

## Measuring up

(October 2006)

In everyday life, many decisions are based on measurements which are usually presumed to be sufficiently accurate for their particular purpose. However, taking precise measurements is an expertise in its own right, and needs to be carried out in such a way that everyone can have full confidence in the results.

The October 2006 issue of *ISO Focus* looks at the importance and broad scope of standards related to measurements that impact our daily lives. It examines precision data in testing and calibration laboratories, guides for uncertainties of measurement and proficiency testing, quantities and units, and more.

In an exclusive interview, **Andrew Wallard**, Director of the BIPM (The International Bureau of Weights and Measures), explains why worldwide uniformity of measurements and their traceability to the International System of Units (SI) contribute towards reducing technical barriers to trade, while providing a secure base for scientific and other measurements throughout society.



## Andrew Wallard

**A**ndrew Wallard has been the **Director of the International Bureau of Weights and Measures (Bureau International des Poids et Mesures – BIPM)** in Sèvres, France since January 2004.

He has a first degree and PhD in physics from St Andrews University, Scotland, and was a laser physicist at the UK's National Physical Laboratory (NPL) until 1978. After that, he spent 12 years in various central government positions, including the Prime Minister's Cabinet Office, and the Department of Trade and Industry where he was a special advisor to various ministers.

He returned to the NPL in 1990 as Deputy Director and Chief Metrologist.

Andrew Wallard was a Vice President of the UK's Institute of Physics until 2005, is a Professor at the University of Wales and has been awarded several national and international honours for his contribution to measurement science and technology.

**ISO Focus:** Could you please update us briefly on BIPM and its membership?

**Andrew Wallard:** The Metre Convention was signed in Paris in 1875 by representatives of 17 nations. As a consequence, BIPM was created to establish a permanent organizational structure for member governments and to act in common accord on all matters



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**“Liaising with relevant technical ISO committees is very important to the BIPM and the national metrology institute community.”**

relating to units of measurement. BIPM provides the basis for a single, coherent system of measurements throughout the world, traceable to the International System of Units (SI). As of today, there are 51 member states of the Metre Convention, and 20 associate states and economies of the General Conference. This brings the BIPM into contact with over 160 metrology institutes worldwide.

BIPM is an intergovernmental organization with an international staff of over 70 and is located just outside Paris. The budget for 2006 is over EUR 10 million. BIPM's scientific work covers research and provision of international reference facilities in time and frequency, mass, electricity, chemistry and ionizing radiations, and is still the custodian of the international prototype kilogram.



**ISO Focus:** A common statement and declaration was made by BIPM, OIML and

ILAC on the relevance of various international agreements on metrology to trade, legislation and standardization. What is the aim of the statement? What do you hope it will achieve?

**Andrew Wallard:** The aim of the international measurement system is to create a framework which provides traceability to the SI and within which the results of measurements can be accepted everywhere without the need for further investigation. An important point about this system is that its use will help reduce technical barriers to trade and provide a secure base for scientific and other measurements throughout society. The common statement made by the BIPM, International Organization of Legal Metrology (OIML) and the International Laboratory Accred-

itation Cooperation (ILAC) ([http://www.bipm.org/en/convention/mou/bipm-oiml-ilac\\_joint\\_declaration.html](http://www.bipm.org/en/convention/mou/bipm-oiml-ilac_joint_declaration.html)) and a similar bilateral statement between the BIPM and ILAC ([http://www.bipm.org/en/cipm-mra/cipm-ilac\\_joint\\_statement.html](http://www.bipm.org/en/cipm-mra/cipm-ilac_joint_statement.html)) lay down the framework for the mutual underpinning of the importance of the roles of the three organizations. Each organization has of course its unique role, the BIPM as a scientific organization promoting the SI and ensuring that measurements are equivalent in different parts of the world, the OIML providing a similar service for legal metrology aspects, and the ILAC as a link between these two organizations and accreditation activities nationally and internationally.

The aim of the statements is to promote the system as a whole and to invite providers and users of measurements to endorse the system and, as a consequence, work towards worldwide consistency and unification of measurements.

**ISO Focus:** How do you see the complementarities between physical measurement standards and the technical standards of the type produced in ISO, which both contribute to the national and global “quality” infrastructure and network?

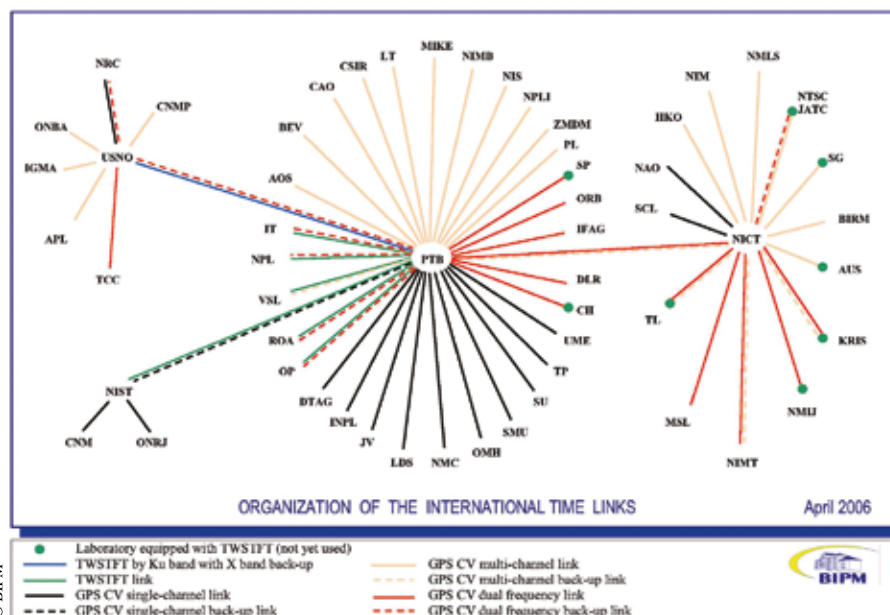
**Andrew Wallard:** The physical and chemical measurement standards of the international system of units (SI), which are used in the framework of the World Metrological System, are closely related to many International Standards, especially where the measurements need to demonstrate compliance and conformity to the SI. This helps to minimize technical barriers to trade, as it



The international prototype of the kilogramme.

**“Participation in the creation of a standard helps the BIPM to better promote it to its national metrology institutes.”**

Links of atomic clocks for the calculation of international atomic time by the BIPM.



can be shown that the standards in different countries are constructed and used in the same way, are henceforth equivalent and are traceable to the SI. The initiative of the BIPM led to the signature of the International Committee for Weights and Measures Mutual Recognition Arrangement by national metrology institutes from some 70 member states and associates. The calibration certificates issued by these signatories are now mutually acceptable at whatever level of uncertainty is required for the technical needs and interests of the countries concerned. The publication of the calibration measurement capabilities of these institutes on the BIPM Web site (<http://kcd.bipm.org>) allows accreditors and regulators to easily see the national metrology institutes peer reviewed measurement capabilities. This facilitates accreditation, helps to ensure consistency of measurements and diminishes technical barriers to trade.

**ISO Focus:** BIPM actively liaises with a number of ISO technical committees. How important is this collaboration – both to the BIPM and its members (the national metrology institutes) and to society at large? How do you see the collaboration evolving in the years to come, especially with ISO technical committees developing standards related to testing and analytical methods and with the ISO Committee on reference materials (ISO/REMCO)?

**ISO Focus:** How can the international community assist in improving the technical capacity of developing countries, in support of their economic and social progress? What should capacity-building assistance, in your view, be based on in our sphere, and what role do you see for collaboration between specialized international organizations, such as that we currently develop in the context of the Joint Committee on Coordination of

*Technical Assistance to Developing Countries in Metrology, Accreditation and Standardization (JCDCMAS)?*

**Andrew Wallard:** The BIPM is committed to the promotion of the combination of metrology, accreditation and standardization infrastructures. However, a very important point in helping developing countries to improve their technical capacity is training and capacity build up. This training can be achieved by specially arranged courses. Inviting developing countries to more general meetings at ISO or the BIPM allows them to learn more about the World Measurement System and how it functions. At the same time, it gives developing countries a possibility to explain to more established countries, and to the two organizations as a whole, their particular needs and concerns in the field of metrology. The BIPM actively promotes the contribution of developing countries to its work, especially through the regional metrology organizations, and finds



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Symbolized structure of the International System together with its base units.

*The Pavillon de Breteuil, offered by the French Government to the International Committee for the establishment of the Bureau International des Poids et Mesures (BIPM).*

**Andrew Wallard:** Liaising with relevant technical ISO committees is very important to the BIPM and the national metrology institute community. It allows us to be aware of ongoing changes to standards and be able to react to proposed changes before they are actually published. The BIPM can then give, on its own behalf and that of its member states, valuable guidance during the editing and discussion phases to make the standards fit for their purpose and can help strengthen and confirm the metrological content and language. At the same time, participation in the creation of a standard helps the BIPM to better promote it to its national metrology institutes.

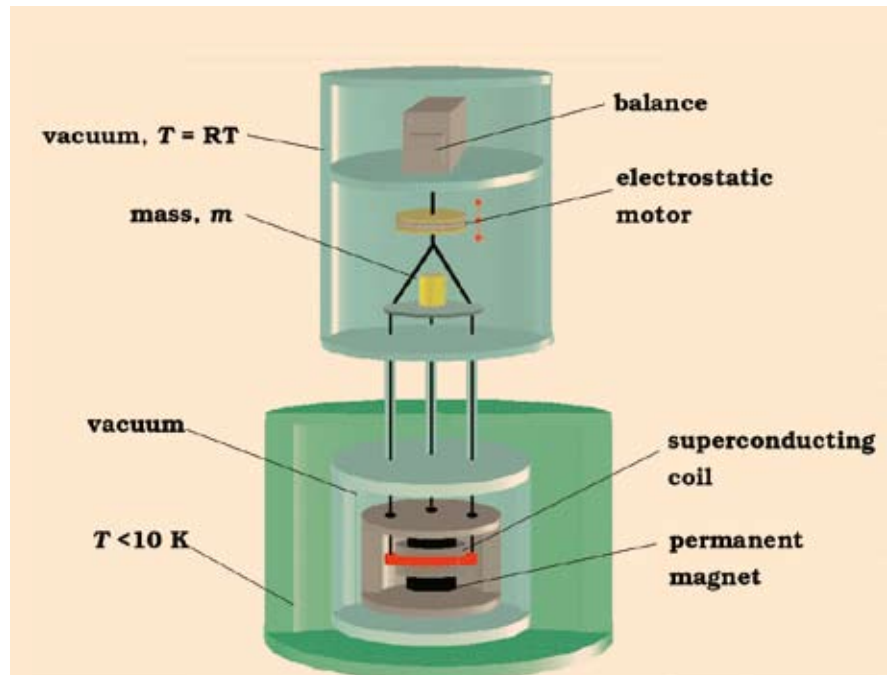
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the JCDCMAS a very valuable way of coordinating the work of the partner organizations.

**ISO Focus:** Over the last century, the scope of BIPM has extended to new areas of measurement, to assist in the progress and needs of science and technology, as well as to respond to the emergence of new “societal” concerns involving accurate measurement and traceability related to environmental, health, safety or security issues. Could you indicate some of the most recent developments in BIPM and whether they might lead to extended collaboration with ISO?

**“The BIPM is committed to the promotion of the combination of metrology, accreditation and standardization infrastructures.”**



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Schematic of the so-called Watt balance in view of a new definition of the unit of mass, the kilogram.

**Andrew Wallard:** Historically the BIPM has always adjusted its scientific work programme to the needs of its member countries and metrology in general, so it is quite normal that some of the activities had to be scaled down to make room for new priorities. Clearly, one of the most important changes at the BIPM in the recent past was the inclusion of chemical measurements into its work. The BIPM has developed links to the World Health Organization and International Federation of Clinical Chemistry, for example, and also contributes to the work of the ISO Committee on reference material (ISO/REMCO). The BIPM has a leading role in the work of Joint Committee for Traceability in Laboratory Medicine in laboratory medicine and forensic science. The BIPM maintains a small but important scientific research activity, notably the Watt balance, which may lead one day to the replacement of the definition of the kilogram. ■

