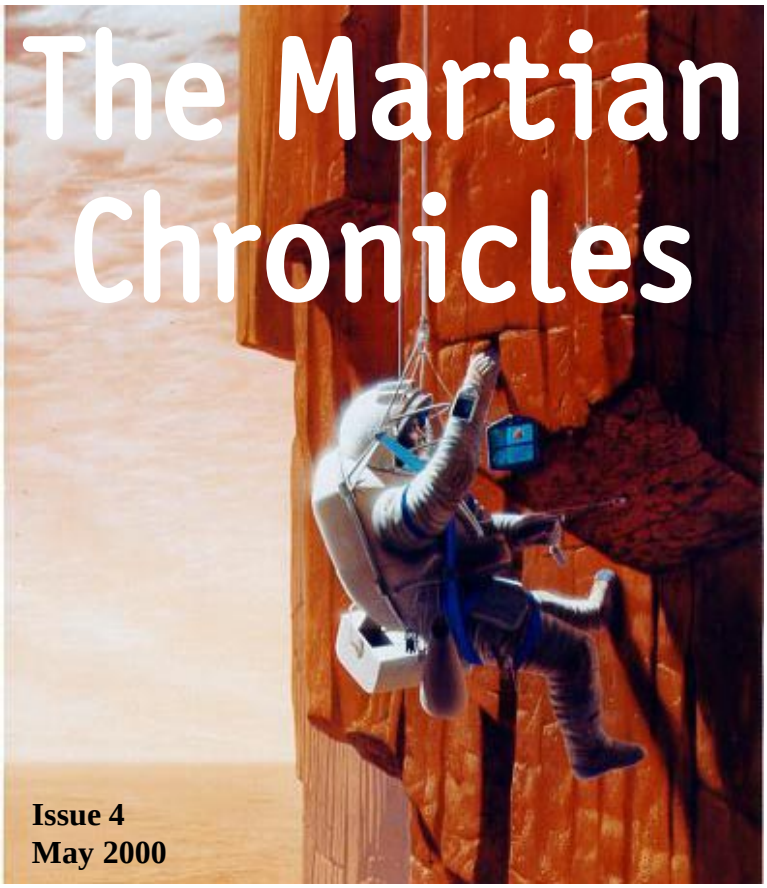
http://chapters.marssociety.org/youth/

The Martian Chronicles



Issue 4
May 2000

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Dear Reader,

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

The newsletter is intended to excite youth about the exploration and near-future human settlement of Mars.

Please distribute freely!!! To be added to the announcement list, or to receive paper copies for distribution, contact Margarita <mmm@mit.edu>.

Send your submissions for the Newsletter!

Enjoy The Martian Chronicles!
Sincerely,
Margarita Marinova.

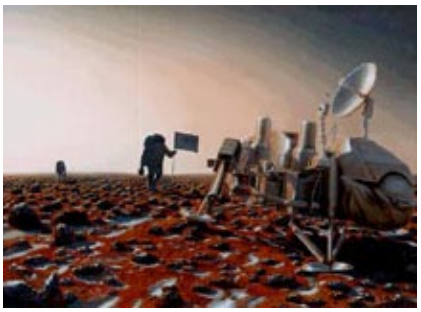
Hakluyt Contest 2000

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

The Hakluyt Prize is awarded to the student who writes the best letter to world political leaders - Presidents, Prime Ministers, Science Ministers, Space Agency Administrators, Elected Representatives - making the case for initiating a Humans-to-Mars Program.

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

The Hakluyt Prize is named after Richard Hakluyt, the brilliant pamphleteer, whose writings, addressed to Queen Elizabeth I, Sir Walter Raleigh, and other influentials in Tudor England convinced the country's power elite to make the policy decisions that led to the establishment of the first British colonies in North America. If not for Richard Hakluyt, the United States would probably not exist.



If there is to be a human civilization on Mars in the future, there needs to be another Hakluyt today. Maybe that person is someone you know. Maybe that person is you. Start writing! The future is counting on you.

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

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

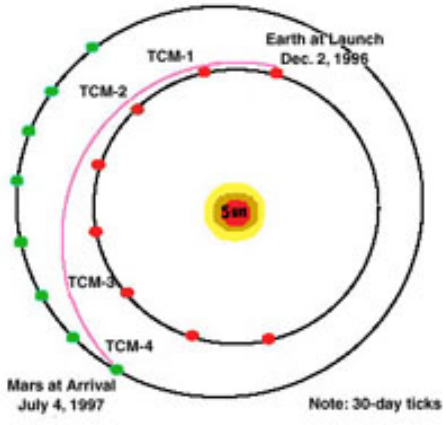
Flying to Mars

Jim Partan

How is the trajectory for a Mars mission chosen?

Mars is a long way from Earth, between 56 million and 400 million kilometers, depending on the phase of the orbits of Earth and Mars. About every 26 months, the cycle repeats, and Earth and Mars are in approximately the same relative positions. So, what are the best trajectories to go to Mars?

For robotic probes, generally the greatest concern is to reduce the cost of the mission. Robotic spacecraft therefore generally follow a minimum-energy trajectory, called a Hohmann trajectory. These trajectories involve a launch when Earth and Mars are on opposite sides of the sun (called "conjunction"), and take about 8 or 9 months to reach Mars, with a minimum of maneuvering in flight (see diagram). With fewer maneuvers, the spacecraft requires less fuel and therefore has less mass; the design team can then decide either to add more instruments, or to use a smaller, less expensive rocket.



Mars Pathfinder Flight Trajectory

For human missions to Mars, there are several additional factors to be considered, to reduce risks to the crew. The time in transit between Earth and Mars should be relatively short, to reduce the crew's solar radiation exposure (on both Earth and Mars, the atmosphere provides significant shielding from radiation). Also, although there are ways of providing artificial gravity, shorter transit times will reduce the crew's time in a weightless or low-gravity environment. Finally, the trajectory should provide a "free return" to Earth: in the event of a serious failure, such as happened in the Apollo 13 mission, the trajectory should naturally return to Earth.

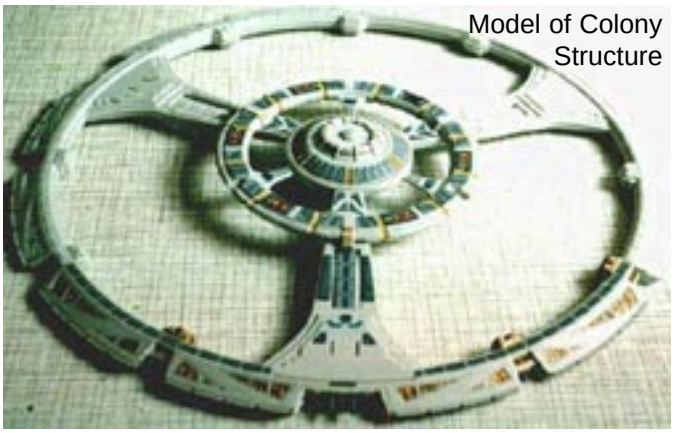
With these considerations, the most practical trajectories are also conjunction-class, but use about twice as much energy as a Hohmann trajectory. The transit time to Mars is reduced to six months, with a two-year free-return to Earth in case the Mars landing is aborted due to serious problems. With this trajectory to Mars, the crew would spend 18 months working on the surface of Mars, and return on a similar six-month trajectory to Earth.

Emissary: A Mars Colony

Tanya Harrison <apple@nwlink.com>

The Mars Millennium Project is a project being run by NASA for students in grades K-12 to design a colony for 100 people on Mars in the year 2030. The main basis of the project is the community on Mars, but I have shifted that to the scientific aspects of colonizing the Red Planet in my project (which is entitled "Emissary"). For more information on the project itself, visit http://www.mars2030.net.

Emissary covers not only the colony itself on Mars, but also goes into detail about the ship that will get the crew to Mars. The ship uses state-of-the-art propulsion systems to cut down on transit time. It runs on nuclear fusion engines which use deuterium-helium-3 fusion reactions (which produce the safest by-product, He-4 and protons). There is also a backup ion drive that runs from the exhaust produced by the nuclear fusion engines, and pulsed plasma thrusters for orbit and landing, and precision positioning.



Model of Colony Structure

On Mars, along with the colony structure itself, there is a space elevator which takes you up to an orbital supply shuttle docking port. The colony also has twenty land rovers (each with a maximum five person capacity), and two NIMFs, which stands for nuclear engine using indigenous Martian fuel. If you have read either "Entering Space" or "The Case for Mars" by Robert Zubrin, you will be familiar with these. Crew layout, life support systems, procedures in case of emergencies, space law, and the crew's effort with planetary engineering (terraforming) are also covered in great detail.

If anyone is interested in reading the entire project, you can contact me at the e-mail address above, and once the website for the project is up and running (it should be shortly, perhaps even by the time you read this), I will send the address to the Mars Society Youth Chapter list. Be sure to check it out!

Margarita,

Here are some of my vacation pics from Mars. We stayed at Frost Beach on Oceanis Borealis after our arrival at the Dome. (As you may know, frost beach is about an hour from the Dome). It was great. Mary and the kids say "hi". Hope you can make it next time.

Mike Kretsch

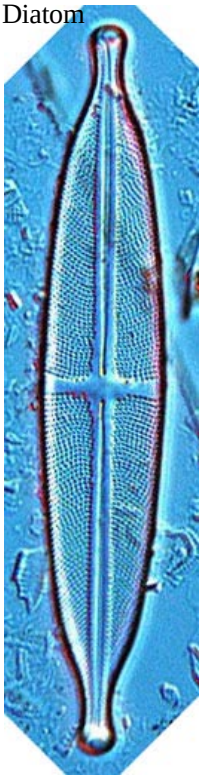
Meet the Scientist
Darlene Lim

Paleolimnologist

Q: What does your work involve, and what are your main interests in this field? What do you find the most interesting and satisfying about your research? What are some of your other interests?

A: I am currently conducting doctoral research at the Department of Geology, University of Toronto in the field of paleolimnology (study of lake history). Sediment that has accumulated through time at the bottom of an existing or extinct lake reads like the pages of a great historical climate book, and by taking a sediment core of the lake we access this precious information. I am particularly interested in the biological remains contained in these cores, since they can help us infer past climate changes. For example, diatoms (left), unicellular algae with glass (siliceous) cell walls, can be used as indicators of past climate change, since their populations will shift in relation to environmental changes. They usually preserve well in the sediment record, and their remains can be incredibly ornate and beautiful (see "Diatoms" Feb 1999 National Geographic for more info). I work specifically in the Canadian High Arctic, where there are a myriad of lakes and ponds. The diatoms in these sites must endure extremely short growing seasons and harsh winters. Through this research I hope to gain insight into how lakes and their algal communities evolve in extreme environments on Earth, and eventually I would like to apply this knowledge to the investigation of paleolakes on other planets, such as Mars.

Diatom



What I appreciate most about paleolimnology is that it incorporates aspects of biology and geology, among with many other topics, into one comprehensive subject area. It is a field that has many applications in environmental monitoring, earth sciences, and space sciences. Most of all, however, I enjoy being immersed in an environment that allows me to not only keep asking questions, but also to participate in the process of trying to find the answers.

Other interests - I recently acquired my private pilot's license, which was a childhood dream come true.

Darlene Lim

Over the Christmas break I visited my hometown of Edmonton, Alberta, and during that time was able to rent a plane and go for a ride. It was an incredible thrill, since I had not piloted around that region of Canada before, and as soon as I took off I had a clear view of the Rocky Mountains backlit by an unforgettable Alberta sunset.

Q: You are very active in the Toronto and Canada Mars Society Chapters. How did you get involved, what do you do, and what do you think is a good way for others to become active humans-to-Mars advocates?

A: The Toronto MS Chapter was founded by Margarita Marinova at the beginning of 1999, and I joined right away. Along with other Toronto and Canada members, I have been working to organize this year's conference, in addition to continuing our outreach and education efforts both on a local and national basis. Many of us are involved as mentors with the Canadian National Marsville program, and have been giving talks at schools, science fiction conferences, and various space organization meetings. The most effective thing to do to become an active advocate is to simply start talking! Getting our message into wide-reaching mediums such as TV, print, and the internet is wonderful, but we can each do our part by talking to our friends and family members, getting into schools, and organizing public lectures with local and international speakers.

Q: When did you start going to the Arctic? What do you find to be fascinating about the place?

A: My first field season in the High Arctic was in the summer of 1997 as part of my MSc. research. I found the landscape to be

Ptarmigan

incredibly fascinating and beautiful due to the feeling of total isolation that it engendered. While I was there, I would pay attention to the smallest detail, since life had a way of subtly showing up. The fauna tended to blend in with the tundra, while the flora seemed to do the opposite, popping up as a splash of green, pink or yellow in an otherwise brown-grey canvas backdrop.

Q: What did you study in undergrad? What made you decide to go to grad school? Do you have any advice for students who will be starting undergrad?
A: I studied Biology during my undergrad at Queen's University in Kingston, Ontario, Canada. I took a limnology course with Dr. John Smol while at Queen's, and got hooked. I was really excited by the opportunities and applications that this research area presented, including the ability to travel and spend time in the field, and I haven't yet been disappointed!

My advice would be to not worry if you aren't sure what you want to do. Sometimes the only way to find out what you really want is to discover what you don't want. Make sure to enroll in classes that YOU are interested in, and in addition to your core courses, be sure to 'broaden your horizons' by taking a variety of electives that deal with subjects you are simply curious about. Undergrad is the perfect time to explore, so use it to your benefit.


Buttercups

Q: You spent a lot of time during undergrad in the field. What did that involve? How did it impact your life?
A: During undergrad, I spent some time in Central America taking biology field courses. I could not have asked for a more stimulating environment in which to learn, and I became resolved at that time to try and make fieldwork always play a role in my life. I also spent some time in Guyana, South America, during undergrad, as part of the Queen's University Project on International Development. This student organization, funded by the Canadian International Development Agency, ran environmental, engineering and teaching programs in Guyana geared at knowledge transfer between Canadians and local Guyanese. Given our limited resources, as a team we were constantly improvising to try and make our projects successful. It taught me that training is invaluable,


Canyon Gulch

but flexibility and creativity are the keys to achieving goals in fluid situations.

Q: What do you believe to be the main reason for going to Mars? When do you think we will get there? If you could have any job/position on the mission, what would it be?
A: Ultimately, I believe that humans will go to Mars for the sake of exploration and adventure. We seem to have an innate drive to look over our horizon, and the history of civilization attests to our species' unquenchable thirst for discovery in scientific, geographic, economic, and personal terms. In the very near future, I believe that space travel, and the quest for Mars, will offer the ultimate ability to satiate these needs. Moreover, science will be at the forefront of this discovery process. We will finally have the chance to execute a comprehensive search for life on Mars, in an attempt to answer the question "are we alone". Furthermore, the need to sophisticate our technology will lead to the inevitable refinement and improvement of our current economic, social, and political systems as we develop future Mars colonies and adjust our own Earthbound protocols to accommodate interplanetary transactions. I think that we will see humans on Mars within the next 20 years, however there is, of course, much work to be done between now and then. Given my background, if I was fortunate enough to be involved in a Mars mission, my 'dream job' would no doubt be to participate as the resident paleoinvestigator. Collecting a core from an ancient Mars lakebed and picking through it for signs of fossil life…now that would be my idea of the ultimate research project!


Sleeping camp

Plastic Mars!

Stephen M. Glenfield

For those of you who'd like to have a plastic replica of any Mars-related craft, the unfortunate news is that the field is fairly limited. At one time Lindberg made a couple of kits, titled "Mars Probe Space Station" and "Mars Probe Landing Module". These kits were simply reissues of existing kits with new titles, and are only available in online auctions. Another pair of old kits that are currently available are Glencoe's reissue of the old Mars Liner and Convair Manned Observation Satellite. While not kits of real Mars spacecraft, they have the benefit of being relatively inexpensive.

Also in the relatively inexpensive category are the Mars craft offered by toy-makers Mattel and Play Visions. I am sure most of you are familiar with the Mattel Sojourner Rover set, as this set has been readily available in toy stores and featured on the news at the time of the landing. A lesser known offering from Mattel is the "Return to Mars" set, which features the Mars Polar Lander, Climate Orbiter and Deep Space 2 probe. Unfortunately, this set is difficult to find, likely due to the mission failures. Play Visions makes two Mars vehicles- a small Viking Orbiter with attached aeroshell, and a larger Viking lander. The Play Vision vehicles are not as accurate as the Mattel offerings (the lander has four legs, not three) but they can usually be found at museum gift shops.


Viking

Finally, for those of you that are both experienced model makers and have sufficient funding, RealSpace Models offers a 1/24th scale model of the Viking Orbiter and Lander. The kit is mixed media, being both resin and metal parts, and costs $150.00, but is worth every penny. RealSpace has a reputation for making highly detailed, extremely accurate kits, and the Viking kit is no exception. The company is also planning to market a Mariner 9 kit in the near future.

The Mars Challenge

The Mars Challenge is a youth program looking for your input! We want to know what can be done to improve how science and technology is taught in schools. Visit our survey form at www.marschallenge.com/survey.html

Diatom Fact

There are over 60,000 species of diatoms and you might be surprised to know that you come into contact with them everyday, since crushed diatoms are used as abrasives in many toothpaste brands, reflectors in white road paint, and cleaners in pool filters.

Mars Youth Rover **Bumper Sticker** Contest!

This Rover Climbed Olympus Mons

Submit an original Mars bumper sticker!

Radio a honk if you make your own air!

Prize - a Hug-a-Mars signed by members of the Mars Society Steering Committee.

Send entries to mmm@mit.edu

The Recluse

Chapter III: Horizons

Rich Reifsnyder

"I copy that, Cynthia. Can you identify the source of the problem?"

Blake grabbed one of the many metal handholds bolted to the ship and hoisted himself out of his seat.

"No luck, Blake," said Cynthia Morgan, his flight engineer. "There are no automated diagnostic systems for that particular piece of hardware. But the most likely cause is either an improperly welded hinge or a bad electrical connection in the servos. If it's the latter it should be easy to fix: just swap out the servo electronics module with one of the onboard spares."

Even with his suit already on, the EVA checklist took an hour and a half. Blake had to check the gauges on his oxygen bottles (which had been filled up days ago), warm up the water cooling systems in advance to get them at full capacity, and check every seal, of which there were over a dozen. At his belt were several loops to which he could latch various items. He hooked a "fannypack" toolkit at two points and bungee cords at two other points. He grabbed a servo wiring module and stuffed it into his toolkit. Then he depressurized the cabin.

Depressurization took several hours, because the nitrogen wasn't out of the air yet. Lowering the air pressure too rapidly would cause nitrogen bubbles to form in Blake's blood — the painful scuba diver affliction known as the bends.

Blake hooked the other end of his bungee cord to a handhold by the side of the hatch. Then he opened the hatch.

The universe flooded his brain.

The stars are, for all practical purposes, an infinite distance away. The human mind is used to seeing objects within arm's reach, within walking distance, on the horizon, etc. But seeing the stars all around is unfathomable. Just standing on Earth and looking straight up at the sky can cause you to lose your balance. But for Blake, the sky was all around him.

The last few wisps of air in the cabin swirled around him and dragged him very slowly to the hatch. He went out head first — and made a desperate snatch at the door frame, which was impossible with his bulky gloves. He screamed into his radio and closed his eyes.

"Blake, you're hyperventilating. Your pulse is rising," said Dr. Palmer.

"Jason, listen to me," said Andrew Stratton, mission director. "You're still tethered safely to the ship. The bungee cord is right by your belt, right? Grab onto it."

Whimpering, his eyes still closed, Jason clawed at his belt like a skydiver who couldn't find the ripcord. But as the cord snapped taut, his left hand touched it loosely.

Gingerly he felt along it with both hands. He could already feel it slackening again as the elastic fibers snapped him back toward the ship.

His helmet rapped against bare metal. "Jason, open your eyes now. Look directly at the ship and find a handhold." There were several handholds molded into the outer hull. He grabbed one, already dizzy. He had rolled at a 45-degree angle and for a minute couldn't tell which way was up. After a few seconds he had located the nosecone of the ship above him. He preferred an up-down mentality, even in zero-g.

The faulty solar panel was a few meters below, stuck in an accordion position. Its position was controlled by multiple thin, hinged, hydraulic arms. When Blake finally worked his way down the ladder of handholds to the servos controlling those arms, he touched the servo module panel and could detect the vibration of a fussy electric motor.

He hooked his left hand around a handhold and wrapped his feet around one of the retracted landing legs immediately beneath him. With his right hand he unzipped the toolkit, found a power screwdriver, and ripped it off the Velcro strip holding it in place. He tightened his grip on the hull, pushed the tool onto the screw, and pressed the trigger.

The screws were in tight, but he got all four of them off. The cylindrical servo module drifted out of its enclosure. His left hand let go of the ship and slowly reached over to catch the module. He put it in his pouch, took out the new module, and pushed it in. He screwed it into place, unhooked his feet, and began to climb up into the hatch.

The problem was indeed the servos, because when he flipped the panel switch again the second solar panel deployed and the ship's lights got a little brighter. He gave himself a break for a few hours, resolving to open up the damaged module tomorrow and inspect the wiring connections that made the system go bad.

He looked outside. The entire Earth was now small enough to fit in the window. He closed one eye and looked away, focusing on that vast infinity that had so terrified him before. He knew he would have to conquer his fear if he had any chance of survival in the voyage ahead.

But at least, with operations like these, he wouldn't get bored.

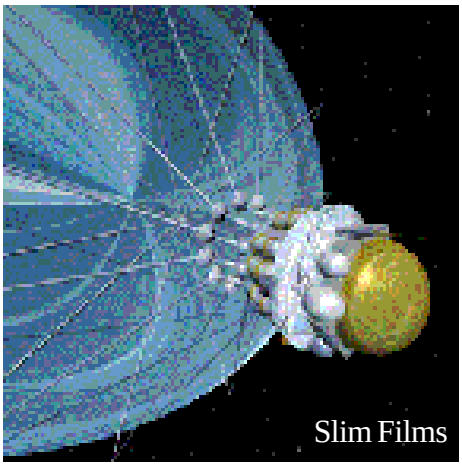
To Be Continued...

Mars Q&A

Q: How long would it take to make a phone call from Mars to Earth? (Ben Bern)
A: It takes a signal 12-20 minutes to travel each way, which is not practical for a phone call. However, currently it is impossible to send a signal to Mars when it is on the other side of the sun. Communication with Mars will need to be done by sending recorded "letters" (video, voice, written) and later receiving a reply in a similar way. - Daniel Slosberg

Q: When man begins the process of terraforming Mars there will most likely be protestors that want to keep Mars as it is. How will we cope with that? (Brett)
A: When terraforming Mars is seriously proposed by Martian settlers this century I predict that debate will rage all over both planets. Personally I believe that terraforming will go ahead anyway by the settlers that will benefit from it but compromises can be made; one of many ideas is to have a height limit: anything above six kilometers above datum can be left near pristine while lower altitudes can enjoy tolerable pressures and temperatures. In the end it will most likely be up to the Martians to decide, and their vested interest will likely be more terraforming oriented. - Felix

Q: Could the idea of using light craft to go to Mars become a reality? If I were to use a light craft to get to Mars, I would put the laser that emits the light to the craft on the bottom of the craft. The laser would not get weaker as the space vessel gets further away from the laser source. Have people thought about using light craft as space travel to Mars, and can the laser be attached to the space vehicle instead of the space station? (Andy Staudacher)



A: In principle, any mission beyond Earth's orbit could be powered by a "light craft" propulsion system, but the major problem is that we do not have the kinds of lasers that would be needed to power such a craft. These lasers would have to be incredibly powerful, practically "Death Star" lasers and would therefore require not only enormous construction facilities in space, but also an incredible power source. The biggest problem with placing the laser on the ship traveling to Mars would be that the laser would have to be huge, and require a vast energy source. If we consider where this energy were to come from, there are really only two possibilities: a nuclear reactor, either fission or fusion, or perhaps controlled micro antimatter detonations. However, if we were able to build these types of reactors, it would be much easier to just use them as a means of propulsion by themselves, rather than tie them into a massive laser. For example, fission reactor engine prototypes in the 70s used the fission of uranium or plutonium to heat up hydrogen gas until it is in a plasma state (all the electrons are sheared off) and then expel it through a nozzle at the back of the ship, thereby producing thrust. Unfortunately, one of the main reasons we have not actively pursued nuclear power technology for space missions is the possible explosion and crash of the rocket during takeoff, thereby spreading radioactive debris over large areas of the Earth and creating an ecological disaster. In other words, while light craft and other forms of exotic propulsion are in principle feasible, we will make many flights using conventional chemical rockets to Mars before we have the infrastructure to construct exotic and perhaps more efficient propulsion systems. - Luke Colby

The Mars Society Youth Chapter was created to provide Youth the opportunity to become more involved in the Mars Society and other Mars-related issues, and to provide a more effective outreach effort to other Youth. http://chapters.marssociety.org/youth/

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