

Conference Call

a plenary lecture by Professor Richard Evans (CSIRO, Australia), who shined a light on polymer research in Australia, celebrating Australian plastic money, plastic lenses, contact lenses, and other achievements of polymer research.

The conference concluded with a dinner, which was held in a picturesque setting at the Bonville Golf Course. The presentation of the RACI Polymer Division awards was part of the dinner. The Sangster Polymer Science and Technology Award, which is given to an outstanding polymer scientist under the age of 40, was awarded to Professor Michelle Coote from the Australian National University in Canberra. The 32nd APS was also the occasion of the inaugural presentation of the Bruce Guise Award. Bruce Guise, an outstanding industrial polymer scientist, dedicated his life not only to his research but also to the polymer community in Australia. Huan Toh from Carl Zeiss (former Sola) was the first recipient of this award, for his contribution to the development of plastic lenses. Traditionally, the APS awards the Trelor Prize for the best student oral and poster presentation. John Moraes (Sydney University) and Vien T. Huynh (University of New South Wales) received the Trelor Prize for best oral and best poster presentation, respectively.

Finally, the Australian Polymer Community had a small, surprise award to bestow. Occasionally, an award is given to an eminent international scientist who has supported the Australian Polymer Community over an extended period of time. This award was given to Professor Christopher Bowman from the University of Colorado, who has had various research collaborations with different Australian researchers over many years. He has frequently visited Australia and also attended many Australian Polymer Symposia, often together with his research group.

At the conclusion of the conference, the chair, Martina Stenzel, introduced Sebastien Perrier, who will be the chair of the 33rd Australasian Polymer Symposium <www.33aps.org.au/2012>.

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The New SI: Units of Measurement Based on Fundamental Constants

by Ian Mills

On 24 and 25 January 2011 a discussion meeting was held at the Royal Society of London. It was prompted by the upcoming presentation by the International Committee on Weights and Measures (CIPM) of a significant revision to the way in which the International System of Units, or SI, is defined and presented, for discussion and approval by the General Council on Weights and Measures (CGPM) at its meeting in Paris in October 2011.¹ The General Council is the controlling body for the approval of any changes to the SI. The Royal Society meeting was held to bring attention to these plans for revision so that they can be widely discussed before the General Council meets.

The proposed changes to the SI are prompted by the need to adopt a new definition for the kilogram, which has been under discussion for many years. This need arises from our knowledge that the International Prototype of the Kilogram (kept in a safe at the Bureau International des Poids et Mesures at Sèvres), which is the present definition of the kilogram, is slowly changing in mass. The change is on the order of 50 micrograms or more over the last century; the change is not known exactly, although it is two orders of magnitude larger than the uncertainty with which kilogram masses may be compared. We do not even know whether it is getting heavier or lighter, because we have no absolute reference with which to compare it. The change is believed to be due to surface chemistry, wear and tear, and possibly gas leaching out of the platinum-iridium prototype trapped within it when it was cast.

The recommendation from CIPM is to adopt new definitions for four of the base units of the SI, relating them to the fundamental constants of physics. It is proposed that the kilogram, ampere, kelvin, and mole should be referenced to fixed numerical values of the Planck constant h , elementary charge e , Boltzmann constant k , and Avogadro constant N_A , respectively (just as the metre was redefined in 1983, referenced to a fixed numerical value of the speed of light in vacuum). The new definitions would be adjusted to preserve continuity with the previous definitions of

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In this Sep.-Oct. 2005 CI cover, master optician Achim Leistner checks on an Avogadro's sphere. Such a perfectly spherical single crystal of silicon is needed for the X-ray crystal density experiment relevant to one of the proposed alternative definitions of the kilogram. (Image courtesy of CSIRO Industrial Physics, Lindfield NSW, Australia.)

the units. It is also proposed that the entire SI be presented in a revised format. This will be the most significant revision to the SI since it was established.

If the General Council approves these plans it is still likely to be several more years before the proposed changes are actually adopted, because new experimental results on the value of the Planck constant to be used in the definition are expected in the near future from watt balance and silicon crystal density experiments currently in progress.

At the Royal Society meeting there were 16 presentations from leaders in the field of metrology, including three Nobel Prize winners, followed by vigorous discussion from the 200 or so participants, who came from many different countries. The presentations covered both the underlying theoretical physics involved as well as recent experimental developments in the watt balance, the X-ray crystal density experiment using a silicon 28 sphere, new measurements of the Boltzmann constant, the use of ultra-cold atoms in precise time measurements, radiometric measure-

ments from space, and units for biological quantities. There were also fascinating discussions of the history of our developing units of measurement.

Of particular interest to chemists was a paper on the Avogadro constant, and the proposal for a new definition of the mole in terms of a fixed numerical value of N_A , which would fix the mole in terms of a fixed specified number of entities. All of the papers and the discussion at the meeting will be published later this year in a special issue of the *Philosophical Transactions of the Royal Society* devoted to a report of the meeting.

References

1. See BIPM 2010, Resolution A for the CGPM, *On the Possible Future Revision of the International System of Units, the SI*. Available on the website of the BIPM <www.bipm.org/utis/common/pdf/24_CGPM_Convocation_Draft_Resolution_A.pdf>. See also <www.bipm.org/cc/CCU/Allowed/20/Watermark_SI_Brochure_Draft_Ch2_29Sep10.pdf>.

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The proposal template has recently been rearranged so that it presents "up front" the project's intended impact (purpose), the intended stakeholders and beneficiaries, the dissemination plan, and how the effectiveness of that plan can be evaluated.

The revised form and guidelines are available at http://media.iupac.org/projects/form_guide.html.