

43 BY THE NUMBERS

A look at George W. Bush's legacy in science.

Although a president's influence extends only so far in determining the United States' research agenda, most if not all areas of science and environmental management feel some impact. In the eight years since he became the United States' 43rd president, George W. Bush has supported major increases in portions of the federal research budget, but he has also attracted

serious criticism for some environmental policies and the degree to which policy decisions in his administration have been informed — or not — by the best available science. A full appreciation of his policies' impacts on a given field may take years. However, the raw data available now lend some insights as to what history is likely to judge as high and low points of the Bush administration's scientific legacy.



J. SOHIM/VISIONSOFAMERICA/GETTY IMAGES

ALTERNATIVE ENERGY

The Bush years saw significant increases in energy production from such alternatives as wind, solar and biomass, driven in large part by skyrocketing oil and natural-gas prices. The Bush administration supported incentives to encourage continued expansion through tax credits and other approaches, but no provisions for permanent incentives were established. Total US renewable-energy production — which is dominated by hydropower and biomass — remains less than 7% of the country's overall energy consumption.

Increase in total installed capacity for wind, solar, geothermal, hydroelectric, wood and waste power generation during the administration of Bill Clinton (1993–2001): 3.07%

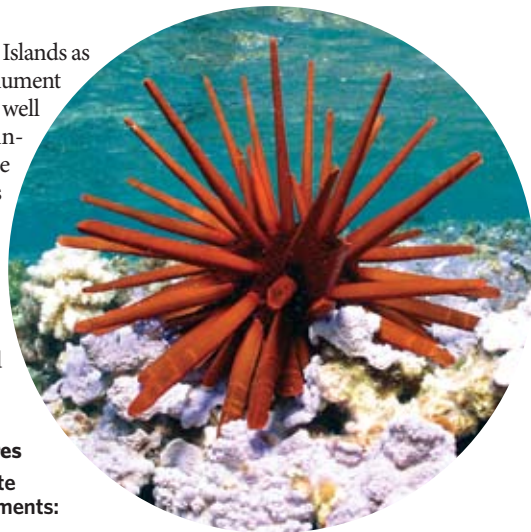
Increase during the current Bush administration, to 2007: 12.5%

MARINE RESERVES

In 2006 Bush declared the Northwest Hawaiian Islands as the Papahānaumokuākea Marine National Monument — the culmination of a long process that began well before he took office. On 6 January, the administration declared three additional, massive marine national monuments in remote areas of the Pacific that include coral reefs around several uninhabited islands and the Mariana Trench. No president has ever protected more ocean area, but the value of the protections will be largely determined by the extent to which the areas are ultimately managed and policed under future administrations.

Area of the Papahānaumokuākea Marine National Monument: 362,072 square kilometres

Area of the new Mariana Islands, Pacific Remote Islands, and Rose Atoll Marine National Monuments: 505,773 square kilometres



E. VUCCI/AP

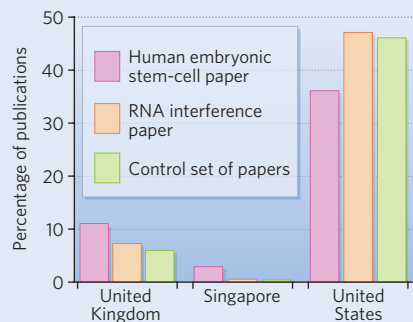
J. D. WATT, TRUST

STEM CELLS

Academics have struggled to quantify the detrimental effects of Bush's decision in 2001 to restrict federal funding for research on human embryonic stem cells to those lines in existence at the time. Aaron Levine, a public-policy professor at the Georgia Institute of Technology in Atlanta, recently studied the stem-cell research contributions of various countries. His work suggests that, relative to other similar research areas such as RNA interference, the US contribution to the field is deficient. Perhaps not surprisingly, all five countries showing the highest performance rates in the field — Singapore, the United Kingdom, Israel, China and Australia — permit the creation of new embryonic stem-cell lines.

FALLING BEHIND

Percentage of publications with the corresponding author from a given country, as measured by citations of key initial biomedical papers (1998–2006).



SOURCE: A. LEVINE



NASA

SPACE

As part of his new 'Vision for Space Exploration', Bush announced in 2004 that the United States would send humans back to the Moon by 2020. The resulting surge in US lunar interest and activities, combined with a cadre of Moon probes launched by other countries such as China, Japan and India, mean that the coming years will see a massive flood of Moon-related data to analyse.

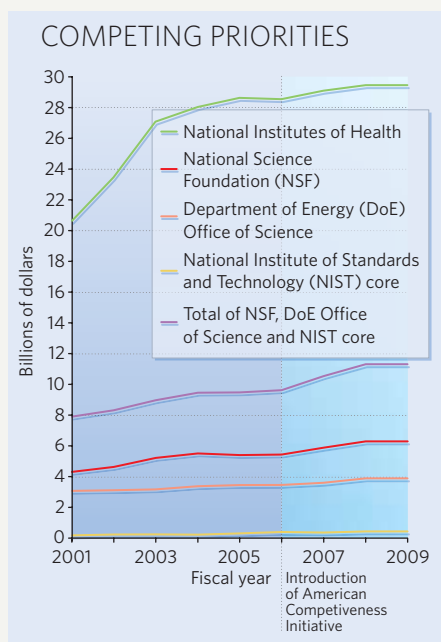
The Lunar Reconnaissance Orbiter (LRO; above) and the Lunar Crater Observation and Sensing Satellite (LCROSS) are slated to launch

RESEARCH FUNDING

For the first few years of his administration, despite tight budgets and calls to expand into other research areas, Bush continued the substantial funding increases at the National Institutes of Health (NIH) that were begun under Clinton. By 2005, the NIH budget had levelled off, and the past few years have seen flat to negative funding once biomedical inflation is accounted for.

In 2006, Bush kicked off a focus on physical-sciences research by announcing the American Competitiveness Initiative. Among other goals, this aimed to double by 2016 the budgets for the National Science Foundation (NSF), the Department of Energy (DoE) Office of Science, and core funding for the National Institute of Standards and Technology. But whereas the president's proposed budgets each year were on track towards doubling, the budgets enacted by Congress have fallen well short of this mark for the NSF and the DoE.

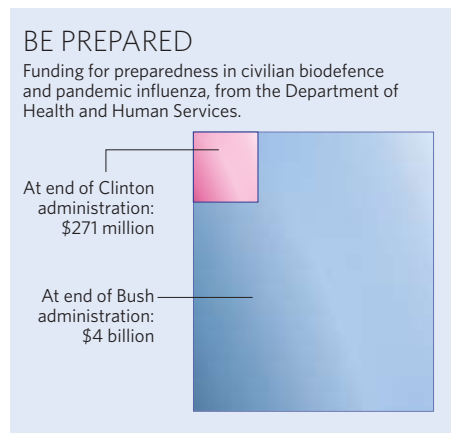
The fate of all agency budgets will remain unclear until the new president makes his annual budget request in early February.



BIOSECURITY

One clear result of the 9/11 terrorist attacks was an increased focus on potential means of terrorism and a drastically heightened interest in research aimed at preventing and responding to attacks. From 2001 onwards there were huge increases in funding for civilian biodefence programmes (see chart below), although many of those also serve broader purposes in preparing for infectious-disease outbreaks or other disaster scenarios.

Even so, experts in the field say additional money is needed to address key needs such as development of medical countermeasures for attacks. A recent report on terrorism threats — *World at Risk*, put out by the bipartisan Commission on the Prevention of Weapons of Mass Destruction Proliferation and Terrorism — concluded that a biological attack is likely somewhere in the world in the next five years.



together in late April. LRO will characterize the Moon's surface from orbit with an eye to finding safe landing and base sites for future astronauts; LCROSS will send two impactors plummeting to the surface to hunt for water ice in the shadowy craters near the lunar poles. Whether the larger vision of returning to the Moon is sustained depends on how Barack Obama crafts his space policy — an unknown at this time.

Number of US missions under development for lunar research, in 2001: 0

Number in 2008: 2

ENDANGERED SPECIES

Endangered-species listings slowed to a trickle during the Bush administration; critics have blamed an increase in bureaucratic hurdles and a failure at times to act according to scientists' recommendations. Officials say the decrease is due largely to litigation that forced the Fish and Wildlife Service to focus most available funding and energy on completing critical habitat designations — which did increase dramatically — for previously listed species. Having addressed much of this backlog, the agency says that more than 50 endangered-species listings are in the works for 2009.

Average number of endangered species listed per year:

Clinton administration: 65

Bush administration: 8



The endangered Santa Catalina Island fox

B. MOOSE PETERSON/ARDEA

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Reported by Mark Schrope, a freelance writer in Florida.

See Editorial, page 235.