, please send your e-mail (preferred) or postal address to Margarita Marinova <mmm@mit.edu>. Please also send your submissions for the Newsletter!

Hope you enjoy The Martian Chronicles!

Sincerely,

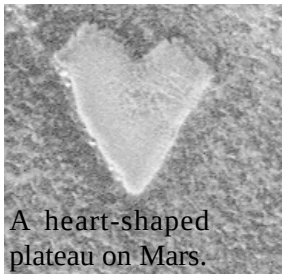
Margarita.

NASA's Valentine

David Pinson

A heart-shaped depression on Mars.

Talk about a romantic encounter: the space probe NEAR, for Near Earth Asteroid Rendezvous, made its close fly-by of the asteroid Eros (yep, named after the Goddess of love) on - you got it - February 14. While the date may have been a bit of a publicity stunt, the craft itself is anything but that. NEAR has been in NASA planning since the early 1980s, when it was a billion-dollar program that never got approval - but now it is a "cheap" mission of the new NASA, returning good science at a fraction of the cost. When it was launched, the rendezvous was supposed to occur in December 1998, but just days before the flyby the probe's engine malfunctioned and it had to pass it by. This time, the engine worked flawlessly, and NEAR returned high-resolution photographs and measurements of Eros. The measurements will give us more precise determinations of the physical makeup of asteroids, their gravity fields, etc. And get this - one of the first high-resolution images returned from the asteroid show what is, with some imagination, a heart on the side of the old rock.



A heart-shaped plateau on Mars.

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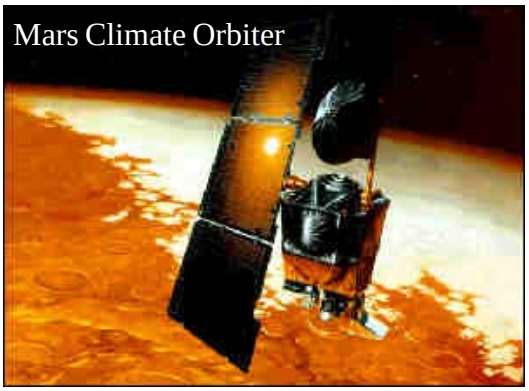
The Mars Society is an international non-profit organization committed to furthering the goal of robotic exploration and human settlement of the Red Planet. www.marssociety.org

The Mars Climate Orbiter and the Mars Polar Lander

Troy Lee Hudson

Mars Climate Orbiter (MCO) and the Mars Polar Lander (MPL) were both slated to arrive at Mars to begin their scientific missions in September and December of last year. Both probes were lost. NASA worked hard after each failure to determine why the probes lost contact. They now think they understand why the MCO failed, yet the reasons behind the loss of the MPL are still a mystery. NASA hopes to garner many lessons from the loss of these two spacecraft, and has pledged to use this information to prevent similar mishaps in future missions.


Mars Climate Orbiter

Mars Climate Orbiter

As the Mars Climate Orbiter approached Mars, it was to fire its main engine to initiate an aerobraking maneuver to reduce the spacecraft's speed. MCO was traveling at 5.5 km/s and would have flown right past Mars if it did not use friction from Mars' upper atmosphere to slow it down into a stable orbit. The engines fired as expected, and the spacecraft passed behind Mars, out of contact with Earth. It never reemerged.

It was later determined that the spacecraft had approached too close to the planet's surface. Instead of 150km, the satellite skimmed only 60 km over Mars' surface, where the atmosphere is significantly denser. The force slowing the spacecraft down was far too large; the satellite lost too much velocity and burned up in the Martian sky.

The root cause of the loss of the spacecraft was the failed translation of English units into metric units. A component of ground-based, navigation-related mission software was given numbers for spacecraft thrust in the English units of pounds-force, but it was expecting those numbers to be in the metric units of newtons. NASA's failure review board also identifies other significant factors that allowed this error to be born, linger and propagate to the point where it resulted in a major error in understanding of the spacecraft's path as it approached Mars.


Launch of the Mars Polar Lander

Mars Polar Lander

The Mars Polar Lander mission proceeded without incident from its launch on January 3, 1999 until its arrival at the Red Planet on December 3, 1999. At that point, the lander reoriented itself (as it was supposed to) prior to landing in Mars' southern polar regions. Thus the lander was out of contact with NASA during its descent through the Martian atmosphere. After landing, the spacecraft was to have pointed its main antenna towards Earth and phone home. But the signal reporting a successful touchdown never came. In fact, no confirmed signal from the polar lander has been received to date, despite NASA's best efforts.

Various commands have been sent to Mars, in the hopes that the lander arrived safely on the surface but was having trouble orienting its antenna and finding Earth. Hopes were raised when two faint signals were detected by a radio telescope in Stanford, Calif. on Jan. 4. The signals, described as "the radio-frequency equivalent of a whistle," were at the ultra-high frequency (UHF) of 401.5 megahertz — the right place to indicate a possible communication from the lander.


Mars Polar Lander

As time wore on, analyses showed that it was unlikely that the received signals were real communications from the lander. The signals appear to have come from Earth. Further checking has suggested that there may have been a bug in the satellite's sensor software which prevented the descent rocket engines from firing. If this turns out to be the case, the probe most likely crashed into the polar wastes of Mars.

NASA continues to vigorously investigate both the MCO and MPL mishaps. The lessons they have learned will be used to ensure future successes in the Mars Discovery program. This program's policy of faster, better, cheaper has had numerous successes in earth, planetary and solar system exploration and NASA intends to maintain this philosophy for the foreseeable future.

Mars or Bust: Doing a Mars Society Presentation

Corey Keith

Doing a Mars Society presentation at my college has been very interesting and a great learning experience. I have yet to see the fruits of my labor since the presentation is a day from when I am writing this very article, however, no matter what happens it has been well worth it. The number of people that I have talked to and now know about the goals of the Mars Society is enormous. Because of this our name and our common goal of going Mars is now becoming more wide spread.

In the process of putting the presentation together I have done many things. First I found a co-sponsorship - one of the societies here at the college. This allowed me to have no booking fees for rooms or any of the equipment I shall be using.

Then I was able to do some advertising. I set up several posters around the college and used word of mouth. I would have advertised in the newspaper, however, an advertisement that would be eye-catching was too espensive. But saying that, I was interviewed by the local newspaper. They asked me several questions about the society and took my picture with a copy of Robert Zubrin's book *The Case For Mars*. If those who live in the Central Alberta area - the article will be in the Advocate's Life News paper. The one thing that I did want to do but was not able to, was advertise on Space: The Imagination Station. This Canadian science and science fiction channel quite often advertises events within Canada on what is called "Space and Time". If you choose to use this type of medium for any future endeavours I would suggest getting your ad in a month or two early because they get booked up quite quickly. Even though this channel is Canadian I am sure that there are equivalent mediums in the US or any other country.

I think the other great thing that has come out of this is that I am more aware of what the society is doing and what projects it has undertaken. It has forced me to do more research to make sure that I know what I am talking about when I get in front of that crowd of people.

So I encourage any and all of you to put together a presentation. With some enthusiasm and a bit of hard work it will do well.

Sign the Mars Petition –
Support the Human Exploration of Mars!

http://thinkmars.net/petition.html

Meet the Scientist

Dr. Robert Zubrin

Mars Society Founder and President


Dr. Robert Zubrin

Kathleen Blake Bohne

"We were going to get to the Moon by 1970. We were going to be on Mars in 1980, Saturn by 1990, Alpha Centauri by the year 2000. We were moving out and I wanted to be a part of it." And Dr. Robert Zubrin certainly is "a part of it." Though the dreams of his childhood and young adulthood may not have come true when he anticipated, he and the Mars Society are ensuring that they will come true now. With 2600 devoted members and $300,000 in the bank (plus another $75,000 on the way), the Mars Society is proving by sheer numbers that the spirit of pioneering isn't a vague memory of days gone by, but a living, powerful force that will determine mankind's destiny in the 21st century.

Dr. Zubrin was five when Sputnik flew and nine when President Kennedy gave his speech inaugurating the Moon program. When manned exploration was abandoned after the Lunar Landing, it was "one of the greatest disappointments" of his life. He went to his first Case for Mars conference (the foundation of the movement known as the "Mars Underground") in 1987 and the rest, as they say, is history…

The Mars Society's first major project is the Flashline Mars Arctic Research Station (M.A.R.S.), to be located on Devon Island in the Canadian Arctic. Construction is actually ahead of schedule and Denverites will be able to see it, ready to be fitted for its interior, in late April. So, what initial research will be performed at M.A.R.S.? There are many discoveries yet to be unearthed regarding human interplanetary exploration - Dr. Zubrin intends for M.A.R.S. to play a major part in these discoveries. "We need to start learning how humans can explore other worlds and to quantify the degree to which humans are more effective than robots. Of course, human explorers on Mars will not be quite as nimble as they are on Earth; they will have to wear space suits. To go long distances they will have to go in pressurized rovers etc…Within those constraints, we have to learn how to maximize the capabilities of human explorers. We also need to start learning what really is the best crew mix; what mix of skills, how big it needs to be. We need to find out all sorts of things that right now we don't even know we don't know. Discussions of human operations on Mars to date have been fairly abstract, everybody's sort of just thinking about it with a very limited experience base. We have to start getting that experience base in order to know what the real world is like."

He envisions the possibility of students being part of the crew at the station. "Of course there are only six people in the station, so it would be limited in that respect. I think we will also set up our own mission control in either the United States or Canada and students could participate in that." He also imagines expanding the project, maybe to include the development of an analog pressurized rover to take to deserts around the U.S. for week-long excursions, similar to what might be performed on Mars. Students may also participate in that exciting project.

When asked about the apparent failure of the Mars Polar Lander, Dr. Zubrin didn't seem intimidated or surprised.

"We have to recognize that robotic Mars probes are high risk; they have no hazard-avoidance capability, they have very little ability to repair or correct themselves and that is why while our human space flight record is over 95% success, our success in robotic probes is about 66%."

Dr. Zubrin puts the failure in perspective, explaining that though a setback, it is not a downfall.

"The main setback we've taken is in terms of time. We've lost two years. In terms of money, it's not that critical. 160 million dollars averaged over the American public is about 60 cents a person, about the price of a coke. It's like putting money in the coke machine and nothing comes out, which happened to me yesterday."

The point Dr. Zubrin wants to get across concerning the Mars Polar Lander is not to let it set us back more than it already has. "The question is, are we going to increase the damage to ourselves by going

into retreat mode and then lose four years by canceling the next mission? Really, the problem with the robotic program is that it's under-funded; we should be sending multiple spacecraft. We used to send them out two at a time. There's an excellent probability that the Mars Polar Lander hit a big rock or fell into a crevice. Viking 1 landed successfully but it landed five feet away from a huge rock that would have destroyed it had it landed there. So, if you're going to do robotic exploration, you have to be prepared to accept a certain failure rate and keep going. There's a word in the English language for people who quit when they encounter a setback and that is 'losers'. The question of whether these setbacks will defeat us or whether they will simply encourage us to redouble our efforts and succeed - that is a question of our own mettle."

In conclusion, I asked Dr. Zubrin to share his vision of how the first manned mission to Mars will play out: "I believe there is already a large popular base supporting human Mars missions. This is proven by the public response to the Pathfinder. They got 100 million hits on their website in one day, which is more than the number of people that vote in the U.S. We're in a situation where you might say the harvest is plentiful and the gatherers few." But the gatherers of this bountiful scientific and wonderfully human harvest are multiplying as we speak.

Hakluyt Contest 2000

Win a trip to the **Mars Society Convetion** in Toronto in August 2000
and a **Bushnell Telescope!**

The Hakluyt Prize is awarded to the student who has written the best letter or group of letters to world political leaders - Presidents, Prime Ministers, Science Ministers, Space Agency Administrators, elected representatives - making the case for initiating a human-to-Mars program.

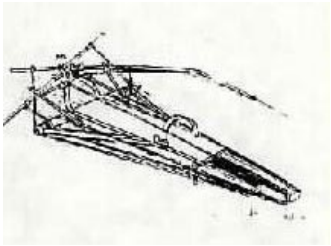
Eligiblity: students ages 12-22 **Deadline**: May 31

For details visit **http://chapters.marssociety.org/youth/**

Human Powered Ornithopter

Vesna Nikolic

"A bird is an instrument working according to a mathematical law. It lies within the power of man to make this instrument with all its motions" (Leonardo da Vinci). For centuries, humans have been looking at birds and trying to imitate their flight. Leonardo da Vinci made the first known ornithopter designs. Many people including Edward Purkis Frost and Alexander Lippisch continued the study of ornithopters, however none of the designs were successful. In 1991, a group of people at University of Toronto Institute for Aerospace Studies (UTIAS) made a 3m wingspan remotely controlled ornithopter. The flight has been very successful and the UTIAS team decided to work on a man-powered version of the same ornithopter. The aircraft was made out of aluminum tubing, wood and carbon fiber. The two wings are attached to the body that moves up and down. This moving of the body makes the two wings flap. The first flight tests of the man-powered ornithopter started in mid 1990s. The aircraft hasn't taken off the ground due to minor mistakes in the design (for example the orientation of the rear fuselage). One of the biggest challenges that the group faces is the strategy for taking off, since the flapping wings would touch the ground, and therefore destroy the craft. If you want to see the first flight of the remote controlled ornithopter go to the following address: http://www.utias.toronto.edu/test/res/fm/fda-proj.html#proj2



What does this have to do with Mars? Since on Mars the gravity is weaker than on Earth, the ornithopter would be lighter, and therefore flying would be easier. Ornithopters would be easier to control and use on Mars than here on Earth. If Mars' atmosphere becomes thicker through terraforming, you could one day fly an ornithopter on Mars.

The Recluse

Rich Reifsnyder

Few rockets had been launched from Cape Canaveral in secrecy. Generally when they were, they launched spy satellites for the Department of Defense. The Titan IV that lifted off on the winter night of 2003, however, carried a civilian payload. The hush-hush nature of the mission was at the request of the man who provided the funds.

His name was Jason Blake, and he had amassed his wealth in the usual manner, with hugely successful websites. But in addition to his primary career, he had an odd sort of hobby: he loved space travel. He showed up at every shuttle launch, logged on to every space-related website, had a huge file of Ad Astra magazines, and as a child had always dreamed of being an astronaut.

He had reached his mid-forties and was unmarried. His business methods had made him very unpopular in America. He soon came to realize that he needed to accomplish something grand and important, something that would leave his footprint on the beaches of time.

Every human being sets that kind of goal at some point in his or her life. Not everyone, though, has billions of dollars at his disposal.

Almost his entire life's earnings went into that one mission. He wanted it carried out in secrecy until shortly before touchdown, at which point the whole world would have its attention focused on him.

The Titan IV accelerated into orbit. The upper stage detached, fired its engine, and pushed an unusually heavy satellite out of orbit and shooting away from the Earth and the Sun. Its destination: the planet Mars.

This particular satellite bore very little resemblance to the usual probes bound for Mars. True, it had a heat shield, solar panels, and an antenna, but it didn't carry many of the usual scientific instruments. It was very large and hollow. Inside were several tanks of water, oxygen, hydrogen, an inflatable plastic tent, packets of seeds and hydroponic racks, freeze-dried food canisters, an arcjet furnace, and a bicycle. There were also an exercise machine, a laptop computer, and an acceleration couch.

Lying in that couch was Jason Blake.

Blake knew from the moment this crazy mission had formed in his head that he wouldn't be coming back to Earth. No manned mission to Mars had ever been designed that small and could still return the crew members to Earth.

So he was in for the long haul. He would live in the tiny space capsule, which was shaped like a bell and had the interior space of a Winnebago. He could barely stretch his legs in that tiny cabin, because half of it was filled with cargo. His acceleration seat was also his bed, and the seat flipped up to reveal a toilet which worked both in zero-g and gravity. He had a "shower bag" which he could pull out of the closet and wrap around himself to take a shower, but he had only budgeted enough water to scrub himself twice a week. He'd probably smell pretty nasty after eight months, but who'd be around to notice?

In his wardrobe he had three coveralls, made of stain-resistant cloth, and one spacesuit. There was a small washing machine, but it used a minimum of water, so the clothes would look kind of grungy after a while.

A microwave oven and a bungee-cord treadmill completed his inventory of household appliances. The rest of the space had racks upon racks of food supplies, seeds, and a library of CD-ROM's.

When he got to Mars, he would plunge into the atmosphere, his heat shield smoking, and land on (hopefully) a deserted terrain of rubble and rocks, like the landing sites of Viking and Pathfinder. He would depressurize the whole craft — he had no room for an airlock — and drive his rover, the size and shape of a go-cart, out onto the surface. Then he would unpack the greenhouse and open it up to create a little bit of farmland. He would detach the solar panels and unfold them to provide power. His chemical factory would start up and turn a small supply of liquid hydrogen into extra water, at least until he could find more in the Martian soil.

He wasn't quite sure what he would do after that. He didn't have enough room for scientific instruments in his capsule. He had thought about a scheme for making

bricks, glass, and steel out of the Martian soil using a solar-powered blacksmithing forge, but the test model he brought along weighed only a few kilograms. He figured if all else failed, he could just kick back, relax, and live out the rest of his life, secure in the knowledge that he had made history.

At least, that's what he thought before the launch.

At T-zero, the Titan's solid boosters ignited. At T plus fifteen minutes, the upper stage had already used up its fuel, and his eight-month-long period of coasting began. He looked out the window and saw the massive orb of the Earth beneath, separated from a perfect inky black sky by a thin blue haze. Even as he stared, the horizon seemed to drop lower and lower. Could that be an illusion? Surely he wasn't traveling fast enough...

He looked around him at the cramped interior of the capsule. In zero gravity, the walls seemed to sway, then to close in. It was deathly silent.

Just fifteen minutes into a flight that would last the rest of his life, Blake began to panic.

To Be Continued...

Mars and Education

Gabriel Rshaid

The Martians are now in the classroom! Whether in College, High School or Elementary (hopefully not, since it would mean that manned missions to Mars are a long way off), the first humans to set foot on Mars are now students. This would suffice to underline the importance of incorporating Mars related topics into the classroom. However, there is more to it. Space activities are fun, exciting, they integrate various disciplines and are a great way to get students to develop critical skills. It is increasingly difficult to capture students' attention in class and engage them in projects that are interesting and meaningful at the same time. And space does it every time.

Take Mars, for example. If you are a teacher and want them to really open their eyes, just talk to them about the possibility of Life on Mars. And once their interest is aroused, ask them whether they think we humans would have a right to settle the planet if we do indeed find life. Then, when they are really deep into the discussion, explain to them Terraforming, and the ethical issues involved in it.

Want them to use computers in a Math or Physics class? Then orbital mechanics is a must. Computer simulations of interplanetary trajectories are fascinating challenges for teachers and students. Or you might want to settle for a spreadsheet that calculates and depicts the gravity gradient in near Earth orbit.

If you are in need of an interesting topic for an essay, why not describe life on a Martian colony 100 years from now? Or draw the first Martian city in an Art class.

There are also literally hundreds of space activities available for the younger ones, most of them hands-on, including model rockets, volcanoes, Mars base building, hydroponics, and more.

The Mars Society Education Task Force is working towards assembling a Mars curriculum that will enable teachers to access a wide variety of these Mars related activities for direct classroom usage. If you are an educator interested in getting one step closer to Mars, then join us by visiting our Web site at http://www.marsacademy.com/marssoc/ or send an email to grshaid@marsacademy.com

Mars Q&A

Q: How much thinner is Mars atmosphere than Earth's? (Leigh Bohne)
A: The atmosphere on Mars is only 6 millibars, compared to Earth's atmosphere which is 1 bar. Which means that the atmosphere on Mars is about 160 times thinner! At this pressure water changes from ice to vapor - it is not stable as a liquid.

Q: How will we change the climate of Mars to make it like Earth? (Dusty Butterfield)
A: The process of changing the climate on Mars to be more like Earth's is called terraforming. The first step in terraforming is to warm the planet. This can be done using greenhouse gases, such as CFCs. The warming will consequently cause carbon dioxide to be released from the soil. While the increase in CO_2 will cause further warming, more importantly it will thicken the atmosphere! The next thing that Mars needs is water; water will be released from underground reservoirs and the polar caps as the planet warms and the atmosphere thickens. To this terraformed Mars we can add many organisms, including plants and large forests! While the high carbon dioxide levels will be poisonous to most animals, humans could traverse the surface only wearing a breathing mask.

Q: How will trees be planted on Mars? (Peter)
A: Once the temperature on Mars is raised and the atmospheric pressure is higher, we can start planting trees. While plants convert carbon dioxide into oxygen, many plants also need oxygen for respiration. There is a special class of plants (C4 and CAM plants) that do not use oxygen during respiration. Since at the beginning Mars will not have sufficient amounts of oxygen in its atmosphere, we will have to plant plants that do not require oxygen.
The martian soil, while not full of nutrients and minerals, has an inventory that is sufficient for plant growth.

To submit questions visit the Mars Youth website (http://chapters.marssociety.org/youth) or write to mmm@mit.edu
Answers will be printed in future issues of The Martian Chronicles or will be posted on theMars Youth webiste.

The **Mars Society Youth Group** was created to facilitate the communicate of ideas between Youth to older generations and to provide a more effective outreach effort to other Youth.

http://chapters.marssociety.org/youth/

3rd Annual Mars Society Conference

Ryerson University, Toronto, Canada

August 10-13, 2000

To **register**, visit www.marssociety.org


Toronto

Reserve a low-cost room for the conference NOW!
Limited low cost accomodations (1min away) are available - students $22 (US) per night, all others $33 (US) per night.

The rooms are going fast! Make your reservation now!

The Mars Society Annual Convention is a great way to learn more about Mars, meet fellow Mars enthusiasts, show your support for the human exploration of Mars, and overall have a great time! This is the one must attend Mars conference of the summer!

The Toronto Chapter of the Mars Society is organizing this summer's conference.
Visit them at http://chapters.marssociety.org/toronto/