

The Elephant in the Attic: the New Presidential Vision for Space

Conway Leovy^{1,2}, Tad Anderson¹, David Catling^{1,3}, Bob Charlson^{1,4}

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¹ Department of Atmospheric Sciences, University of Washington, Seattle, WA

² also with the Department of Earth and Space Sciences, University of Washington

³ also with the Astrobiology Program, University of Washington

⁴ also with the Department of Chemistry, University of Washington

Earth scientists have an elephant in the attic, and although some of us have been mumbling to ourselves about it, we are saying very little in public. The elephant is the new Presidential vision for America's civil space program that envisages manned lunar missions within two decades and an eventual manned mission to Mars - the 'Moon-Mars' vision for short. This elephant is not just peacefully sleeping; it is actively carousing around up there, threatening to bring drastic changes to the house, changes that could threaten vital research avenues in the Earth sciences. Prior to any careful consideration of feasibility or unintended consequences, NASA has moved rapidly to restructure itself in response to the new vision. These changes run the risk of preempting much of the work of a current NRC panel assessing space-based needs for Earth science (1).

Implementation of the Moon-Mars program has been articulated in the 'Aldridge Commission Report' (2). It is an important read for all those interested in the future of the Earth sciences. Key elements are its recommendations that the entire civilian space program be focused on the Moon-Mars vision and that the United States commercialize as much space activity as possible, as fast as possible. The report states that:

"If it is determined that the inclusion of specific highly regarded science programs hampers the implementation of the vision, then such programs, along with their attendant budgets, should be transferred to another [non-NASA] government agency or organization that could capably implement them."

Does this mean the Earth sciences? It may. In one recommendation, the report urges that Congress provide "incentives for entrepreneurial investment in space" and "assure appropriate property rights for those who seek to develop space resources and infrastructure". On a recent visit to the University of Washington, Commission member Neal deGrasse Tyson, an advocate for the Moon-Mars vision, explained what this means - that NASA should quickly divest itself of low Earth orbit responsibilities and turn them over to other entities. Since most space activities of the Earth sciences are accomplished from low Earth orbit, since little of this has non-taxpayer-funded commercial potential, and since NOAA and other agencies are not currently structured to take on NASA's role in the Earth sciences, this could have severe consequences for our community. Tyson

acknowledged that restructuring would entail 'losers' as well as 'winners' and he listed two 'losers': the 'Beyond Einstein' missions and Earth sciences. Most significantly, NASA's response has included restructuring its headquarters organization to eliminate visible responsibility for all of Earth science except 'Sun-Earth Connections'. As far as we are aware, there is no plan to transfer NASA Earth science research groups or their facilities to agencies such as NOAA. Such a plan would be difficult and expensive. Lacking such provisions, the current trajectory appears to entail substantial loss of Earth science research capability.

The prospect of returning humans to the Moon and eventually sending them to Mars is exciting. Mars intrigues us too. Two of us conduct research dealing with that planet; one has done so for more than 40 years. But we believe that such a program should not be carried out at the expense of research that is vital to the well-being of humankind. NASA's Earth science observations are a service to humanity that provides crucial knowledge of life on Earth, the air we breathe, and the environment we inhabit. The list of achievements is long. NASA Earth science has been essential for characterizing the 'ozone hole', for revealing its causal mechanisms, and for tracking the atmosphere's response to international policies limiting the production of ozone-destroying halocarbons. Continued Earth observation is essential if we are to understand the changing radiation budget of the planet, the mass balance of the Greenland and Antarctic icecaps, and the accumulation of heat in the oceans in response to elevated levels of greenhouse gases (3). It is critical for evaluating changes in forest, crop, and fresh water resources and, more generally, in the biological productivity of the land and oceans, with its attendant effects on the global carbon budget. It is vital for improved knowledge of industrial and biomass-burning aerosols, a major source of uncertainty in climate forcing and a potential driver of changes to the hydrological cycle. In general, a sustained and innovative program of space-based observations is crucial for discovering both man-made and natural changes to our planet.

How should our community respond to this elephant in its attic? Very likely there are a wide range of opinions about whether manned missions to the Moon and Mars should be carried out, about whether the program outlined by the President and the Aldridge Commission is a promising way to do it, and even about whether NASA requires a manned component to sustain public interest, as is so often asserted. But we can agree that the Earth sciences provides information of great importance to the public and to policy makers, that observations and activities generated by the space program - and by NASA in particular - are vital to progress in many of our fields, and that continued progress need not and should not be undercut as part of an effort to improve extraterrestrial exploration.

As the leading professional organization for Earth scientists, AGU ought to engage this issue. It should develop a position that articulates the importance of sustaining a strong space-borne Earth science program while taking account of the diverse views of the community. So far few have been willing to take public stances that criticize the President's vision. Nobel Laureate Steven Weinberg (4) and the American Physical Society (APS) (5) are exceptions, but they considered only potential impacts on

space physics and astronomy. The impact on Earth sciences is likely to be much greater. After appropriate consideration, the AGU should issue its own recommendations, with a focus on our own issues.

Maybe it's time we spoke up about the elephant in our attic.

References:

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(3) Weinberg, S. (2004) *The wrong stuff*. New York Review of Books, 51, no. 6, available at www.nybooks.com/articles/17011.

(4) American Physical Society Panel on Public Affairs (2004). *The Moon-Mars Program*, November, 2004. <http://www.aps.org/publicaffairs>.