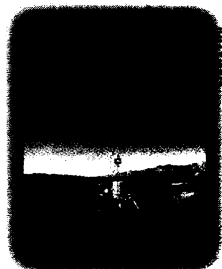


LETTERS

Small but significant

National Research Council reports on NASA's "new philosophy" about small planetary missions (such as Mars Pathfinder, right) are discussed. The University of North Dakota credits generous donations from corporations with "significantly" reducing "research and teaching downtime" after damaging Red River flooding in April 1997. And ecologists debate how to discover "novel patterns in natural ecosystems" in island area studies.



Small NASA Missions

Andrew Lawler's article "Small missions lift planetary science" (News & Comment, 12 Sept., p. 1596) highlights the ongoing transformation in the exploration by the National Aeronautics and Space Administration (NASA) of the solar system: a steady stream of relatively small, focused flights (for example, the successful Mars Pathfinder and the soon-to-be-launched Lunar Prospector) is replacing the infrequent multibillion-dollar, comprehensive missions (Galileo, now observing Jupiter and its retinue of moons, and Cassini, launched to Saturn) that NASA used to fly. The introduction of these "smaller, cheaper, faster" missions has reinvigorated a stagnant field.

Three recent National Research Council (NRC) reports (1) agree with Lawler's analysis that NASA's new philosophy brings many advantages. For small planetary missions to fulfill their promise, however, certain guidelines must be met. Each mission should be proposed as an integrated package led by a principal investigator and should be selected through open competition; this is not being done in NASA's New Millennium Program, nor in its Mars Surveyor Program. Moreover, NASA should impose minimal restrictions on the mission design. Last, NASA's past practices must change to eliminate unnecessary oversight and review.

Long-term scientific objectives will only be fully achieved if sufficient funds are made available for spacecraft operations and for the full analysis of the data returned by these missions. In the past, mission concepts have been gestated by judicious funding from NASA's Research and Analysis (R&A) program; yet R&A funding has declined consistently over the last few years. In addition, streamlined missions necessarily trade higher risk of failure for lower cost and faster schedules; yet it is far from clear whether NASA's aversion to risk has lessened.

Finally, a responsive program for planetary exploration will require a mix of mission sizes ranging from comprehensive missions with multiple objectives to small missions with highly constrained scientific goals (2). The jury is still out on whether small missions will return as much knowledge, both scientific and technological, per dollar as have the flagship missions of the past.

Joseph A. Burns*

Department of Astronomy, Cornell University,
Ithaca, NY 14853, USA
E-mail: jab116@cornell.edu

David Smith

Study Director, Committee
on Planetary and Lunar Exploration,
National Research Council,
Washington, DC 20418, USA
E-mail: dhsmith@nas.edu

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2. *An Integrated Strategy for the Planetary Sciences: 1995-2010* (National Academy Press, Washington, DC, 1994).

*Former chair, National Research Council's Committee on Planetary and Lunar Exploration.

Corporate Philanthropy

The University of North Dakota in Grand Forks sustained significant damage to lower levels of many buildings during the flooding of the upper Red River valley in April 1997. In addition to direct damage by water, electrical service was disrupted for an extended period, which threatened the storage of biomedical and research materials housed in the university's School of Medicine. Although this building was served by an emergency generator, a shortage of diesel fuel required that electricity be supplied for 3 hours "on" and 3 hours "off" during several days before community-supplied power was restored. This practice was sufficient to save most

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items stored in -70°C freezers, but the cycling did not maintain desired temperatures in -20°C freezers or in refrigerators. Also, for a time the building was inaccessible or could not be entered except by maintenance personnel, and so stored items could not be moved (and there was essentially nowhere in town to move them to, in any case). The result was that five floors of research laboratories lost numerous heat-labile enzymes and other reagents because they did not survive the temperature fluctuations.

After the flooding, four companies offered significant levels of aid to researchers in Grand Forks. First, Stratagene rapidly contacted departments in the School of Medicine and offered to resupply, gratis, all enzymes and reagents that were lost by our laboratories as a result of the flood, regardless of their original commercial source. This saved a huge amount of time and funding for several laboratories, including my own and three others in my department. In addition, Stratagene made available to us additional materials and equipment at a large discount. Boehringer Mannheim Biochemicals resupplied several laboratories with reagents, also at a huge discount, and Glaxo Wellcome sent many items of equipment to either replace or enhance specific research capabilities damaged during the flooding. Finally,

Beckman Instruments donated to the Department of Microbiology and to the Department of Biochemistry several microcentrifuges, clinical centrifuges, pH meters, and spectrophotometers to equip the undergraduate and medical teaching laboratories that had been destroyed.

The actions of these companies significantly reduced our research and teaching downtime during a period when all of us were occupied with conflicting demands in reconstructing our community and our personal, professional, and teaching lives. Each company approached us unasked, and deserves our public thanks for their generosity.

Kevin D. Young

Thomas Hill

Ann Flower

Francis Sailer

*Department of Microbiology and Immunology,
University of North Dakota
School of Medicine,
Grand Forks, ND, USA*



Biodiversity and Ecosystem Properties

Because the goal of ecology is to understand the causes of patterns observed in

the natural world, studies that document novel patterns in natural ecosystems are of central importance. The report "The influence of island area on ecosystem properties" by David A. Wardle *et al.* (29 Aug., p. 1296) is such a study. Some interpretations of data made by Wardle *et al.* illustrate the difficulty of ascribing causation on the basis of observation. In particular, their assertions "that ecosystem process rates were lowest on those islands with the greatest diversity" and that "this finding is in direct contrast to other studies which have shown elevated process rates in more diverse communities" are difficult to justify given their analyses and the data in the other studies (1-4).

In the archipelago studied by Wardle *et al.*, the variables of island size, fire frequency, successional state, and species composition were strongly interdependent. Compared with larger islands, smaller islands were found to have lower fire frequencies, higher plant diversity, and species compositions biased toward later successional species. Because of these interdependencies, correlations between any one of these variables and any of the ecosystem response variables may lead one to spurious conclusions. Multiple regressions, or other multivariate techniques, would be needed to determine if the data

"These columns add just the right spin to my lab work: they get it done so that I can have fun," says Marc Awobuluyi, a molecular neurobiologist living and working in Boston, Massachusetts, USA.

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a biomolecule with
a single **Trap**ep

(The answer is
in the question, Marc)