Space Appeal

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Life On Mars?
“Public relations activities have been and always will be an integral part of crew activities. While these activities absorb resources, the most significant of which is time, they also bring public and political support to the program and provide some of the return on investment of the program.” – NASA, The Mars Reference Mission, Pg. 25

Since the day of NASA’s greatest triumph on July 20, 1969, there has been a sense among many American people and politicians that the once-unimaginable goal of conquering space has been accomplished, and that much of what NASA has done since are simply unnecessary frills of the federal budget. In order to attempt to justify its own existence, NASA has felt the need to engage in projects that can thrill the public and thus keep people interested in space exploration. In doing so, a significant portion of their budget, which has been cut over the years, is spent on public relations, decreasing the budget for actual space-related activities. By using its resources to “bring public and political support to the program”¹, NASA has been looking at the problem backwards. By operating more efficiently and spending less on making their projects “sexy” they could actually accomplish their goals, which would implicitly grab the public’s attention. It is time for NASA to move into a new era, where the goal is to pick those projects that will actually succeed instead of those that sensationalize space, those that appeal to the scientist instead of the average American.

One goal that NASA has been working toward for years is that of sending a manned mission to Mars. While there is no official plan to send a man to Mars, there is wide support for it at NASA and it clearly would be attempted when/if possible. Sending a human to another planet would be an impressive step for the recently maligned space

program, and would likely bring back a large public interest in the cosmos not seen since the heyday of space in the 1950s and 60s. However, NASA exists neither to entertain the American people nor to promote interest in outer space. According to Sean O’Keefe, NASA’s newly-minted Chief Administrator, it exists to “advance the development of science and technology”. Given the inherent risks involved in human space travel, NASA should only have sending humans to Mars as a goal if it could make a significantly more substantial contribution to science than if a series of rovers, probes, and satellites were used. Recent research in this area has yielded some astonishing accomplishments. In order to truly serve the American people and efficiently allocate usage of taxpayer dollars, the goals of NASA must be realistic, efficient, and scientifically useful. From the evidence currently available, it is unlikely that the ambition of sending humans to other planets in the foreseeable future will meet any of these standards.

President George W. Bush’s nomination on December 21, 2001 of Sean O’Keefe as NASA’s Chief Administrator and the subsequent confirmation of this appointment by the Senate is a step in the right direction for NASA. Mr. O’Keefe’s goal is a new space program that realizes its function and sees that it should not try to do many things ordinarily, instead it will succeed by “doing what we do real[ly] well.” Mr. O’Keefe says that he does not espouse a certain grand vision for the future of the space program and instead sees a series of “strategic efforts,” innovation, flexibility, and efficiency. He does not appear to be one who will find a goal such as sending a man to Mars and run with it at any cost. Many current NASA supporters say that O’Keefe is not cut out for the

2 Ibid.
position, as he is more of an accountant than a space connoisseur. However, after the well-intentioned yet failed vision of “faster, better, cheaper” of his predecessor Dan Goldin, a pure numbers man may be just what the agency needs—true space buffs will recall that James Webb, the leader of NASA during the golden years of the Apollo missions, was also seen as too much of an accountant for the position.

The stance and ideas of Mr. O’Keefe are easily contrasted with those of other members of the space community. Mr. Goldin had the right idea of doing more with a constrained budget, but this plan led to NASA’s recent blunders. The employees of NASA were overworked, and resources were often spread too thin. The catastrophic failures of the Mars Polar Lander and Orbiter are still fresh in the memories of many Americans, and have tainted the agency’s once-elite image. It looks now as if NASA has been too concerned with their appearance. Ironically, this led to the failures that have made their reputation worse than ever. By wasting resources on style instead of substance they had to put too much emphasis on “cheaper” in the administration’s old slogan, and could have accomplished more by focusing on the more sensible projects such as the probes and orbiters to Mars.

Mr. Goldin was also idealistic during his tenure as Chief Administrator, which may have clouded his judgment on some issues. He was very much interested in what could be done instead of what should be done. While there is nothing wrong with being passionate about one’s job, he often would “gaze toward the heavens and got a lumpy throat whenever he faced a camera.”

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employee of Mr. Goldin’s who also had an emotional attachment to Mars was Donna Shirley. She served as manager of the Mars Exploration Program, which landed the Sojourner Rover on July 4, 1997. While this was one of the largest successes of the Goldin administration, one wonders if more could have been accomplished had the workers been more objective rather than emotional in their beliefs about Mars. In an interview, she mentions, “the best science fiction movies and books in [my] youth were about Mars”\(^5\). Among her more surprising quotes are “sending robots wasn’t exactly what I had in mind…maybe my grandchildren can go,” and “Mars is the coolest planet, and it’s the only people could really hope to live on.”\(^6\) These do not sound like ideas that have support from much hard scientific research. These are people, while certainly well educated and qualified, who got caught up in the mystique of space, which has little place in an efficient, well-run space agency. While it is true that many of the largest names in space throughout history have fantasized about sending humans to space, one must be very careful not to let hopes and desires interfere with the best interests of science.

Some who advocate sending a man to Mars realize that it should be done only if there are significant advantages in doing so compared to sending intelligent unmanned missions. This is an argument that will be discussed later, and at least has some valid points. However there are many who wish to send a man to Mars simply in order to quench man’s desire to explore, show how much man can accomplish, or even unite countries here on earth. These arguments should not and cannot be used in a serious discussion of the future of space exploration. The money allocated to NASA will be under scrutiny now more than ever with an increased federal defense budget. All

\(^6\) Ibid.
resources must be used on realistic and productive goals in order to accomplish anything. Space travel has not become routine, as every mission achieved is the result of many thousand man-hours, and yes, as hard as it is to say, some good luck. However, the objective of sending men to Mars would dwarf any previous risk taken in space.

The director of NASA’s National Space Biomedical Research Institute, Dr. Jeffrey P. Sutton, says, “We just don’t know whether people will be able to go to Mars and come back alive. Space travel is risky business.” Quite a chilling quote from a man who knows as much about health during space flights as anyone. The risks from weightlessness alone include bone density loss in weight-bearing bones of 1%-2% for every month spent in weightlessness due to increased calcium lost via urination, decrease in production of red blood cells, shrinking of the heart, loss of cell structure and disturbed sleep patterns. The immune system is weakened due to extreme isolation and stress, without even mentioning the less known psychological effects of such a mission. Long-term human isolation studies are still in an embryonic stage. The longest any man has spent in space is 14 months; a mission to Mars would take over twice as long. It is quite possible that a crew of 6 people could not get along in isolation well for 30 months anywhere, without even considering the added stresses and dangers of interplanetary travel.

New findings from the Mars Odyssey mission currently orbiting the earth also show that the levels of radiation may be higher in deep space than previously believed.

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This will be as much of a safety hazard for humans in space as any other; a radiation expert at the Johnson Space Center in Houston says, “This is a real problem for getting humans out there”\textsuperscript{10}. Results of radiation exposure include increased risks of cancer and cataracts. The collision of high weight atomic particles with cell nuclei due to galactic cosmic radiation could kill a significant amount of cells in the amount of time needed for an interplanetary mission.\textsuperscript{11} Many of these risks would not be seen during the mission, and full repercussions would possibly not be observed until the descendants of the astronauts mature, but it is hardly fair to send up astronauts as guinea pigs on the first long-term radiation exposure missions. The experts agree that the risks of a human mission to Mars are large, and the goal of landing a man on Mars is farther away than most think. Significant amounts of money and research would have to go into developing methods of transporting people in outer space without getting pummeled by harsh radiation.

Much has been made about reducing the risk of unintentional contamination of the surface of Mars with bacteria or other microscopic life from Earth. This is obviously a major issue in sending any manned or unmanned mission to Mars, as contamination of the Martian surface would greatly increase the possibility of false positive results when life is searched for via testing, and unnecessarily interfere with the Martian ecosystem. However one issue that has been ignored, and surprisingly so, is that if there is life on Mars, that paradoxically human beings must avoid contact with it. While the search for life is one of the great interests of going to Mars, any contact between humans and totally


unknown organism could be of disastrous consequences to both parties. It is quite conceivable that an alien bacterium or other life form could be fatal to those astronauts, as the human immune system would be totally unprepared for a life form never before seen in all of human existence. It would also be a shame to go to Mars, find life, and then endanger that life by disturbing its natural habitat and adding terrestrial components to the surface of Mars. Another issue that has just recently been discovered is the possibility of large amounts of hexavalent chromium (the poisonous contaminant from the film “Erin Brockovitch”) on the surface of Mars.\textsuperscript{12}

NASA will never be able to eliminate all earth-based microscopic life forms on any mission to Mars, as it appears that with newly-found life in Antarctic waters and nuclear reactors where previously thought impossible, that no sterilization process will be able to kill everything present on a rocket. However, a large risk can be taken out of this equation if robots are sent to Mars. Without any germs of their own or immune system to be attacked, they will be unaffected by whatever may be found on Mars. This would lessen the possibility of human contamination of Mars, and eliminate the chance that a bacterium or other foreign object could compromise a mission. An astronaut catching a disease or dying while on Mars would be a huge setback to the space program, and would make it even more difficult to obtain funding for future Mars missions. Worse yet is the chance that a disease could be obtained by the astronauts and not be found upon their return, thereby unleashing an outbreak once they come back to Earth. As unlikely as this scenario may sound, it is conceivable and is currently being researched by NASA, as they attempt to determine landing sites for manned missions that would ironically \textit{reduce} the

chances of encountering life on Mars. Unmanned missions would not have to worry about such problems, and could land in those places where life is most likely to survive in order to determine if it exists. This is one of the Mars program’s main goals, and the fact that humans may not be able to travel to these areas is a serious drawback of manned missions.

Now that the dangers and drawbacks of sending manned missions to Mars have been pointed out, another question arises: what are the benefits of a manned mission compared to an unmanned one? At first glance it would appear that the answers would be manifold, as it is natural to think that there would be many tasks, be they physical, observational or analytical, which would be better performed by humans. However, amazing advances in artificial intelligence and remote-controlled technology occur every year, and it is not inconceivable that within a few years an unmanned mission could achieve the same goals as a manned one. We must remember Chief Administrator O’Keefe’s statement that NASA should advance science and technology, not entertain. It is in the best interests of the scientific community, and the general public, that NASA give more incentive to innovate in the robotics industry by demanding products that could make an unmanned voyage to Mars as productive as a manned one, with fewer inherent risks. The following examples of innovations that have come about in the last year alone provide good reason to believe that within a few years a proposed unmanned mission could be at least as efficient and scientifically fruitful as a manned one.

One of the many obstacles brought up by proponents of manned missions is that machines will not be able to do the “grunt work” needed on Mars without men to operate

\[13\] Ibid.
them. It is often assumed that robots can gather data near the location where they land but without much mobility in any dimension. In testing performed this January, however, a “hot-nosed robot” essentially dug 75 feet into a glacier in the Arctic.\textsuperscript{14} By heating its copper tip to a temperature of 90 degrees Celsius, it melted the ice below it, boring into the ice, traveling downward for a four-day period. This research was co-sponsored by NASA with a goal of possible use on Mars in mind, and the results strongly suggest that robots would be able to perform other physical tasks.

Technology from the petroleum industry is also being tested which could be used to collect samples from \textit{inside} the rocks on Mars using a robot. Dr. John Parnell, geology professor at Aberdeen University in Scotland, has discussed the possibility of sending a spacecraft of only a few cubic feet in volume to Mars. He has said that the machines could essentially extract the fluids inside rocks and test them by “simply adapting the technology and the method already used in oil exploration”.\textsuperscript{15} This is a project that clearly encourages innovation and could lead to other future advances in the field of petroleum exploitation, which will be very important in the 21\textsuperscript{st} century here on Earth.

One of the main goals of any Mars-related project is finding out how much water is present on the planet, in what state it is and where most of it lies. Water is considered an absolute necessity in order for life to survive on any planet. In March of 2002 the Odyssey orbiter found large amounts of hydrogen in the southern hemisphere of Mars using a gamma ray spectrometer, which has been called a “virtual shovel”.\textsuperscript{16} This leads

nearly all scientists to believe that the hydrogen is bonded to oxygen and forms a massive amount of water ice on the Martian surface. Not only that, a conclusion from this satellite imaging has been drawn that most of the ice is mixed with dust, dirt and rock that form the upper 90 centimeters of the planet’s surface from the south pole north to approximately the 60 degree south latitude mark. After seeing what the boring machine did in the extreme conditions of the Arctic, there is little doubt that machines could dig down to this ice, and then perform tests on it. This virtual shovel in combination with real digging machines already tested here on Earth could prove to overcome the physical obstacles that many point to as reason to support a manned mission.

The potential for other, seemingly more far-off mechanized products is unlimited, as other astonishing automated projects are currently being researched. One project proposed by Dr. Christopher McKay, a research scientist at NASA, would be to plant a flower in Martian soil in order to see if growth is possible. Martian soil would be scooped up and put into a greenhouse and flushed of toxins with water. The greenhouse would then be pressurized with carbon dioxide (which is needed for plant life and abundant on Mars) and the seed of Arabidopsis, a common weed, would be planted. This would all be accomplished using a machine that would be autonomous once it reached Mars. Also, fluorescent proteins could be added to the weed so that different “symptoms” of the weed’s possible problems would be color-coded. Using this novel technique, if the plant failed, scientists could see why it did.

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The most impressive of all potential projects is the “micro flyer” idea pioneered by Australian scientists. The researchers tout these as having “the agility of dragonflies and the eyes of bees”\(^{19}\). These miniature flying objects could weigh as little as 75 grams and are being designed to be able to fly into the Valles Marineris and explore from inside. Mechanical eyes would be used to detect the distribution of ultraviolet and green light in order to maintain level flight, which was previously thought impossible in the ultra-thin atmosphere of Mars\(^{20}\). In this instance it is apparent that, if successful, this project could be much more successful than a similar manned mission.

This flyer project, the boring machine, and the flower project have all received funding from NASA, as the space giant has accomplished its goal of stimulating innovation in industry worldwide and then rewarding those projects that have potential for use. These projects will better achieve the goals of exploring Mars and advancing technology, which could in turn improve life here on Earth. Many of the researchers of the projects mentioned hope to have their projects completed by 2007 in order to earn a coveted spot on the series of Mars landers launched beginning in that year called “Scout”. Mr. O’Keefe has mentioned that he wants to implement a system of “competitive sourcing”, that is, finding the best way to get into space, be it by using projects designed in the public or private sector.\(^{21}\) The support by NASA of the projects cited, all endorsed during O’Keefe’s short tenure, show that as of yet he has stuck to his ideas.


\(^{20}\) Ibid.

In order for NASA to better explore the cosmos, only pure results of scientific research should determine which projects are undertaken. The goal of sending a man to Mars merely so he can plant an American flag with human hands is a gross waste of resources and time, and an unnecessary risk of life. Until proven otherwise, NASA is better off investing in projects that are purely designed to get humankind closer to unlocking the secrets to Mars. Mr. O’Keefe has taken steps toward this logical and orderly goal. In using this criterion, the government agency that was once the most revered can regain its status. Let the scientists, not politicians or voters, decide which course to take in exploring Mars.

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