

astronauts to the station, is potentially on the chopping block.

NASA critics can rightly point out that the benefits of human space flight are fuzzy, especially when it comes to the science. The returns are occasionally bountiful, as with the astronauts' recent repair of the Hubble Space Telescope. But for the most part they are incidental and hugely expensive.

NASA-funded space scientists might be excused for feeling a bit smug. Their robotic science missions to Mars and elsewhere are orders of magnitude more cost-effective. And their budgets remain relatively protected from the turmoil engulfing the debate on human space flight — as they should be. Indeed, Obama's budget proposals bolster NASA's Earth-observation programme, where some of the most pressing knowledge is to be gained.

Like it or not, however, scientists do have a stake in the human space-flight debate. The rockets and the technology developed to take astronauts beyond Earth orbit could also make it possible to

mount much more ambitious robotic missions. And perhaps even more important, the sight of humans travelling beyond Earth has an undeniable power to inspire future generations of space scientists (see *Nature* **460**, 314–315; 2009). This link should not be surprising: both endeavours are animated by the same spirit of exploration.

True, sending astronauts beyond low Earth orbit is never going to be cheap. But adequately funding the 2004 exploration vision would not require money on the scale of the Manhattan Project, or even the Apollo programme. A boost of a few billion dollars a year — perhaps 15% of NASA's \$17.6-billion total budget — would allow the agency to pursue a long-term programme of heavy-lift rockets that could go to the Moon, or other deep-space locales.

If Obama is not willing to support such a plan, then he and the American public should stop pretending that they are in favour of human space exploration. Because maintaining the space station is not exploration. It is a commute. ■

Overrated ratings

Criteria for 'green buildings' need to make energy performance a priority — as do universities.

The American College and University Presidents' Climate Commitment, a pledge by some 650 US institutions of higher education to eventually make their campuses carbon neutral (see page 154), is an effort that should be encouraged and expanded. Buildings account for an estimated 45% of the world's total energy consumption and a similar share of its greenhouse-gas emissions; the classrooms, laboratories and other structures in US universities collectively generate some 42 million tonnes of carbon dioxide per year.

However, one emissions-reduction mechanism endorsed by the commitment deserves a more sceptical look than it often gets. This is a requirement that all new campus structures aim for certification under the Leadership in Energy and Environmental Design (LEED) rating scheme developed by the US Green Building Council (USGBC).

LEED is the best known of several internationally recognized rankings for environmentally conscious design. Launched in 1998, it now encompasses 14,000 projects in the United States and 30 other countries. Yet, as is well known in the building research community but not outside it, neither LEED nor any other such rating is a reliable guide to energy performance. Labelled buildings often perform no better in energy terms than the general building stock, and sometimes worse.

One reason is that the energy performance is not the only measure used in the ratings. LEED, for example, also awards greenness points for the choice of a site that protects the environment and wildlife; the use of sustainable, environmentally friendly materials; water and waste management; and indoor air quality. Another reason is that most ratings assess a building's energy performance using theoretical projections from engineers' models, but don't measure its real, post-occupancy performance, which often can be much poorer.

Issues of indoor environmental quality and sustainability are important. But given the urgency of addressing climate change —

plus the fact that a high green-building rating is often taken to be an energy certification, even when it is not — the schemes should give energy performance considerably more priority than they have to date (see *Nature* **452**, 520–523; 2008).

In April, the USGBC took a welcome step in that direction, releasing a revised version of its scoring system that gives energy performance more weight. And this month it announced an equally welcome initiative to collect post-occupancy data, while carrying out research with academic partners to better compare these data with predicted performances. This is an area that, like most green-building research, has been abysmally underfunded in the past.

If universities wish to set an example in climate-change efforts, they too must place greater emphasis on building-energy performance.

One way to accomplish this would be to supplement green-building ratings, such as LEED, with dedicated energy-performance ratings, such as the Swiss Minergie standard, which focuses exclusively on the bottom line: a building's annual energy consumption per square metre.

By setting higher standards than local government regulations, voluntary rating systems such as LEED have undeniably raised public awareness of sustainable building practices, and have stimulated the adoption of those practices across the building profession. Despite this, progress in reducing the energy consumption of buildings remains negligible compared with its huge potential for reducing global CO₂ emissions.

Likewise, the US colleges and universities that have signed up to the climate commitment have done the right thing by setting their own energy performance bar high enough to inspire other organizations, and to help stimulate broader change across the economy. But, as former US president Bill Clinton said last month at a summit meeting of the commitment in Chicago, Illinois: "For all the good we're doing, we're just piddling compared to what we ought to be doing, and compared to what we could be doing." ■

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