2012
NASA PLANETARY PROTECTION PROGRAM
COMMUNICATION STRATEGY

The strategy in detail

Introduction

"The scientific research enterprise...is built on a foundation of trust." So say the National Academies. Scientists trust that the results their colleagues report are valid, and society trusts that those reports are honest, accurate and unbiased. Scientific knowledge is typically presented to public audiences as "fixed and universal. Yet scientific knowledge obviously emerges from a process that is intensely human...shaped by human...values and limitations and by societal contexts."[1]

NASA's Planetary Protection Program recognizes that knowledge and trust are key to its mission. The Planetary Protection Program administers policies and practices established to protect other solar system bodies (including planets, moons, asteroids and comets) from Earth life and to protect Earth from life that may be brought back from other solar system bodies.[2] With the era of solar system sample return missions already under way and an increasing focus in planetary exploration missions on astrobiology research and the search for signs of water and life on Mars and elsewhere, the work of the Planetary Protection Program is expanding, and interest in this work is growing.

The Planetary Protection Program employs a communication strategy designed to guide efforts to explain the science, technology, and risk involved in planetary protection; improve understanding of astrobiology research and planetary exploration goals and plans; sustain an ongoing dialogue with interested audiences; and contribute to the building and maintenance of public trust. This strategy functions within a framework established by NASA planetary protection policy and related policy documents[3], National Research Council advice[4], and an international protocol for Mars sample return.[5]

Rationale

The science community has been interested in and involved with planetary protection issues since the beginning of the space program and has provided NASA extensive expert guidance since the agency was first established in 1958, continually updating its advice over the past 50 years.

In 1992, a Task Group on Planetary Protection, appointed by the Space Studies Board (SSB) of the National Research Council (NRC) to study issues relating to the biological contamination of

Mars recommended "that NASA make every attempt to inform the public about current planetary protection plans and provide continuing updates concerning Mars exploration and sample return." The task group concluded that "great public concern over the question of outbound contamination" was unlikely:

> …if the public understands the scientific objectives and is aware that the issue of contamination has been addressed (and that appropriate precautions are being taken). The better the effort at public education and the earlier it begins, the smaller the likelihood that there will be public concern and negative reaction. In the case of sample return missions…the potential for negative reaction is much greater and that the need for public education and involvement is therefore even greater.[6]

Noting that NASA had a planetary protection officer but "no budgeted program to implement needed planetary protection research, public education programs, and the like,"[7] the task group recommended that NASA initiate such a program as soon as possible. NASA quickly acted on this recommendation, and a NASA-sponsored planetary protection communication research initiative began in 1992, focusing on legal and ethical issues and expert audiences.

In 1997, an SSB Task Group on Issues in Sample Return reported to NASA:

> Throughout any sample-return program, the public should be openly informed of plans, activities, results, and associated issues. Significant changes have occurred in the public decision-making realm since the return of lunar samples during the Apollo program. More open review processes now allow for citizen involvement in nearly all aspects of governmental decision-making, most notably the National Environmental Policy Act. Scientific and technical decisions about mission hardware and operations, while still made by…experts, now are openly scrutinized by other governmental bodies, the general public, advocacy groups, and the media…. It is possible that environmental and quality-of-life issues will be raised in the context of a Mars sample-return mission. If so, it is likely that the adequacy of NASA's planetary protection measures will be questioned in depth. The most effective strategy for allaying fear and distrust is to inform early and often as the program unfolds. Acknowledging the public's legitimate interest in planetary protection issues, and thereby keeping the public fully informed throughout the decision-making process related to sample return and handling, will go a long way toward addressing the public's concerns.[8]

NASA's Planetary Protection Program consequently expanded its communication research initiative to address the nature, needs, and interests of public audiences. The communication strategy described here is a product of this expansion of effort, addressing the ways and means of informing internal and external, expert and non-expert, audiences.

Purpose

Exploring the universe and searching for evidence of habitability and life beyond Earth is a primary mission of NASA. A range of discoveries in planetary exploration over the past 15 years has led scientists to consider more seriously the possibility of extraterrestrial life. These discoveries include evidence of past liquid water on Mars and a present liquid-water ocean on Europa, the controversial 1996 claim of fossil evidence of life in a martian meteorite, detection of more than 770 extrasolar planets thus far with the rate of discovery on the rise, and the finding of microbial life thriving in virtually every extreme Earth environment explored to date.

NASA's Astrobiology Roadmap calls for research that addresses a wide range of topics relating to the origin, evolution and distribution of life in the universe, including microbial ecology, life's precursors and habitats in the outer solar system, links between planetary and biological evolution, and the effects of climate and geology on habitability. One of the primary goals of NASA's Mars Exploration Program is to determine whether life ever arose on that planet. An increasing number of NASA planetary exploration missions are addressing questions of astrobiological interest, with the Mars Science Laboratory mission being NASA's first astrobiology mission to the planet since Viking. NASA planetary protection policy mandates that all of these missions take steps to protect pristine environments for future astrobiological studies.

For example, the Galileo mission to Jupiter, launched in 1989, produced evidence of possible liquid water oceans beneath the icy surfaces of Jupiter's moons Callisto, Europa, and Ganymede. Astrobiological interest in these pristine environments mandated alteration of Galileo's end-of-mission plan to ensure that the spacecraft would not jeopardize future exploration by crashing into any of these moons. (NASA mission controllers sent the Galileo spacecraft into the atmosphere of Jupiter, where it burned up, at the end of its mission life in 2003.) Planetary protection may become a consideration even for missions that are not focused on searching for signs of life. Planetary protection controls were in place for the Cassini mission to Saturn, which in 2004 delivered a probe to the surface of Saturn's moon Titan, where prebiotic chemistry may be taking place.

Mars is currently considered the best site to search in our solar system for evidence of past or present life, and planetary protection plans are in place or in preparation for current and prospective NASA missions to this planet.[9] Planetary protection requirements guided the Genesis mission's 2004 solar wind sample return in 2004, the Stardust mission's cometary and interplanetary dust sample return in 2006. All future missions to solar system sites that may feature prebiotic chemistry or past or present environmental conditions conducive to life will be required to have planetary protection plans in place.

With numerous planetary exploration missions under way and in the works, a communication strategy for planetary protection is a useful tool to have at hand. This strategy is intended to provide guidance on methods, messages, tools, and audiences and ensure flexibility and continuity in communication about planetary protection.

Foundations

Research in mass communication, science communication, risk communication and the psychology of risk, social studies of science, public understanding of science, the rhetoric of science, and journalistic practices yields many findings that are relevant to communication about planetary protection.[10]

Scholars have explained, for example, that communication is contextual, contingent, situated, and symbolic as well as functional. They have shown how and why "the public" is not a monolithic audience. Studies of journalists and scientists at work have explored the professional values and practices they employ in their professions and revealed how these values and practices differ and sometimes conflict. Studies have shown how mass media play a key role in public discourse about science, technology and risk and examined other sources of information tapped by public audiences. Among other relevant findings are that:

- Public understanding of science does not ensure public appreciation or support for science.
- Perceptions of reality constitute reality in the context of communication about science, technology and risk.
- Experts and expertise serve a purpose in communications about science, technology and risk, but effective communications depend on other factors as well.
- Science and scientists are not apolitical, objective, or value-free, and thus the information they communicate to public audiences may be perceived as biased.
- Quantitative data may be effective in communications among scientists about science, technology and risk, but they are not so effective in communications with nonscientists about these subjects.
- Effective communication about science, technology and risk depends on the quality of the overall communication, not just the quality and quantity of scientific, technical and risk information communicated.
- Successful communication with public audiences about science, technology and risk requires validation of emotional responses and personal beliefs as well as factual data and official positions, by all parties to the dialogue.
- Social trust is a critical element of effective communication about risk, and though science and scientists hold a privileged status as arbiters of knowledge in our culture, this status alone does not assure them the public's trust. Keys to establishing trust in communication about scientific and technological risks — for individuals and institutions — are caring and empathy, honesty and openness, commitment and dedication, and competence and expertise.
- Approaching communication as a dialogue can enable more effective communication about science, technology and risks, greater public engagement, more informed public decision-making, and enduring public trust.

Successful communication about science, technology and risk, then, does not depend solely on the quantity or quality of information conveyed by experts to public audiences. It is contingent upon a range of factors, including the social context in which it takes place. Communication strategy for planetary protection rests on a model of communication as an ongoing, interactive process that occurs in specific social contexts and serves material and symbolic ends. This dialogic and contingent model:

- Acknowledges that communication involves complex networks of interacting exchanges (by means of mass media, local media and other public channels as well as interpersonal contacts);
- Assigns value to expert and local knowledge;
- Accommodates multiple perspectives;
- Enables public participation in decision making; and
- Engenders broadened public discourse by accommodating multiple perspectives, thereby contributing to the establishment and maintenance of social trust.

This communication strategy rests on a number of underlying assumptions that may affect the framing and content of communications. These assumptions are that:

- Attitudes are important: they establish motives, and motives define actions.
- Since perceptions of reality constitute reality in the context of communications about science, technology and risk, it is important to heed non-expert as well as expert knowledge and beliefs about planetary protection.
- Scientists and others who engage in communications about science, technology and risk associated with planetary protection will be willing and able to connect with their audiences — to listen, question, explain, and empathize.
- Debunking as an approach to communicating about science, technology and risk creates a negative frame and fosters rejection. Seeking common ground creates a positive frame and fosters acceptance.
- Participatory communication is democratic communication.

Scope

The scope of communications about planetary protection to date is broad, encompassing terrestrial and extraterrestrial biology; environmental protection; human health; ethics; national and international law, regulation and policy; engineering and technology development; risk assessment, analysis, and management; and more. Issues in planetary protection include forward and back contamination; technology requirements for cleaning, sterilization, containment and analysis; astrobiology research goals and plans; space nuclear systems development and deployment; and legal, regulatory, and policy frameworks.

Communication about planetary protection to date has focused largely on interested members of the global space science community, particularly the international Committee on Space Research (COSPAR), NASA, and the NRC, with some involvement of the science community outside of space science. The Planetary Protection Program recognizes the need to extend communications not only beyond space science to the broader science, technology and space communities but also to nongovernmental organizations, interest groups and other public audiences. Public audiences include state and local governments, community organizations, the public health and safety community, environmental groups, the post-secondary education community, the K-12 education community, and the mass media.

The present environment for communicating with public audiences about planetary protection is excellent. Opportunities to inform various audiences about planetary protection are plentiful, occurring in conjunction with NASA exploration missions, scientific conferences, public outreach programs, and other events. Sources of information on planetary protection are plentiful, and organized at NASA's planetary protection Web site. Informed spokespeople are available, and members of the NASA Advisory Council's Planetary Protection Advisory Subcommittee have a part to play as overseers and implementers of communications about planetary protection. It may be appropriate for the scientific community to take a leading role in communications about planetary protection. NASA and the National Science Foundation offer media training to their scientists, as do many professional associations and research universities.

Goals

Protecting "all of the planets, all of the time" is the goal of the Planetary Protection Program. Preserving astrobiological research opportunities in extraterrestrial environments and preserving life on Earth are the primary objectives of planetary protection. "Keep it clean" is the first rule of planetary protection. The basic approach to communication employed by the Planetary Protection Office is to "tell 'em early and often." This approach provides a solid foundation for a comprehensive, long-term planetary protection communication strategy.

The strategy described here can support an organized communication initiative for planetary protection that can meet the needs of specific audiences and adjust to changes in social context over time. The goal of this strategy is to guide overall communication about planetary protection, help the Planetary Protection Office identify and meet the needs of its various "publics," aid fulfillment of NASA's statutory function to "provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof"[11], and establish and maintain trust with audiences over time.

This strategy is intended to facilitate interaction between the Planetary Protection Program and NASA's Public Affairs Office on communication with the media and the public, the Legislative Affairs Office on communication with Congress and the White House, the External Relations Office on interactions with foreign national and international organizations and other concerned audiences, and the Office of the Administrator on any issues of interest. While this communication strategy focuses on public audiences, the Planetary Protection Program recognizes the need for coordination and consistency between external and internal communications.

Current events can quickly change the context for communication about the risks of biological contamination, at any time and without warning, for better or worse. A wide range of uncertainties is involved in planetary protection. As mission plans and schedules change, planetary protection plans must adjust. New discoveries and changing perspectives in science affect the evolution of planetary protection plans. Planetary protection plans must adapt to technological advances and technological difficulties. And current events can influence public concerns about planetary protection issues. By employing a flexible communication strategy, the Planetary Protection Program can take full advantage of positive conditions for communication and respond quickly to any possible negative conditions.

Responsibilities and procedures for risk communication in NASA's Science Mission Directorate (SMD) are explained in the Directorate's Risk Communication Plan for Solar System and Deep Space Exploration Missions. This planetary protection communication strategy is intended to support public affairs, risk communication, and education and public outreach plans for the SMD, Mars exploration missions, the Astrobiology Program, and all other relevant planetary exploration initiatives.

Implementation

Implementation of this communication strategy advances NASA's mission by strengthening efforts to inform and engage the public about space exploration, research in astrobiology, the search for extraterrestrial life, and methods of protecting extraterrestrial and terrestrial environments from forward and back contamination by exploration missions. By employing the strategy described here, the Planetary Protection Program will be able to establish and maintain direct and continuous communications with all of its various audiences, building and sustaining continuity, credibility and trust by pursuing a consistent, constructive, inclusive approach to communication. By following this strategy, the Program will be able to ensure full and timely disclosure; provide complete, accurate, and comprehensible information using all available media and networks; get to know audiences; develop and maintain relationships; giving people what they need; and acknowledge uncertainty.

Implementation of this communication strategy entails:

- Development of a clear, concise, complete narrative explaining what planetary protection is and does, describing links among astrobiology, Mars exploration, and planetary protection and identifying key issues.
- Examination of lessons learned in relevant NASA communication campaigns such as the Galileo mission to Jupiter and the Cassini-Huygens mission to Saturn, whose launches raised public concerns about risks related to the use of radioisotope thermoelectric generator; and the Keck Telescope outrigger project, which raised community concerns about public involvement in environmental impact assessments.
- Identification and preparation of spokespeople.

- Establishment and maintenance of a planetary protection communication network, including representatives of internal and external audiences.
- Maintenance of a comprehensive, up-to-date NASA planetary protection Web site.
- Identification and definition of public audiences.
  - Research on organizations that are potential audience members.
  - Contact with potential audiences to gauge needs and concerns.
  - Prioritization of potential audiences based on research results.
- Engagement with selected audiences and contacts.
  - Routine communications.
  - Special events (conferences, workshops, town meetings).
  - Rapid response to queries.

Implementation of this communication strategy for planetary protection will be monitored by the Planetary Protection Program, in consultation with the NAC Planetary Protection Advisory Committee and other experts, as needed, to verify that it is proving effective. The strategy will be revised as needed.

Conclusion

This communication strategy for planetary protection aims to sustain an ongoing dialogue with interested audiences, guiding efforts to explain the science, technology, and risk involved in planetary protection plans for solar system exploration missions. This strategy rests on a conception of communication as an ongoing, interactive process that promotes public dialogue and accommodates a diversity of perspectives. Approaching communication as a dialogue can enable greater public engagement, more informed public decision-making, enduring public trust and more effective communication about science, technology and risks.

Notes

1. National Academy of Sciences, National Academy of Engineering, Institute of Medicine. On Being a Scientist: Responsible Conduct in Research (2nd edition). Washington, DC, National Academies Press, 1995.
2. NASA's Planetary Protection Program is responsible for preventing biological contamination in connection with solar system exploration. Beyond a concern for the possible effects of perennial heat sources aboard spacecraft on the survivability of Earth life in extraterrestrial environments, the Planetary Protection Program is not chartered to ensure protection against nuclear contamination in connection with solar system exploration. It also is not chartered to ensure protection of Earth against asteroid impacts.
3. NPD (NASA Policy Directive) 8020.7F, Biological Contamination Control for Outbound and Inbound Planetary Spacecraft; NPR (NASA Procedural Requirements) 8020.12B, Planetary Protection Provisions for Robotic Extraterrestrial Missions; NPG (NASA Procedures and Guidelines, now known as NASA Procedural Requirements) 53040.aD (draft), NASA Standard Procedures for the Microbial Examination of Space Hardware.
4. See the following reports of the National Research Council's Space Studies Board (available from the National Academies Press, Washington, DC, www.nap.edu):
   Biological Contamination of Mars: Issues and Recommendations, Task Group on Planetary Protection, 1992.
   Evaluating the Biological Potential in Samples Returned from Planetary Satellites and Small Solar System Bodies, Task Group on Sample Return from Small Solar System Bodies, 1998.
   Mars Sample Return: Issues and Recommendations, Task Group on Issues in Sample Return, 1997.
   Preventing the Forward Contamination of Europa, Task Group on the Forward Contamination of Europa, 2000.
   The Quarantine and Certification of Martian Samples, Committee on Planetary and Lunar Exploration, 2002.
5. Rummel, J. D. et al, eds. *A Draft Test Protocol for Detecting Possible Biohazards in Martian Samples Returned to Earth*. NASA/CP-2002-211842, 2002. Notice of availability for public comment published in Federal Register Vol. 68, No. 146, July 30, 2003 (Notice 03-085).
6. Space Studies Board, Task Group on Planetary Protection. *Biological contamination of Mars: issues and recommendations*. Washington, DC: National Academies Press, 1992, p. 55.
7. *Biological contamination of Mars*, p. 56.
8. Space Studies Board, Task Group on Issues in Sample Return. *Mars sample return: issues and recommendations*. Washington, DC: National Academies Press, 1997, pp. 6-7.
9. NASA's Mars Exploration Rovers, which landed on the surface of planet in January 2004; Mars Reconnaissance Orbiter, launched in 2005; the Mars Phoenix polar lander mission launched in 2007; the Mars Science Laboratory (MSL) mission planned for launch in 2009; and the European Space Agency's ExoMars mission planned for launch

in 2011 (including NASA-sponsored investigations).
10. See Selected References for sources.
11. Sec. 203 (a) (3), PL85-568, National Aeronautics and Space Act of 1958.

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