

Building on failed planetary missions

The apparent failure of a Mars probe underscores NASA's difficulties in pursuing planetary exploration. Planetary scientists must be allowed to build a credible programme of missions on the bedrock of continuing public support.

The likely fate of the Mars Polar Lander, coming on top of September's loss of the Mars Climate Orbiter, again calls into question the 'better, faster, cheaper' approach to planetary missions that the US space agency NASA has embraced under the leadership of its director, Dan Goldin (see page 565, and *Nature* **402**, 217; 1999). It also highlights the formidable technical challenges that confront attempts to probe the red planet. There have been a few successes—notably the Vikings of the 1970s, Mars Pathfinder in 1997 and the highly productive Mars Global Surveyor now in Martian orbit—but many more failures.

As another window of opportunity to fly to Mars passes without success, it may be time for NASA and the community to go back to first principles. The space agency needs to determine what must be done to meet our scientific objectives on Mars and other bodies in the Solar System, and to realistically assess how much they will cost to address.

Such an assessment may well point towards unmanned missions of greater technical sophistication—and therefore cost—than the craft that have been lost this year. For such missions to come to fruition, public opinion must be mobilized in their favour. Given the amount of attention the Polar Lander has attracted in the past week or two, that may be less daunting a challenge than it seems.

A large segment of the US public is highly motivated by the Mars missions in particular and by space exploration, manned or unmanned, in general. Most members of this group believe that it falls naturally on the US government to sponsor the exploration of the space frontier, and are happy, within reason, to pay taxes to that end.

Another sector of the public views space exploration with

apathy and even some hostility, regarding it as an extravagance irrelevant to the problems of their everyday lives. This point of view has been expanding in its reach since the end of the Apollo programme, and certainly won new adherents after the Challenger disaster in 1986. Some fear that this year's Martian mishaps will alienate even more people from the space programme. But no one has died, not much money has been spent, and there is no need for that to happen.

Advocates of a vigorous US space science programme, even if outnumbered by the apathetic and the downright antagonistic, can still have their way if they are sufficiently determined. Supporters of America's role in exploring the cosmos need to point out the obvious, budget-driven weaknesses of NASA's recent missions. The Polar Lander, for example, was built so cheaply that it lacks basic diagnostic and telemetry systems with which to pass on clues about its fate.

Proponents need to cultivate and build upon the enthusiasm of many ordinary Americans for planetary science, and they need to find articulate champions in the political arena. A prevalent theme of the current US presidential election campaign is that, after eight years of unprecedented economic success accompanied by a sense of gnawing unease about America's national purpose, voters want inspired leadership. This sentiment is being effectively tapped by the insurgent campaigns of Senator John McCain and former Senator Bill Bradley. A candidate who wants to enhance America's sense of itself could do worse than come out in support of planetary science and unmanned space exploration, pledging not to flinch from the challenge posed by the lost missions to Mars. ■

Wise progress with embryos

New guidelines should reduce the scale of ethical dilemmas in embryo research.

Given the ethical arguments that revolve around the status of the embryo, getting consensus on whether human embryo research should be allowed is impossible. Even the major religions disagree. The Roman Catholic Church states that an embryo is a person from conception, Judaism from 40 days, while Protestant churches say that it is neither a person nor a simple object. German law mirrors the Roman Catholic position and has a total ban. French law requires 'respect' for the embryo from conception, but gives legal rights only at birth; it has a *de facto* ban. Britain, Canada and Australia not only authorize embryo research, but allow embryos to be deliberately created for research purposes. So does the United States, where an absurd situation exists in which almost anything goes in the private sector, while Congress bans the use of federal funds for any such research.

The therapeutic promise of human embryonic stem cells—a new era in transplantation and cell therapy will surely emerge from their ability to divide indefinitely and differentiate into all sorts of human

tissues—obliges countries to revisit the issue of human embryo research. It has already prompted France's Conseil d'Etat, a sort of Supreme Court, and the US National Institutes of Health to do so. Both have arrived at the same conclusion: that such research should be restricted to embryos left over from *in vitro* fertilization that would be destroyed anyway (see page 565).

That is a wise and pragmatic position. Whatever one feels about the destruction of a human embryo, there is a major difference between creating embryos deliberately for research and doing research on embryos destined to be destroyed in any case. The two national bodies have usefully reduced the scale of the ethical dilemma. Moreover, which of the following is morally better, to allow spare embryos to be destroyed or to use them for research that could benefit the seriously ill? Ironically, embryo research generally, by improving the efficiency of *in vitro* fertilization and thus reducing the production of spare embryos, could avoid a future ethical dilemma posed by millions of embryos languishing in cryopreservation worldwide. ■