

**The Science Mission Directorate: Enabling NASA's Exploration Activities
for the Long Term**

White Paper

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In his January 14, 2004 speech on the future of space exploration, President George W. Bush proposed a return to the Moon followed by “human missions to Mars and to worlds beyond.” Bush’s proposal, calling for both robotic missions and new manned space vehicles to replace space shuttles, sought a new justification for space exploration.

In the words of NASA Administrator Sean O’Keefe, this plan is not “merely for the sake of adventure, however exciting that might be, but seeks answers to profound scientific and philosophic questions.”¹ This approach recognizes that today’s questions require interdisciplinary approaches to knowledge, and that the term “interdisciplinary” encompasses more than integration across the sciences, but also the ethical and cultural aspects of scientific research.

Following from these statements, we propose that the ethical, cultural, and philosophic aspects of solar system exploration be one of the core interdisciplinary research focus areas of NASA’s Vision for Space Exploration. Specifically, we propose that a) NASA establish a small separate line of funding within the 2005 omnibus solicitation to support interdisciplinary collaborations among scientists, philosophers, writers, and public policy researchers; and b) an inaugural workshop of NASA program managers, scientists, engineers, philosophers and writers, the purpose of which will be to identify best practices for incorporating societal relevance into proposal submitted to NASA.

The call for white papers suggested a broad range of interdisciplinary lines of scientific inquiry as possible research topics, from understanding the geological and climatic histories of other planets, to preparing for a sustained human presence throughout the solar system. Such research topics raise two types of questions, one set scientific and technical, the second ethical, cultural, and philosophical.

Public science agencies have increasingly viewed these two types of questions as complementary in nature. Thus in 1997 the National Science Foundation instituted its second review criterion of ‘broader impacts’ in addition to its first criterion of ‘intellectual merit.’ Similarly, the Human Genome Project and the National Nanotechnology Initiative each devote 3% of their budget to research on the Ethical, Legal, and Societal Implications (ELSI) of their work. Such investigations provide a larger context for the science research being conducted, completing the cycle of knowledge by connecting research to the concerns of the citizens that fund this work. In an increasingly tight federal budgetary climate such justification is the surest means for ensuring that NASA research retains the attention that it deserves in the long term.

How does scientific research in the areas above relate to the life of the average American citizen? Why, in an increasingly straightened budgetary climate, should such research be funded at all? As the Vision for Space Exploration notes, “Direct human experience in space has fundamentally altered our perspective of humanity and our place in the universe.” But if this is true, should not the cultural effects of establishing a sustained presence throughout the solar system be carefully examined within NASA’s interdisciplinary portfolio? Given that this research is *public* science, science funded by public funds, it is imperative that we be able to give an account of such questions that spark the imagination of the public.

There is also precedent for this approach within NASA. For instance, some of the research within the NASA Astrobiology Institute (NAI) has considered philosophical issues. The Center for Astrobiology at the University of Colorado includes *philosophical and societal issues in astrobiology* as one of its research themes. This research has been focused on fairly narrow epistemological issues such as the difference between historical and experimental sciences. In keeping with the President and Administrator’s statements, we suggest expanding this approach to include more fundamental questions such as how the discovery of extra-terrestrial life might affect our conception of ourselves.

NASA’s Vision for Space Exploration must ultimately address the interests and concerns of the public that funds it. Although there is widespread support for manned missions to the Moon, Mars, and beyond, and robotic exploration of the planets, there is also widespread concern for the stewardship of our own planet. A Vision for Space that does not include the one that we live in may well be doomed to become a short-lived phenomenon. The essential scientific and technological synergy between the

¹ Frontpiece, *The Vision for Space Exploration: February 2004*. National Aeronautics and Space Administration.

exploration of the planets and our own home as a planet does not go away with a reorganization of NASA. Moreover, the intellectuals that articulate the needs, concerns and dreams of the US population are typically not scientists and engineers – they are the writers, philosophers and policy makers that touch the hearts and souls of the working men and women of this country. Including them in a dialogue with scientists and engineers that do the fundamental work of NASA is an important strategy in understanding the long term viability of NASA’s plans and vision.

We propose that NASA establish a small separate line of funding within the 2005 Research and Analysis omnibus solicitation to support interdisciplinary collaborations among scientists, philosophers, writers, and public policy researchers. These projects will enable NASA-funded researchers to delve deeply into the meaning of scientific exploration as well as into the expectations of the public that supports NASA. We suggest an initial program of \$1-2 million a year. We further suggest an inaugural workshop of NASA program managers, scientists, engineers, philosophers and writers, the purpose of which will be to identify best practices for criteria for incorporating societal relevance into every proposal submitted by potential NASA PIs. This interdisciplinary workshop would be one of the follow-on activities to the announced Spring 2005 pre-proposal workshop.

Some of the questions that could be explored by such a solicitation include:

- How do individual NASA research projects speak to the reasons for why we explore? Scientists should be encouraged to reflect on the consequences of their anticipated scientific results.
- One goal of the Vision for Space Exploration is to explore the solar system for scientific purposes and to support human exploration in order to ultimately establish a sustained “presence” throughout the solar system. What are the ethics of developing a sustained presence on other worlds? What about the ethical issues of resource acquisition outside our own world? Might there be a legitimate concern that the spirit of exploration can mean avoiding dealing with the essential finitude of the Earth and its resources?
- How should we prepare for contact with either microbial or intelligent life found on other worlds? Space is the new frontier. Americans are pioneers, and the frontier beckons and inspires like nothing else can. However, the exploration and development of the American frontier carried with it not only promise and glory, but heartache and atrocities. The development of the American frontier also included, along with its nobility of purpose, genocide and unrelenting damage to the natural environment. How will we conduct ourselves in the future?
- Should we send poets, philosophers, and architects to space along with pilots and scientists? Who shall we designate to reflect on the meaning of exploration, derived from direct experience in space, and communicate this to the general public?