and on how to handle and correct errors. In future, IPCC authors will use consistent terminology to qualitatively describe uncertainties, and will cross-check more thoroughly the authenticity and robustness of data and information taken from 'grey literature' that has not been peer reviewed.

Most climate scientists say that errors in the assessment report — such as the notorious statement that all Himalayan glaciers could melt by 2035 — do not undermine the scientific case that human activity is dangerously warming the planet. But such errors must be corrected quickly and transparently to preserve the IPCC's credibility, the IAC said, and climate scientists agree. "Making the treatment of uncertainty more consistent is very important, and that task is very well on its way," says Gabriele Hegerl, a climate modeller at the University of Edinburgh, UK.

The IAC also proposed more far-reaching changes to the IPCC's management structure to streamline its decision-making. But delegates postponed any action pending the outcome of further investigation by several newly established task groups. By January 2011, these groups will propose options for improving the IPCC's management structures, review procedures, communication strategies and conflict-of-interest policies. The IPCC will decide how to implement these at its next plenary session, to be held in May 2011 in Abu Dhabi.

Several scientists lamented the slow pace of reform. "I think the IPCC needs to go further to restore its credibility with the public, policymakers and other scientists," says Judith Curry, a climate researcher at the Georgia Institute of Technology in Atlanta. She adds that the organization needs to undergo "continued self-reflection on how to ensure the highest quality assessments and that the entire process is transparent and free from conflicts of interest".

Michael Zürn, an expert on transnational conflicts and international institutions at the Social Science Research Center Berlin (WZB), thinks that the IPCC has more fundamental problems that the reforms will not address. The IPCC is more than a loose alliance of scientists tasked by the United Nations with assessing our knowledge of climate change — its work also has a political dimension, he says.

But, Zürn adds, the 'soft' political authority that the international community has bestowed on the IPCC can all too easily clash with national interests, particularly because the IPCC's legitimacy is based on expertise rather than on a democratic mandate.

Pachauri, however, is optimistic about the future. The IPCC, he says, is well-prepared to march ahead towards producing a fifth assessment report by the end of 2014. "Despite all the noise we have not wasted a single minute to do what the world expects us to do," he told *Nature*. "I, for one, never lack the physical and mental energy that is required for the job." ■

PTB

The silicon-28 sphere is the latest contender in a long weighting game.

METROLOGY

Elemental shift for kilo

A precise atom count could usurp antique mass standard.

BY GEOFF BRUMFIEL

The kilogram is a massive headache for scientists. It is officially defined as the mass of a 122-year-old cylinder of platinum and iridium, kept at the International Bureau of Weights and Measures (BIPM) in Paris. Yet the cylinder's mass seems to be changing as it ages, prompting several groups of scientists to seek a replacement. They hope to define the kilogram by referring to a physical constant rather than an antique object.

The latest result from a team led by Peter Becker of the Federal Institute of Physical and Technical Affairs (PTB) in Braunschweig, Germany, published on arXiv (P. Andreas *et al.* Preprint at http://arxiv.org/abs/1010.2317; 2010), comes closer than ever to ending the cylinder's reign. The team has measured the number of atoms in a sphere of silicon-28 to calculate Avogadro's constant to nine significant figures: $6.02214084(18) \times 10^{23}\ \mathrm{mol}^{-1}$. The constant refers to the number of atoms in a sample whose bulk mass in grams equals the relative atomic mass of the element. This general relationship makes Avogadro's constant a fixed point from which to define mass.

The big challenge was making the silicon sphere. In an ordinary sample of silicon, 92% of the atoms are silicon-28; the remainder are a mix of silicon-29 and silicon-30. To weed out those heavier isotopes and other stray atoms, Becker's team turned to the Central Design Bureau for Machine Building in St Petersburg, Russia, which enriches uranium for nuclear power plants. The bureau's gas centrifuges purified silicon-28 to 99.99%, which Becker's team used to grow a 5kg crystal that could be fashioned into two near-perfect spheres.

Using laser interferometery, the team mapped each sphere's surface to measure its volume, and used X-ray diffraction to image its crystal structure. Calculating the volume taken up by each atom of silicon allowed them to work out how many atoms were in the whole sphere, and derive Avogadro's constant with a relative uncertainty of 3.0×10^{-8}. That uncertainty must fall below 2.0×10^{-8} before the International Committee for Weights and Measures will consider redefining the kilogram, says Richard Davis, who heads the BIPM's mass department.

The measurement will also need to match other efforts. The main rival relies on a watt balance, which measures the mass of a test cylinder by suspending it using a combination of electrical currents and magnetic fields. The results can be used to define the kilogram in terms of the Planck constant that relates the frequency of a particle's wavefunction to its energy. But the two methods produce slightly different values for the kilogram. Becker says he hopes refining the current measurements of the spheres can reduce the uncertainty. "We need a couple of years, but we can see the end of the tunnel," he says. ■