

**Bureau international des poids et mesures**

# **Comité international des poids et mesures**

99th meeting (October 2010)

### Note on the use of the English text

To make its work more widely accessible the International Committee for Weights and Measures publishes an English version of its reports.

Readers should note that the official record is always that of the French text. This must be used when an authoritative reference is required or when there is doubt about the interpretation of the text.

## TABLE OF CONTENTS

Member States and Associates of the General Conference **113**

The BIPM **115**

Current members of the International Committee for Weights and Measures **119**

Staff of the International Bureau of Weights and Measures **121**

### **Proceedings of the sessions, 12-15 October 2010 123**

Agenda **124**

- 1 Opening of the meeting; quorum; agenda **125**
- 2 Confirmation of the minutes of the 2009 meeting **126**
- 3 Membership of the CIPM and other matters **126**
- 4 Report of the Secretary and activities of the bureau of the CIPM (October 2009 – October 2010) **126**
  - 4.1 Meetings of the bureau of the CIPM (bureau) **126**
  - 4.2 CIPM membership **127**
  - 4.3 States Parties to the Metre Convention (Member States) and Associates of the General Conference on Weights and Measures (Associates) **127**
  - 4.4 Member States in financial arrears for more than three years **129**
  - 4.5 BIPM administrative matters **129**
  - 4.6 BIPM buildings and maintenance **131**
  - 4.7 BIPM Quality System and health and safety matters **131**
  - 4.8 BIPM scientific work **132**
  - 4.9 The CIPM MRA **133**
  - 4.10 Relations with other intergovernmental organizations and international bodies **133**
  - 4.11 BIPM workshops **134**
  - 4.12 Meeting of NMI Directors **135**
  - 4.13 Preparation for the 24th meeting of the CGPM **135**
  - 4.14 Financial report **136**

- 5 States Parties to the Metre Convention and Associates of the CGPM **137**
- 6 Preparation of the 24th meeting of the CGPM **140**
  - 6.1 Draft programme of work and budget 2013 - 2016 **140**
  - 6.2 Draft Convocation and Draft Resolutions **143**
  - 6.3 Interactions with governments before the CGPM **150**
  - 6.4 Arrangements for the 2011 meetings of the CGPM and CIPM **150**
- 7 Presentation of the BIPM science programmes – Reports from Science Department Directors **151**
- 8 Reports from Consultative Committees **153**
  - 8.1 Consultative Committee for Mass and Related Quantities (CCM) **153**
  - 8.2 Consultative Committee for Amount of Substance – Metrology in Chemistry (CCQM) **156**
  - 8.3 Consultative Committee for Ionizing Radiation (CCRI) **158**
  - 8.4 Consultative Committee for Thermometry (CCT) **158**
  - 8.5 Consultative Committee for Units (CCU) **159**
  - 8.6 Consultative Committee for Electricity and Magnetism (CEM) **162**
  - 8.7 Consultative Committee for Length (CCL) **162**
  - 8.8 Consultative Committee for Time and Frequency (CCTF) **163**
  - 8.9 Consultative Committee for Photometry and Radiometry (CCPR) **163**
  - 8.10 Consultative Committee for Acoustics, Ultrasound, and Vibrations (CCAUV) **164**
  - 8.11 Timetable of future meetings **164**
  - 8.12 Changes to CC membership **165**
- 9 Report of the present status of the CIPM MRA **165**
  - 9.1 Report from the Joint Committee of the Regional Metrology Organizations and the BIPM (JCRB) **165**
  - 9.2 Report on the BIPM key comparison database (KCDB) **167**
  - 9.3 Proposed revision of the CIPM MRA **168**
- 10 BIPM/ILAC joint working group **170**

- 11 Joint Committee for Traceability in Laboratory Medicine **171**
- 12 Contacts with other intergovernmental organizations and international bodies **172**
  - 12.1 OIML **172**
  - 12.2 WMO, WHO, WTO, CIE, ISO/IEC, ISO/CASCO, Codex Alimentarius Commission, WADA, pharmacopeias and international forensic bodies, and UNIDO **173**
- 13 Joint Committee for Guides on Metrology (JCGM) **173**
- 14 Work of the BIPM **174**
  - 14.1 Director's Report for 2009-2010 **174**
  - 14.2 Report of the management review of the BIPM Quality System **175**
  - 14.3 Safety report **175**
  - 14.4 Depository of the metric prototypes **176**
- 15 *Metrologia* **177**
- 16 Administrative and financial affairs **178**
  - 16.1 *Rapport aux Gouvernements* for 2009 **178**
  - 16.2 Quietus for 2009 **178**
  - 16.3 Member States in financial arrears **178**
  - 16.4 Changes to the BIPM's accounting system **181**
  - 16.5 Estimated out-turn for 2010 **182**
  - 16.6 Budget for 2011 **182**
  - 16.7 Possible additional sources of funding for the BIPM **183**
  - 16.8 BIPM staff: promotions, departures and recruitment **186**
  - 16.9 Amendments to the BIPM staff Regulations, Rules, and Instructions **187**
- 17 Other Business **188**
  - 17.1 World Metrology Day **188**
  - 17.2 Physiological Quantities and Nanometrology Workshops **188**
  - 17.3 BIPM-WMO Workshop on Climate Change **189**
  - 17.4 Other business **190**
- 18 Date of next meeting **191**

**Annex: Jan de Boer obituary 193**

**List of acronyms used in the present volume 197**

## MEMBER STATES AND ASSOCIATES OF THE GENERAL CONFERENCE

as of 12 October 2010

### Member States

Argentina	Kenya
Australia	Korea (Democratic People's Republic of)
Austria	Korea (Republic of)
Belgium	Malaysia
Brazil	Mexico
Bulgaria	Netherlands
Cameroon	New Zealand
Canada	Norway
Chile	Pakistan
China	Poland
Croatia	Portugal
Czech Republic	Romania
Denmark	Russian Federation
Dominican Republic	Serbia
Egypt	Singapore
Finland	Slovakia
France	South Africa
Germany	Spain
Greece	Sweden
Hungary	Switzerland
India	Thailand
Indonesia	Turkey
Iran (Islamic Republic of)	United Kingdom of Great Britain and Northern Ireland
Ireland	United States of America
Israel	Uruguay
Italy	Venezuela (Bolivarian Republic of)
Japan	
Kazakhstan	

### Associates of the General Conference

Albania	Cuba
Bangladesh	Ecuador
Belarus	Estonia
Bolivia (Plurinational State of)	Georgia
CARICOM	Ghana
Chinese Taipei	Hong Kong, China
Costa Rica	Jamaica

**Associates of the General Conference (cont.)**

Latvia	Philippines
Lithuania	Seychelles
Macedonia (the FYR of)	Slovenia
Malta	Sri Lanka
Mauritius	Tunisia
Moldova (Republic of)	Ukraine
Panama	Viet Nam
Paraguay	Zimbabwe
Peru	

## THE BIPM

The International Bureau of Weights and Measures (BIPM) was created by the Metre Convention signed in Paris on 20 May 1875 by seventeen States during the final session of the diplomatic Conference of the Metre. This Convention was amended in 1921.

The BIPM has its headquarters near Paris, in the grounds (43 520 m<sup>2</sup>) of the Pavillon de Breteuil (Parc de Saint-Cloud) placed at its disposal by the French Government; its upkeep is financed jointly by the Member States.

The task of the BIPM is to ensure world-wide uniformity of measurement; its function is thus to:

- establish fundamental standards and scales for the measurement of a number of principal physical quantities and maintain the international prototypes;
- carry out comparisons of national and international standards based on unique international reference facilities for its Members;
- ensure the coordination of the development of appropriate measurement techniques;
- carry out and coordinate measurements of the fundamental physical constants relevant to these activities.

The BIPM operates under the exclusive direction and supervision of the International Committee for Weights and Measures (CIPM), which itself comes under the authority of the General Conference on Weights and Measures (CGPM) and reports to it on the work accomplished by the BIPM. The CIPM has eighteen members each being of different nationality, and at present it meets every year. The CIPM submits to the Governments of the Member States an annual report on the administrative and financial situation of the BIPM.

The CGPM is made up of delegates from all Member States and at present meets every four years. Its mission is to:

- discuss and initiate the arrangements required to ensure the propagation and improvement of the International System of Units (SI), which is the modern form of the metric system;
- confirm the results of new fundamental metrological determinations and various scientific resolutions of international scope;
- take all major decisions concerning the finance, organization and development of the BIPM.

The activities of the BIPM, which in the beginning were limited to measurements of length and mass, and to metrological studies in relation to these quantities, have been extended to standards of measurement of electricity (1927), photometry and radiometry (1937), ionizing radiation (1960), time scales (1988) and to chemistry (2000). To this end the original laboratories, built in 1876 -1878, were enlarged in 1929; new buildings were constructed in 1963-1964 for the ionizing radiation laboratories, in 1984 for the laser work and in 1988 for a library and offices. In 2001 a new building for the workshop, offices and meeting rooms was opened.

Some forty-five physicists and technicians work in the BIPM laboratories. They mainly conduct international comparisons of realizations of units, calibrations of standards and metrological research. An annual report, the *Director's Report on the Activity and Management of the International Bureau of Weights and Measures*, gives details of the work in progress.

Following the extension of the work entrusted to the BIPM in 1927, the CIPM has set up bodies, known as Consultative Committees, whose function is to provide it with information on matters that it refers to them for study and advice. These Consultative Committees, which may form temporary or permanent working groups to study special topics, are responsible for coordinating the international work carried out in their respective fields and for proposing recommendations to the CIPM concerning units.

The Consultative Committees have common regulations (*Rules of procedure for the Consultative Committees (CCs) created by the CIPM, CC working groups and CC workshops*, 2009, CIPM-D-01). They meet at irregular intervals. The president of each Consultative Committee is designated by the CIPM and is normally a member of the CIPM. The members of the Consultative Committees are metrology laboratories and specialized institutes, agreed by the CIPM, which send delegates of their choice. In addition, there are individual members appointed by the CIPM, and a representative of the BIPM (Criteria for membership of Consultative Committees, *BIPM Proc.-Verb. Com. Int. Poids et Mesures*, 1996, **64**, 124).

At present, there are ten such committees:

1. The Consultative Committee for Electricity and Magnetism (CEEM), new name given in 1997 to the Consultative Committee for Electricity (CCE) set up in 1927.
2. The Consultative Committee for Photometry and Radiometry (CCPR), new name given in 1971 to the Consultative Committee for Photometry (CCP) set up in 1933 (between 1930 and 1933 the CCE dealt with matters concerning photometry).

3. The Consultative Committee for Thermometry (CCT), set up in 1937.
4. The Consultative Committee for Length (CCL), new name given in 1997 to the Consultative Committee for the Definition of the Metre (CCDM), set up in 1952.
5. The Consultative Committee for Time and Frequency (CCTF), new name given in 1997 to the Consultative Committee for the Definition of the Second (CCDS) set up in 1956.
6. The Consultative Committee for Ionizing Radiation (CCRI), new name given in 1997 to the Consultative Committee for Standards of Ionizing Radiation (CCEMRI) set up in 1958 (in 1969 this committee established four sections: Section I (X- and  $\gamma$ -rays, charged particles), Section II (Measurement of radionuclides), Section III (Neutron measurements), Section IV ( $\alpha$ -energy standards); in 1975 this last section was dissolved and Section II was made responsible for its field of activity).
7. The Consultative Committee for Units (CCU), set up in 1964 (this committee replaced the “Commission for the System of Units” set up by the CIPM in 1954).
8. The Consultative Committee for Mass and Related Quantities (CCM), set up in 1980.
9. The Consultative Committee for Amount of Substance: Metrology in chemistry (CCQM), set up in 1993.
10. The Consultative Committee for Acoustics, Ultrasound and Vibration (CCAUV), set up in 1999.

The proceedings of the meetings of the General Conference and the CIPM are published in the following series:

- *Comptes rendus des séances de la Conférence générale des poids et mesures;*
- *Procès-verbaux des séances du Comité international des poids et mesures.*

The CIPM decided in 2003 that the reports of meetings of the Consultative Committees should no longer be printed, but would be published on the BIPM website, in their original language.

The BIPM also publishes monographs on special metrological subjects and, under the title *The International System of Units (SI)*, a brochure, periodically updated, in which are collected all the decisions and recommendations concerning units.

The collection of the *Travaux et Mémoires du Bureau International des Poids et Mesures* (22 volumes published between 1881 and 1966) and the *Recueil de Travaux du Bureau International des Poids et Mesures* (11 volumes published between 1966 and 1988) ceased by a decision of the CIPM.

The scientific work of the BIPM is published in the open scientific literature and an annual list of publications appears in the *Director's Report on the Activity and Management of the International Bureau of Weights and Measures*.

Since 1965 *Metrologia*, an international journal published under the auspices of the CIPM, has printed articles dealing with scientific metrology, improvements in methods of measurement, work on standards and units, as well as reports concerning the activities, decisions and recommendations of the BIPM.

In 1999, the CIPM established a Mutual Recognition Arrangement of national measurement standards and of calibration and measurement certificates issued by National Metrology Institutes (CIPM MRA). Signature of this Arrangement commits NMIs to:

- accept the process specified in the CIPM MRA for establishing a data base, which is maintained by the BIPM and publicly available on the Web;
- recognize the results of comparisons published in the database;
- recognize the calibration and measurement capabilities of other participating NMIs as stated in the database.

## CURRENT MEMBERS OF THE INTERNATIONAL COMMITTEE FOR WEIGHTS AND MEASURES

as of 12 October 2010

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on 12 October 2010

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**Deputy Director/Director Designate:** Prof. M. Kühne

**Mass:** Dr R.S. Davis

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<sup>1</sup> Also Chemistry

<sup>2</sup> Under the invalidity scheme

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Mr P. Benoit, Mr F. Boyer, Mr M. de Carvalho<sup>2</sup>, Mr E. Dominguez<sup>4</sup>,  
Mr A. Dupire, Mr P. Lemartrier, Mr C. Neves<sup>3</sup>, Mr S. Segura, Mr B. Vincent

**Emeritus directors:** Prof. P. Giacomo, Dr T.J. Quinn

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1 Also Chemistry

2 Under the invalidity scheme

3 Also Publications

4 Also General Services

International Committee  
for Weights and Measures

**Proceedings of the sessions  
of the 99th meeting**

(12 – 15 October 2010)

## Agenda

1. Opening of the meeting; quorum; agenda
2. Confirmation of the minutes of the 2009 meeting
3. Membership of the CIPM and other matters
4. Report of the Secretary and activities of the bureau of the CIPM (October 2009 – October 2010)
5. States Parties to the Metre Convention and Associates of the CGPM
6. Preparation for the 24th meeting of the CGPM
7. Presentation of the BIPM science programmes – reports from Science Department Directors
8. Report from Consultative Committees
9. Report on the present status of the CIPM MRA
10. BIPM/ILAC joint working group
11. Joint Committee for Traceability in Laboratory Medicine
12. Contacts with other intergovernmental organizations and international bodies
13. Joint Committee for Guides on Metrology
14. Work of the BIPM
15. *Metrologia*
16. Administrative and financial affairs
17. Other business
18. Date of next meeting

**1. OPENING OF THE MEETING;  
QUORUM;  
AGENDA**

The International Committee for Weights and Measures (CIPM) held its 99th meeting from Tuesday 12 October to Friday 15 October 2010 at the Pavillon de Breteuil, Sèvres.

Present: S. Bennett, K. Carneiro, K.H. Chung, Y. Duan, L. Énard, E.O. Göbel, B. Inglis, L.K. Issaev, R. Kaarls, J.W. McLaren, W. May, H.O. Nava-Jaimes, W. Schwitz, M. Tanaka, H. Ugur, J. Valdés, A.J. Wallard (Director of the BIPM). Apologies were received from F. Hengstberger and A. Sacconi.

Also attending: M. Kühne (Deputy Director of the BIPM; Director Designate); T.J. Quinn (Emeritus Director of the BIPM); J. Kovalevsky (Honorary Member of the CIPM, present for part of the meeting); I.M. Mills (President of the Consultative Committee for Units (CCU), present for part of the meeting); F. Joly (Head of Communication and Information Section); R. Sitton (Communication and Information Section). Also in attendance for parts of the meeting: B. Perent (Financial and Administrative Director of the BIPM); I. Andernack (Finance, Administration and General Services Department); J.R. Miles (Communication and Information Section); S. Arlen (Legal Adviser of the BIPM) and A. Henson (International Liaison Officer) and the following Executive Secretaries of Consultative Committees and other contact persons: P.J. Allisy-Roberts, E.F. Arias, R.S. Davis, L. Mussio, A. Picard, L. Robertsson, M. Stock, C. Thomas, and R.I. Wielgosz.

Prof. Göbel, President of the CIPM, opened the 99th meeting of the CIPM. With nearly all members present (16 out of 18), the quorum was satisfied according to Article 12 of the Regulations annexed to the Metre Convention.

Prof. Göbel noted with sadness the announcement of the deaths of Myung Sai Chung, member of the CIPM from 1995 to 2007; Oscar Sala, member of the CIPM from 1986 to 1992; and Jan de Boer, in his 99th year, a member of the CIPM from 1952 to 1993 and CIPM secretary from 1962 to 1989. He was also the first President of the CCU from its creation in 1964 until 1994. Prof. Göbel read his obituary, a copy of which is annexed to the present report.

A minute's silence was observed in their memory.

The agenda was accepted without change.

## **2. CONFIRMATION OF THE MINUTES OF THE 2009 MEETING**

The minutes of the 98th meeting (2009) were accepted without comment.

## **3. MEMBERSHIP OF THE CIPM AND OTHER MATTERS**

Prof. Göbel welcomed Dr Duan to the CIPM. There were no announcements of any planned resignations from the CIPM. Prof. Ugur informed the CIPM that he will be standing down as President of the Consultative Committee for Thermometry (CCT) after its next meeting.

There are several future candidates for membership of the CIPM. Prof. Wallard commented that new people are always being sought to serve on the Committee although there are no vacancies at the moment.

## **4. REPORT OF THE SECRETARY AND ACTIVITIES OF THE BUREAU OF THE CIPM (OCTOBER 2009 - OCTOBER 2010)**

### **4.1 Meetings of the bureau of the CIPM (bureau)**

Since the last meeting of the CIPM, the bureau of the CIPM ('the bureau') has met on three occasions: on 8–9 March 2010, 3–4 June 2010 and 11 October 2010. These meetings were held at the BIPM Headquarters. The Secretary made a number of additional visits to the BIPM Headquarters during the year.

The bureau also held its regular annual meetings in March 2010 with the International Organization of Legal Metrology (OIML) and the International Laboratory Accreditation Cooperation (ILAC), and, for the first time with the International Organization for Standardization (ISO).

## 4.2 CIPM membership

There have been no resignations from the CIPM since its last meeting. The bureau has, however, kept a list of potential members under review and has encouraged the submission of additional potential candidates to allow the nomination of suitable new members should vacancies arise.

The CIPM will, however, be aware that Dr Yuning Duan, Deputy Director of the National Institute of Metrology (NIM) of Chinese nationality, has been elected by the process of ballot and the 99th meeting of the CIPM is his first meeting. Dr Kaarls welcomed him.

## 4.3 States Parties to the Metre Convention (Member States) and Associates of the General Conference on Weights and Measures (Associates)

The Republic of Kenya became a Member State on 1 January 2010, bringing the current total number of Member States to 54. The number of Associates increased to 31 with the access to this status by the Peoples' Republic of Bangladesh on 29 March 2010, the Republic of Seychelles on 10 September 2010, the Republic of Zimbabwe on 14 September 2010 and the Republic of Mauritius on 5 October 2010.

Dr Kaarls reported to the members of the CIPM that several other States have indicated an interest in being associated with the BIPM's activities. In particular it is expected that Saudi Arabia will become a Member State, which may trigger the entry into the BIPM of more Member States and/or Associates from the same geographic region. The current situation will be reported to the CIPM later in the agenda. One point of note is that as part of the various assistance programmes for the Inter-Africa Metrology System (AFRIMETS), the subscription of four States will be supported by AFRIMETS, namely the Seychelles and Zimbabwe, which have become Associates, and Tanzania and Zambia, for which applications for Associate status are expected. The bureau expressed concern over the long-term commitment by such States to continue to fulfil their financial obligations after the cessation of the initial financial support from donors. The financial commitment appears to be genuine and the bureau looks forward to the further development of a network of Member States and Associates in the AFRIMETS region.

## **Outreach**

The bureau complimented the BIPM for the success achieved with its “limited outreach” programme.

The secretariat of the Joint Committee on Coordination of Assistance to Developing Countries in Metrology, Accreditation and Standardization (JCDCMAS) has moved from the BIPM to the International Electrotechnical Commission (IEC). The JCDCMAS has been renamed the DCMAS Network, while the terms of reference have been revised.

## **CARICOM**

The BIPM received a request from the Caribbean Community (CARICOM) to add in the Association some of its Member States which are not currently part of the current Associate status. Resolution 6 adopted by the General Conference on Weights and Measures (CGPM) at its 23rd meeting on the acceptance of Economies as Associates of the CGPM, stipulates that no further Economies shall become Associates of the CGPM until criteria developed by the CIPM (and against which applications from Economies to become Associates of the CGPM should be assessed) are approved by the CGPM. Since this resolution does not freeze the situation concerning current Associate Economies, CARICOM received the reply that some of its Member States which are not currently part of the current Associate status may be added to the Association and that this will consequently result in an increase in the annual subscription paid by CARICOM.

## **From Associate State to Member State**

After the CIPM decided in 2009 the criteria that would enable it to review whether it would be appropriate for an Associate State to become a Member, the bureau has considered a draft resolution which has been prepared by the BIPM and included in the draft Convocation of the CGPM.

## **Regional Metrology Organizations (RMOs)**

The bureau welcomed the formation of the North-East and West Africa Metrology Programme (NEWMET), with Egypt as the core participant. This is the sixth sub-region of AFRIMETS. Many African States now participate in AFRIMETS.

Similarly, there has been a welcomed increase in activity in the GULFMET area, which may lead to GULFMET becoming the world’s sixth RMO.

#### 4.4 Member States in financial arrears for more than three years

There continue to be four States in financial arrears for more than three years: Cameroon, the Dominican Republic, the Islamic Republic of Iran and the Democratic People's Republic of Korea. Actions relating to this issue which have been undertaken since the last meeting of the CIPM will be reported later in the agenda. Renewed and intensified contact took place with the governments of these States via their Embassies or Representations in Paris as well as through personal contacts. *Notes verbales* were regularly sent to the Embassies or representations of each of these four States pursuant to Resolution 8 adopted by the CGPM at its 23rd meeting (2007). Each of the States concerned has been made aware that, if no change occurs in the situation before the end of 2010, the CIPM will recommend to the CGPM at its 24th meeting (2011), to take a decision regarding their exclusion in accordance with Article 6 paragraph 8 of the Regulations annexed to the Metre Convention. Such draft resolutions are included in the text of the convocation of the CGPM for its 24th meeting, which will be sent to Member States in December 2010.

The bureau discussed the consequences of an agreed rescheduling agreement between the CIPM and a defaulting Member State for the payment of its arrears. The result of this discussion will be the submission to the CIPM of a draft resolution for inclusion in the convocation of the next meeting of the CGPM.

#### 4.5 BIPM administrative matters

4.5.1 The members of the bureau receive regular reports on the financial status of the BIPM throughout the year. As will be seen later in the agenda the situation is satisfactory against the 2010 budget, as approved by the CIPM in October 2009.

4.5.2 The bureau received a number of presentations and reports from the Financial and Administrative Director on the implementation of an accrual basis of accounting. Further details will be provided later in the meeting. The bureau noted, in particular, the draft financial statements, the policy on depreciation of equipment and buildings and the results of an inventory and valuation of the BIPM's assets.

At the same time, there has been a long discussion on the most effective and informative way of presenting the budget related to the programme of work

for 2013–2016 to the CIPM and to Governments. As the switch from a cash basis of accounting to an accrual basis of accounting is in progress, the draft budget for the next programme of work has been prepared on a cash basis. When the restatement of the 2009 accounts is completed in accordance with accrual basis of accounting, draft financial statements (Statement of financial performance, Statement of financial position, Cash flow statement) will be prepared under an accrual basis of accounting for the periods 2009–2012 and 2013–2016.

- 4.5.3 Bureau members were notified of changes to the percentages of repartition of the Dotation used for the calculation of the Member States' contributions and Associates' subscriptions as a result of the adoption of the Scale of Assessments for the apportionment of the expenses of the United Nations Organization for the period 2010–2012. These changes will be applied, retrospectively, to the 2010 contributions and subscriptions and any adjustments resulting from these changes for 2010 will be included in the 2011 *Notification des parts contributives*. The bureau members noted significant increases for Brazil (1.13/1.97), China (3.46/3.90), Poland (0.65/1.01), the Russian Federation (1.55/1.96) and Turkey (0.49/0.75) and significant decreases for France (8.16/7.48), Italy (6.58/6.11) and the United Kingdom of Great Britain and Northern Ireland (8.60/8.07). Also of note is the application of the Regulations related to the re-evaluation of the minimum and maximum contributions following the ratification of the Metre Convention by three new Member States during the present quadrennium. This will result in a decrease of the maximum contribution from 9.67 % to 9.53 % of the Dotation and a decrease of the minimum contribution from 0.49 % to 0.48 % of the Dotation beginning with the Notification for 2013.
- 4.5.4 A number of amendments to the *Staff Regulations, Rules and Instructions applicable to staff members of the BIPM* (RRI) were proposed for the bureau's opinion and the modifications will be presented to the CIPM for approval during the meeting. The changes, for the most part, are a harmonization and reflect changing societal patterns and norms, including non-discrimination towards handicapped staff and an expansion of certain benefits to include partners in addition to spouses.
- 4.5.5 The Director of the BIPM informed the bureau that he has decided that Alain Picard will be nominated as Director of the Mass Department from 1 November 2010 following the retirement of Richard Davis on 31 October 2010. The Director also informed the bureau of the appointment

of Aldo Dupire as Head of Workshop following the retirement of José Sanjaime on 31 December 2010.

#### **4.6 BIPM buildings and maintenance**

- 4.6.1 The bureau received a draft report on the long-term building plan for the BIPM. This plan includes future renovations, in particular those needed for the Nouveau Pavillon and the Pavillon du Mail as their components are, or soon will be fully depreciated. Also included were a number of actions arising from an energy audit of the BIPM's premises that was undertaken to improve energy efficiency and to reduce energy costs.
- 4.6.2 As will be seen by members of the CIPM when they tour the BIPM premises during their review of the laboratory work, there have been a number of internal office and laboratory refurbishments, most notably in the Mass Department and in preparation for the move of the watt balance to an improved location, which is expected in 2011.

The BIPM terminated its laser work some years ago and the laboratories in the Laser building will be renovated to host laboratories for the Chemistry Department. In addition, the Time laboratory will move from its present location to facilitate easier access and to ensure a safer way of dealing with antennas and receivers. *Circular T*, which is independent from the laboratory activities, will not be affected by the move.

- 4.6.3 The BIPM's IT system will start to be renewed and updated in 2011 and this will continue in the following years, together with refurbishment and maintenance of buildings.

#### **4.7 BIPM Quality System and health and safety matters**

The Director has reported regularly on quality and health and safety matters. These are agenda items but members of the CIPM are advised that modifications to the BIPM's Quality Manual have been finalized and that there are no issues of significance related to health and safety. The appointment of a new Quality, Health and Safety Manager has led to a significant increase in the levels of activity in these areas.

On 8 September 2010 the CIPM Secretary attended the annual Quality System Management Review meeting at the BIPM. Results of internal and external on-site peer reviews were discussed, as well as the progress in the

updating of the BIPM Quality Manual and related procedures. It was noted that good progress had been made, although some actions were still to be completed. The CIPM Secretary expressed his confidence in the BIPM's Quality System.

#### **4.8 BIPM scientific work**

Members of the CIPM will hear presentations from the scientific Department Directors on the progress of work in their Departments and will visit the laboratories later in the agenda.

All that needs to be reported on is the state of gravimetry and the future of international comparisons of absolute gravimeters (ICAG). This was discussed at the last meeting of the CIPM which approved the cessation of the laboratory activities at the BIPM headquarters at the end of the present programme of work. To implement this decision, the Consultative Committee for Mass and Related Quantities (CCM) Working Group on Gravimetry was consulted to suggest site options for future ICAGs. Two options are under consideration, one at VNIIM, St. Petersburg, Russia, and one at Walferdange, Luxembourg, the latter under the supervision of METAS. Final decisions will be made by the president of the CCM based on the opinion of the Working Group on Gravimetry.

From time-to-time, the Director draws the attention of the bureau members to major issues of scientific interest. There are two particularly noteworthy issues. The first is the assembly of the calculable capacitor, with the assistance of NMIA (Australia). As a result of this collaboration some further modifications will be made to components in the BIPM's workshops and the aim is to commission the capacitor by the end of 2010. The second issue, to which the bureau members have paid close attention, is the project to establish a dosimetry scale based on linear accelerators. A study into the options available to establish and disseminate such a scale was completed by the BIPM. If approval of the proposed programme of work is granted by the CIPM and the dotation is agreed by the CGPM at its next meeting, then the best possible solution will need to be decided. Until this time, other NMIs have offered the use of their national facilities and further discussions will be needed once the funding possibilities have become clear. The Deputy Director will report on the state of these considerations during the agenda item on the 2013–2016 programme of work.

## **4.9 The CIPM MRA**

- 4.9.1 There have been no new signatories to the CIPM MRA from Member States or Associates. However, a major success was the signing of the CIPM MRA by the World Meteorological Organization (WMO) during the BIPM-WMO Symposium in Geneva, Switzerland, on 30 March–1 April 2010, which brought in three WMO reference laboratories. Reference will be made later to the proposed follow-up to the BIPM-WMO symposium. A number of institutes have been designated by the signatories and the BIPM has received further requests for use of the CIPM MRA logo. This brings the number of signatories to 78 (from 48 Member States, 27 Associates and 3 international organizations), the number of DIs to 134 and the number of institutes and organizations approved to use the logo to 89.
- 4.9.2 Following discussions at the meeting of National Metrology Institute (NMI) Directors on 2 June 2010, a revised text of the addendum to the CIPM MRA (documents CIPM/2010-20 and CIPM/2010-21) as well as a redraft of the whole document are available for discussion by the CIPM. The documents could then be circulated to the NMI Directors to gain approval for the addendum and to solicit comments on the redrafted document.
- 4.9.3 A report on the Joint Committee of the Regional Metrology Organizations and the BIPM (JCRB) activities will be given to the CIPM later in the agenda.

## **4.10 Relations with other intergovernmental organizations and international bodies**

- 4.10.1 Cooperation with the OIML is continuing, but no new developments can be reported concerning the possible "rapprochement".
- 4.10.2 The cooperation with ILAC is continuing satisfactorily. An ILAC draft document on the accreditation of NMIs is being prepared and is under discussion, as are a number of other ILAC documents addressing traceability and measurement uncertainty issues.
- 4.10.3 The cooperation with ISO, in particular with the ISO/CASCO (Committee on conformity assessment) has intensified. It is expected that the cooperation with ISO will expand as the number of written standards addressing metrological traceability and measurement uncertainty increases.
- 4.10.4 In particular, in new and challenging areas of metrology such as climate change, health care, pharmacopoeia, physiology, forensics, microbiology

and nanotechnology, an increased interest has been observed in the number of intergovernmental organizations and international bodies seeking to cooperate with the BIPM and the CIPM's Consultative Committees.

Several dedicated workshops with stakeholders have been organized (physiological quantities, nanoscience, climate change and forensics) or are planned (microbiology).

- 4.10.5 Contrary to the cooperations mentioned above, the proposed cooperation with the Versailles Project on Advanced Materials and Standards (VAMAS) has, so far, not developed.

#### 4.11 BIPM workshops

The BIPM Workshops on Physiological Quantities and SI Units and Metrology at the Nanoscale were well attended by representatives from many different communities with an interest in traceable measurements and were considered by all attendees to be a success.

Reports on the Workshops on Metrology at the Nanoscale and Physiological Quantities and SI Units are contained in the Director's report for 2009/2010. A report on the former can be found at <http://www.bipm.org/en/events/nanoscale/> and the latter at [http://www.bipm.org/en/events/physiological\\_quantities/](http://www.bipm.org/en/events/physiological_quantities/).

The report of the CCQM to the CIPM will touch on the Workshop with the forensics community.

The WMO-BIPM Workshop on Measurement Challenges for Global Observation Systems for Climate Change Monitoring, held at the WMO headquarters in Geneva, Switzerland, was very successful and a follow-up is being prepared.

From these workshops it was concluded that the CIPM's Consultative Committees need to be open-minded regarding expertise from other communities, in particular, when addressing the need for establishing globally comparable measurement results through traceability to the SI.

A joint meeting of Consultative Committee (CC) Presidents and CC Working Group Chairs may need to take place in the near future to share information and harmonize working procedures and external contacts.

#### 4.12 Meeting of NMI Directors

The meeting of NMI Directors held on 2–3 June 2010 focused largely on the proposed programme of work for the BIPM for 2013–2016. The main outcomes of the meeting, relevant to the CIPM’s consideration of the programme of work, were:

- A number of statements were made with respect to the proposed increase in the dotation, which might be too optimistic and warnings were given that no increase may be the best to hope for, in which case, the BIPM should have a clear view of its priorities and the consequences of non-funding. Some NMI Directors called for the programme of work to include scenarios for no increase, or even a decrease, and “a little” increase in the budget;
- Clear support was shown for the BIPM’s laboratory work, in particular for mass and time, but some doubt was expressed about the linear accelerator (linac) from some of the larger NMIs, while NMIs without linacs of their own tended to support the linac project;
- Continued expansion in organic chemistry received mixed support;
- The value of the BIPM’s international liaison activities was emphasized.

A series of presentations on challenging metrological developments in new areas, such as climate system monitoring, carbon trading/carbon economy, biology and nanotechnology (risk management, standards and regulation), metrology and stem cells and economic impact of metrology, all of which are high priority and ongoing projects in many countries, was well received by the NMI Directors.

#### 4.13 Preparations for the 24th meeting of the CGPM

- 4.13.1 The members of the bureau have been heavily involved in preparations for the 24th meeting of the CGPM and two key documents: the Convocation and the Programme of Work and Budget. As has been reported to the CIPM by the Deputy Director, the bureau asked for significant reductions in the budget and therefore the proposed dotation in order to reduce the cost of the programme whilst maintaining the scientific content as discussed by the CIPM at its last meeting. The bureau also reviewed preliminary drafts of draft resolutions included in the Convocation. These two documents and likely also the President’s Report will be sent to Member States by the end of 2010. Representatives of governments of Member States will be invited to

a meeting in May 2011 at which further details will be given, questions answered and any actions to prepare for the next meeting of the CGPM can be arranged.

- 4.13.2 The BIPM Director and Deputy Director have visited a number of countries to discuss the BIPM's proposed programme of work and to investigate the opinions of Governments with respect to their potential financial commitments for the programme of work 2013–2016.
- 4.13.3 Members of the CIPM will be asked to discuss and approve the two key documents (Convocation and Programme of Work and Budget) during the present session.

#### 4.14 Financial report

The table below shows the situation of the assets of the BIPM, in Euros, on 1 January of the year noted at the head of each column.

Accounts	2007	2008	2009	2010
I. Ordinary funds	8 035 603.86	8 564 535.51	9 170 045.97	10 626 144.61
II. Pension fund	12 088 858.38	12 359 859.62	12 232 125.88	12 802 809.56
III. Special fund for the improvement of scientific equipment	0.00	0.00	0.00	61 762.00
IV. Staff loan fund	238 715.51	248 729.00	252 288.72	262 215.98
V. Building reserve fund	114 602.35	0.00	0.00	0.00
VII. Medical insurance reserve fund	555 390.57	523 843.30	479 104.91	441 277.99
Totals	21 033 170.67	21 696 967.43	22 133 565.48	24 194 210.14

Prof. Göbel thanked Dr Kaarls for his report and invited questions from the CIPM members.

Dr May made a general comment that the BIPM's scientific workshops were often so successful that they raised over-optimistic expectations that there

would be follow-up actions. There is a need to explain that workshops are often just exploratory. Prof. Göbel agreed, stating that workshops are intended to be the start of discussions to assess potential metrological involvement in the area concerned.

## 5. STATES PARTIES TO THE METRE CONVENTION AND ASSOCIATES OF THE CGPM

The following changes in Membership of the BIPM and Associates of the CGPM have occurred since the 98th meeting of the CIPM:

- the accession of the Republic of Kenya, formerly an Associate since November 2002, on 1 January 2010;
- the association of the Republic of Bangladesh on 29 March 2010;
- the association of the Republic of Seychelles on 10 September 2010;
- the association of the Republic of Zimbabwe on 14 September 2010; and
- the association of the Republic of Mauritius on 5 October 2010.

Prof. Göbel noted that, as reported by the Secretary, as of 12 October 2010 there were 54 Member States and 31 Associates. Prof. Wallard added that the BIPM has increased its efforts over the last 5–6 years to increase membership and that signing of the CIPM MRA is a major driver for encouraging States to become Associates of the CGPM. Since the 98th meeting of the CIPM, the position of International Liaison Officer has been created and Mr Henson was recruited to fill this position. These tasks have previously been undertaken on an *ad hoc* basis and through secondees.

Mr Henson gave a summary of the ongoing work to attract new Member States and Associates. The Middle East and Africa are considered to be key areas and intensive work is being carried out in both. Progress is being made in the Gulf States, with momentum building up towards the launch of the GULFMET Regional Metrology Organization (RMO). It is thought that when one State in the Middle East becomes a Member State or an Associate, this will act as a catalyst for other States to follow. Saudi Arabia is likely to be the first although no formal application for accession has yet been received by the BIPM. Saudi Arabia is establishing an atomic time scale so

that when it becomes a Member, it can contribute to Coordinated Universal Time (UTC) as part of the “Mecca Time” initiative. Talks are ongoing with Kuwait, Oman, Qatar and Yemen as part of the GULFMET initiative. Discussions have also been held with Bahrain, Iraq and the United Arab Emirates. Mr Énard mentioned that talks with Syria regarding its application to become an Associate of the CGPM are ongoing and that its first payment will be through funding with the European Union.

In Africa, the BIPM works alongside the United Nations Industrial Development Organization (UNIDO) and various aid programmes to recruit African States to participate in the activities of the BIPM. It is a prerequisite for benefiting of these aid programmes that any State must have the technical capability to participate and that it must be able to meet its financial commitments after accession. The AFRIMETS metrology school will be held in Nairobi, Kenya, in February 2011 and will provide an opportunity for the BIPM to have contact with potential new Associates or Member States. In June 2010 Tunisia, an Associate since 2007, announced its intention to become a Member State. A delegation from Nigeria is planning to visit the BIPM.

In the Americas, of the 34 Members of *Sistema Interamericano de Metrología* (SIM), only 9 do not participate in the activities of the BIPM. These States are Belize, Colombia, El Salvador, Guatemala, Guyana, Haiti, Honduras, Nicaragua, and Suriname. In the Asia-Pacific region, of the 23 members of the Asia Pacific Metrology Programme (APMP), only 4 do not participate in the activities of the BIPM. These States are Fiji, Mongolia, Nepal, and Papua New Guinea.

In the case of Eastern Europe and Central Asia, the BIPM sent letters to Kyrgyzstan in November 2009 and Azerbaijan and Uzbekistan in January 2010 to follow up on the Euro-Asian Cooperation of National Metrological Institutions (COOMET) initiative and to provide information on participation in and the benefits of taking part in the activities of the BIPM.

In Europe, out of the 36 States that are Members of the European Association of National Metrology Institutes (EURAMET), only 5 do not participate in the activities of the BIPM. These States are Bosnia and Herzegovina, Cyprus, Iceland, Luxembourg, and Montenegro. The Minister of Economy of Luxembourg will visit the BIPM in 2011.

Prof. Wallard outlined the three criteria adopted by the CIPM in 2009 to encourage Associates of the CGPM, which have been Associates for at least 5 years, to become Member States. Nine States now meet these criteria (Belarus, Costa Rica, Cuba, Jamaica, Lithuania, Latvia, Panama, Slovenia and Ukraine) and a letter was sent to each in February 2010 by the Director of the BIPM to remind them of the benefits of Membership. No positive replies have been received.

Dr Inglis asked about the sustainability of African States which become Associates if their subscription is funded through aid programmes. Mr Henson replied that the Southern African Development Community (SADC) guarantees sustainability by writing to States that are considering becoming Associates of the CGPM explaining that it involves a long-term financial commitment. Two States did not return the letter, so the SADC did not support their application to become Associates.

Prof. Kühne suggested that the wording of one of the criteria set by the CIPM to review whether it is appropriate for an Associate State to become a Member should be changed. The criterion is currently for 'participation in comparisons published in the KCDB'. NMIs should already have participated in comparisons at the time of the review by the CIPM, so it was suggested that the criteria should be for 'Publication of comparisons results in the KCDB'. Dr Kaarls supported this suggestion. Prof. Kühne added that this is an important driver for Associates to become Members because the results of comparisons are required to get CMCs published. If the NMI of an Associate has CMCs listed in the KCDB, which is easy to check, it is a clear indication that the Associate is successful and no ambiguity exists over whether it has met the criteria to be encouraged to become a Member State.

The CIPM approved this revision of the criteria that enables it to review whether it is appropriate for an Associate State to become a Member.

Since the 98th meeting of the CIPM, Viet Nam has met the criteria to be encouraged to become a Member State and it was added to the list of States to be encouraged to accede to the Metre Convention.

Prof. Wallard attended the APMP RMO General Assembly in December 2009 to speak to representatives of potential new Associates of the CGPM and Associates that are planning to apply to become Member States. A great deal of work is undertaken by the RMOs in this area and their role is very active and important.

Prof. Göbel thanked Mr Henson for his report and concluded the discussion by noting that after many years of standing still the number of new Member States and Associates is increasing. Prof. Göbel also stated that the proposal to replace the phrase ‘Member States of the BIPM’ with ‘States Parties to the Metre Convention’ will be discussed later in the meeting.

## **6. PREPARATION FOR THE 24TH MEETING OF THE CGPM**

The CIPM discussed the draft Programme of Work and Budget 2013–2016 and the draft Convocation and draft Resolutions for the 24th meeting of the General Conference. The approved versions will be published and sent to the governments of the Member States in December 2010. The CIPM also discussed the proposed meeting with the government officials in advance of the CGPM as well as the arrangements for the 2011 meetings of the CGPM and the CIPM.

### **6.1 Draft programme of work and budget 2013-2016**

Prof. Kühne gave a presentation on the draft programme of work and budget for the BIPM for 2013–2016. Initial estimates in early 2010 were that the programme of work for 2013–2016 would have required a dotation in excess of 57 million Euros. The bureau of the CIPM suggested in March 2010 to limit the dotation to about 54 million Euros. Prof. Kühne revised the programme of work and the estimated resources needed to carry out this programme of work with the BIPM’s Department Directors and a reduced programme was developed requiring a dotation of 53.8 million Euros. This revised programme was presented to the NMI Directors at a meeting in June 2010. Following the suggestion by the NMI Directors, the programme was further revised downwards requiring finally a dotation of 51.4 million Euros. This programme of work is seen by the BIPM as the minimum to achieve its mission for the period 2013–2016. Most of the costs involved are for the operation or necessary improvement of existing facilities or to a limited extent for expanding in existing areas of activity to respond to the growing needs of Member States. The programme of work also includes provisions to cease the activities in gravimetry.

Mass is a key activity for the BIPM, particularly the conservation and dissemination of the international prototype of the kilogram (IPK). A strong presence will be maintained in this area. The programme of work for 2013–2016 includes a provision to establish a sophisticated storage facility for the pool of artefacts and continuation of the work to find improved materials for the artefacts. Work will continue on the watt balance. Precision measurements are scheduled to start in 2012. The watt balance will initially operate at room temperature.

In the Time Department the computation of International Atomic Time (TAI) and Coordinated Universal Time (UTC) will continue and there will be further improvements to *Circular T* and time transfer. The number of staff in the department will be reduced from 9 to 8 following the non replacement of a staff member who is expected to retire in 2014.

In the Electricity Department the programme of work for 2013–2016 includes a continuation of high-level realizations of the volt and ohm via the Josephson and quantum Hall effects. There will be a continuation of on-site comparisons. The development of an ac quantum Hall effect comparison system will be investigated and work on the calculable capacitor will continue.

The programme of work for 2013–2016 for the Ionizing Radiation Department focuses on the possible acquisition of a linear accelerator (linac) which will allow the BIPM to move into the area of high-energy photon dosimetry. Most Member States do not have access to linacs and rely on calibrations utilizing the BIPM's  $^{60}\text{Co}$  source. If the BIPM operated a linac it would be possible to utilize the linac to directly calibrate national measurement standards of Member States at high photon energies. At present, the uncertainty from calibrations using the cobalt source is 2.2 %. If the BIPM could calibrate using its own linac, this uncertainty would fall to 1.0 % which could provide for a significant improvement in the quality of treatment available to cancer patients in those Member States. A Strategic Plan has been developed examining options for addressing these needs for improved dosimetry at high photon energies using a linac. It lists 3 options for the BIPM: to continue with the cobalt source; use a linac at one of the NMIs; or install a linac at the BIPM headquarters. In the short term using a linac at an NMI would be cheaper, but overall, the most efficient and most cost-effective option would be to purchase and install a linac at the BIPM headquarters. This would require a one-off investment and minimal running costs over 16 years.

The Chemistry Department's programme of work for 2013–2016 focuses on international equivalence of gas standards for air quality and climate change monitoring, as well as an extension of international equivalence of organic primary calibrators into molecules of higher molar mass. The Chemistry Department will continue to work on the characterization of insulin, following a request via the World Health Organization (WHO) that there should be an international standard for biosynthetic human insulin traceable to the SI. The expansion of the Chemistry programme into 'larger' molecules will enable the establishment of a reference facility with shared costs for the Member States. The programme of work for 2013–2016 in the Chemistry Department will require an increase in the number of staff of 2.5 staff and the acquisition of new equipment, and as a result an ongoing increase in operational costs.

Prof. Kühne gave an overview of the costs involved in the programme of work for 2013–2016. He pointed out that over the next decade significant costs due to required building modernization are also to be expected. A breakdown of the figures in the budget and the sources of income were given. The expenditures for 2013–2016 are estimated at 57 million Euros. Total expected income over the period 2013–2016 is 54.603 million Euros with the majority of this figure (51.362 million Euros) coming from the dotation. For the purpose of the programme of work, it would be preferable if the Member States' contribution could be larger in the first year of the programme of work and consequently reduced in the following three years. But this is not thought to be a practical option as governments prefer to pay a flat amount for each year of the four-year period. The BIPM's financial reserves have been split into a Reserve Fund and a Capital Investment Fund. At the end of 2012 it is estimated that these two funds will total about 7 million Euros. A proportion of this is required to cover the fluctuations in payments of annual contributions from Member States that do not pay on time. This would leave about 4.643 million Euros in the Capital Investment Fund at the end of 2016, an amount which is considered to be the minimum.

Prof. Kühne finished his presentation by asking the members of the CIPM to come to an agreement on the proposed dotation.

Dr May suggested three possible budget scenarios that he would like to review at the May 2011 meeting of the NMI Directors:

- A 0 % increase in the dotation.

- A dotation that will allow the BIPM to maintain the *status quo*, effectively the minimum budget required for a viable programme of work.
- The proposed dotation increase.

Dr Quinn reminded the members of the CIPM that the programme of work covers mandated activities to be undertaken by the BIPM which would otherwise be carried out by the Member States. The consequences of a reduced budget must be made clear. Dr Quinn noted that there is no option but to follow the suggestion made by Dr May.

Dr Inglis suggested that several budgets could be presented at the NMI Directors' meeting in May 2011. The CIPM needs to discuss these different budgets and the impact of each.

Prof. Kühne and Prof. Göbel reiterated that there is a need to agree on a programme of work for 2013–2016, and if necessary the programme would be reduced. If the BIPM does not get approval for the budget it is seeking, it will need to make cuts in the programme of work for 2013–2016.

After an intense discussion of the programme and the needed dotation Prof. Göbel summarized the main points of the discussion on the draft programme of work and budget for 2013–2016 and invited the members of the CIPM to vote on the following proposal: The Convocation will include the full programme of work for 2013–2016, and the meeting of the NMI Directors in May 2011 will discuss the three proposed scenarios with the corresponding budgets (I) the programme as presented, (II) a programme limited to the continuation of the present activities, and (III) a programme based on “no increase” of contributions from Member States. This proposal was accepted unanimously.

## 6.2 Draft Convocation and Draft Resolutions

Prof. Wallard noted that section 9 of the Convocation refers to the Report of the President of the CIPM which will be circulated to the Governments of Member States at the meeting of the CGPM in October 2011.

The draft resolutions discussed were:

- Draft Resolution A - On the possible future revision of the International System of Units, the SI (Section 11.1 in the Convocation). This draft resolution was discussed at the meeting of the Consultative Committee

for units (CCU) in September 2010. A paper presented by Prof. Mills at the meeting of the CIPM gave a detailed proposal for changes to the SI. A draft resolution (paper 17) has been produced and will be discussed later.

- Draft Resolution B - On the importance of international collaboration so as to place measurements to monitor climate change on an SI traceable basis (Section 11.2 in the Convocation).
- Draft Resolution C - Dotation of the BIPM for the years 2013 to 2016 (Section 12 in the Convocation). The text of this draft resolution will need to be amended to take into account the results of the discussions in the CIPM meeting.
- Report on issues related to Associates of the CGPM (Section 15 in the Convocation). Draft Resolution D - On the status of Associate State of the General Conference (Section 15.1) recommends raising the financial subscriptions of Associate States. Draft Resolution E - On the acceptance of Economies as Associate of the CGPM (Section 15.2) refers to an issue dating from 1999 when the concept 'Economies' was not defined. CARICOM, a regional intergovernmental organization, is the only intergovernmental organization which became an Associate and more intergovernmental organizations may apply to become Associates, particularly from Africa. The proposal is to end the accession of intergovernmental organizations as an Associate Economy and to adopt criteria against which applications from Economies to become Associates can be assessed by the CGPM. This draft resolution also recommends to the CGPM to allow CARICOM to continue to enjoy the status of Associate Economy, although the Member States of CARICOM will be encouraged to apply to become Member States or Associates.
- Draft Resolution F - On exclusion of defaulting Member States (Section 16 in the Convocation). There are currently four Member States that have had financial arrears for more than six years. The proposal is to produce a separate draft resolution recommending the CGPM to take a decision on the exclusion of each of these defaulting States. If a rescheduling agreement is negotiated with defaulting Member States and a first instalment of outstanding contributions takes place before the meeting of the CGPM in October 2011, the draft resolution will be withdrawn for the states concerned.

- Draft Resolution G - On rescheduling agreements between the International Committee for Weights and Measures and defaulting States Parties to the Metre Convention for the payment of their financial arrears.
- Draft Resolution H - On a Convention on the privileges and immunities of the BIPM (Section 18 in the Convocation). The BIPM enjoys privileges and immunities from the French territory pursuant to the BIPM Headquarters Agreement between the Government of the French Republic and the CIPM. These privileges and immunities facilitate the execution of its mission by the BIPM on French territory. However, the BIPM does not currently enjoy any privileges and immunities on the territory of its other Member States. This situation can lead to difficulties. The problem would be eased if functional privileges and immunities were recognized by each Member State for the BIPM, its staff members and experts on official mission for the BIPM on their respective territory. Such recognition would take the form of a multilateral convention on privileges and immunities of the BIPM, in a process similar to the Convention on privileges and immunities of the United Nations.
- Draft Resolution I and J. On the revision of the *mise en pratique* of the metre and the development of new optical frequency standards and on the adoption of a common terrestrial reference system (Section 19 in the Convocation).
- Proposals by delegates (Section 20 in the Convocation). There is a set timescale for delegates to the meeting of the CGPM to submit proposals. It is not known at present if any proposals will be submitted.

Dr Bennett questioned the necessity of having a resolution to exclude Member States that are in arrears. There is already a provision in the Metre Convention to exclude a State if it has been in arrears for more than six years. Prof. Wallard confirmed that the Metre Convention does allow the exclusion of a State that has been in arrears for more than six years but the CGPM decided in 2007 the procedure to be applied in such cases. Mrs Perent added that Member States in arrears are offered the chance to negotiate a rescheduling agreement with the CIPM. If there is no such formal agreement concluded before the meeting of the CGPM, and these States continue to default on their financial obligations, it will be the prerogative of the CGPM to decide whether to exclude the States concerned.

Dr Quinn asked why some of the text in the English version of Draft Resolution F is in French. He pointed out that Thailand and some other States requested English language documents at the last meeting of the CGPM. Prof. Wallard and Mrs Perent stated that the official version is the French one and that some sections are quoted from the Metre Convention. Dr Quinn asked if both French and English texts could be provided for the next meeting of the CGPM. Mrs Perent confirmed that this could be done.

**Draft Resolution A** - On the possible future revision of the International System of Units, the SI

Prof. Issaev noted that although the possible redefinition of the kilogram will be based on the Planck constant,  $h$ , it is necessary to mention the Avogadro constant,  $N_A$ , in the definition. Prof. Wallard and Prof. Göbel replied that the CCU had discussed this and had made a strict recommendation that the redefinition of the kilogram will be based on the Planck constant. Prof. Issaev noted that this may be problematic because not all countries have a watt balance. Prof. Kovalevsky added that there is a misunderstanding as the Avogadro constant will be used in the redefinition of the mole and it is not possible to use the same constant for two different definitions.

Dr Valdés made a presentation which offered an alternative to Draft Resolution A. The presentation was developed by Dr Valdés and Dr Tanaka in collaboration with Dr Bich at INRIM, Italy. The proposal is based on keeping the distinction between base and derived units and gives alternative wording for the individual definitions of the base units. Dr Valdés gave a detailed presentation which highlighted the objections to Draft Resolution A. Prof. Göbel thanked Dr Valdés for his presentation and noted that this presentation will form the basis for further discussions.

Dr Tanaka asked the CIPM to note this alternative proposal to Draft Resolution A. Prof. Göbel replied that the CIPM as a whole must reach a decision. Dr Carneiro stated that the alternative proposal should be presented to the CGPM at its next meeting because it was a good compromise solution. Dr Bennett raised a concern that the wording of Draft Resolution A makes it look like the decision has already been made regarding the redefinitions. The proposed wording for the unit of length has not been discussed at the Consultative Committee for Length (CCL) yet, and he had concerns over circularity.

Prof. Kühne stated that the CIPM should come to a decision regarding Draft Resolution A so that it can be presented to the CGPM at its meeting in October 2011: otherwise it will appear that the BIPM is not ready to go ahead with the proposed redefinitions. Dr Tanaka and Dr Valdés commented that their presentation showed that they do not support Draft Resolution A. Prof. Göbel stated that any further discussion on Draft Resolution A will be postponed until the discussion on the CCU section of the agenda.

Following the report from the CCU and further discussions, a revised copy of Draft Resolution A was circulated. Prof. Mills made two suggestions which were presented by Dr Quinn:

- The title of Resolution A should be broader and proposed “On the future revision of the International System of Units”;
- The word “scaling” should be removed.

Prof. Wallard stated that it may be necessary to retain the word ‘possible’ in the title and suggested “On the possible future revision of the International System of Units”. Prof. Göbel invited the members of the CIPM to vote on whether they agreed with Draft Resolution A. There was a majority vote in favour, with four abstentions (Prof. Issaev, Dr Tanaka, Dr Valdés and Prof. Ugur).

Prof. Göbel thanked the CCU and its President for their recommendations and for all the hard work they had put into producing Draft Resolution A.

**Draft Resolution B** - On the importance of international collaboration so as to place measurements to monitor climate change on an SI traceable basis. It was suggested that the bullet point ‘relevant bodies to take steps to ensure that all measurements used to make observations which may be used for climate studies are made fully traceable to SI units’ should be changed to ‘relevant bodies to take steps to contribute to coordination of measurements fully traceable to SI units and used to make observations which may be used for climate studies’. Dr Bennett asked if there had been any discussions with the ILAC concerning Draft Resolution B. Prof. Wallard replied that there had not been any discussions but noted that there was a need to do so. Dr May asked to what extent the NMI Directors at their meeting in June 2010 had agreed Draft Resolution B. Prof. Wallard replied that an agreement had been reached and a working group chaired by Dr Jornada had carried out coordination activities in the Consultative Committee for Mass and Related Quantities (CCM) and Consultative Committee for Photometry and Radiometry (CCPR).

Prof. Göbel invited the members of the CIPM to vote on whether they agreed with the draft resolution. There was unanimous acceptance of Draft Resolution B.

**Draft Resolution C** - Programme of work of the BIPM for the years 2013 to 2016. Prof. Göbel called on the members of the CIPM to vote on whether they agreed with the draft resolution. There was unanimous acceptance of Draft Resolution C.

**Draft Resolution D** - On the status of Associate States of the General Conference. The bullet point ‘Participation in comparisons published in the key comparison database (KCDB)’ will be changed to ‘Publication of comparisons results in the key comparison database (KCDB)’. Prof. Ugur questioned if it was possible to change the rules governing the status of Associate States. Ms Arlen replied that it was up to the CGPM to decide what those rules should be and in particular the level of the subscriptions. The Associate States can decide whether or not to remain as Associates. The BIPM did not explicitly state that conditions will not change when the category of Associate was created. Prof. Göbel added that an Associate State has the right to cease to be an Associate if it disagrees with any changes.

Prof. Göbel invited the members of the CIPM to vote on whether they agreed with Draft Resolution D. There was a vote in favour, with one abstention (Prof. Ugur).

**Draft Resolution E** - On the acceptance of Economies as Associates of the General Conference was unanimously accepted without discussion.

**Draft Resolution F** - On exclusion of defaulting Member States. Prof. Kovalevsky asked if a State can become again an Associate State of the CGPM after it has been excluded. This is not mentioned in Draft Resolution F. Mrs Perent replied that the CGPM agreed at its last meeting that an application to become an Associate of the CGPM will not be considered from States which were previously a State Party to the Metre Convention. Prof. Ugur repeated a statement made earlier by Dr Quinn about the inclusion of French text in the English text of Draft Resolution F, specifically why there is a need to repeat text from the Metre Convention. Mrs Perent replied that the idea was to maintain the reference to the Metre Convention in the resolution but that it is possible to quote the relevant articles in English as well as French, with a mention that French is the authoritative language of the Metre Convention. Prof. Wallard added that the reference to the Metre Convention sets the context of the resolution.

Prof. Göbel noted that the respective defaulting Member States which may potentially be excluded will be added to the resolution following discussions in Section 16. A separate resolution will be drafted for each defaulting Member State so that the resolution can be withdrawn if the State in question negotiates a rescheduling agreement and starts making payments before the next meeting of the CGPM. The members of the CIPM voted on the draft resolution. There was unanimous acceptance of Draft Resolution F.

**Draft Resolution G** - On rescheduling agreements between the International Committee for Weights and Measures and defaulting Member States for the payment of their financial arrears. Prof. Ugur requested confirmation of how this process will work. He asked what will happen for example if a defaulting State which has failed to pay financial contributions for 5½ years enters into protracted negotiations with the BIPM. Prof. Göbel replied that if there is no actual agreement with a defaulting State, the CIPM will recommend the CGPM to take a decision regarding exclusion and the procedure defined by the CGPM will be applied. Prof. Ugur asked for the insertion of a sentence into Draft Resolution G to clarify the situation. Mrs Perent replied that it will be mentioned in the communications with the defaulting States. Dr Kaarls added that it will be clear that a rescheduling agreement must be concluded and the first instalment settled before the convocation is sent or draft resolutions with the name of the defaulting States will be included in the convocation. Prof Göbel concluded the discussion by saying that the CGPM will make the final decision on exclusions.

Prof. Göbel invited the members of the CIPM to vote on the draft resolution. There was unanimous acceptance of Draft Resolution G.

**Draft Resolution H** - On a Convention on privileges and immunities of the BIPM.

**Draft Resolution I** - On the revision of the *mise en pratique* of the metre and the development of new optical frequency standards.

**Draft Resolution J** - on the adoption of a common terrestrial reference system.

No comments were made on these draft resolutions.

Prof. Göbel invited the members of the CIPM to vote on Draft Resolutions H, I and J. There was unanimous acceptance of Draft Resolutions H, I and J.

### 6.3 Interactions with governments before the CGPM

Prof. Kühne outlined his contacts with some representatives of governments since the 98th meeting of the CIPM. A number of contacts were made during the preparation of the programme of work and budget for 2013–2016. Regular contact was maintained with the French *Ministère des Finances, de l'Économie et de l'Industrie*, and Prof. Kühne met with Peter Mason, Chief Executive of the UK National Measurement office (United Kingdom), during the NMI Directors' meeting in June 2010. Contact was made with Prof. Humberto Brandi from the Inter-American Metrology System (SIM) during the recent JCRB meeting. A meeting with the Department of State in the United States of America confirmed that the USA is expected to recommend a 0% increase in the BIPM's dotation for 2013–2016 but clarification of the areas of work that the Department of State considered to be important, namely cancer treatments and the development of drugs to treat diabetes was ascertained. Prof. Kühne also met with government representatives from Germany, Russia and Japan. A meeting with government representatives from China resulted in support for an increase in the BIPM's dotation. A further visit to the Department of State in the USA is planned before the next meeting of the NMI Directors in May 2011. Prof. Kühne is actively seeking more contacts with governments.

Prof. Göbel thanked Prof. Kühne for his presentation.

### 6.4 Arrangements for the 2011 meetings of the CGPM and CIPM

The 24th meeting of the CGPM will be held from Monday 17 October 2011 to Friday 21 October 2011 at the *Centre de Conférences Ministériel du Ministère des Affaires Étrangères et Européennes, 27, rue de la Convention, Paris 15<sup>e</sup>*<sup>1</sup> in a room offered by the *Ministère des Affaires Etrangères et Européennes de la République Française*. Delegates will be invited to a reception at the German Embassy in Paris and there will be an opportunity for delegates of the CGPM to tour the scientific laboratories of the BIPM followed by a reception in the grounds of the Pavillon de Breteuil.

There will be no NMI Directors' meeting on Wednesday 19 October 2011 as this has been brought forward to May 2011. The CIPM will meet in the week beginning 10 October 2011 prior to the meeting of the CGPM.

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<sup>1</sup> Following the withdrawal of the offer by the Foreign Affairs Ministry in June 2011, the new location is at the *World Organization for Animal Health, 12, rue de Prony, Paris 17<sup>e</sup>*.

The 100th meeting of the CIPM will take place in 2011 and a celebration is planned.

Mrs Perent will make a presentation on changes to the BIPM's accounting system during the CIPM meeting on Friday 15 October 2010. The BIPM is moving from a cash accounting system to an accrual basis of accounting system applying the International Public Sector Accounting Standards. This has consequences on the process of approval of the BIPM financial statements which have to be approved by the CIPM shortly after the issuance of the auditors' report. Therefore from 2011 onwards the CIPM will meet in May or June instead of October.

In 2011 the CIPM will meet in May. There will be a meeting of the bureau of the CIPM on 23 May 2011 followed by a meeting of the CIPM on 24 May 2011 to approve the 2010 financial statements. The NMI Directors will meet on 25 May 2011 and this will be followed by a meeting of representatives of Member States on 26–27 May 2011.

Prof. Göbel asked if there were any objections to this revised schedule. None were received.

## **7. PRESENTATION OF THE BIPM SCIENCE PROGRAMMES - REPORTS FROM SCIENCE DEPARTMENT DIRECTORS**

The BIPM's Science Department Directors gave reports on the activities of their departments since the 98th meeting of the CIPM.

Prof. Göbel thanked the Science Department Directors for their presentations and opened the floor for questions and comments.

Prof. Göbel asked Dr Wielgosz about the quality of data in the HITRAN database. Dr Wielgosz replied that funding is being sought in the EMRP call to develop high quality spectroscopic data for entry into databases such as HITRAN.

Dr Kaarls asked Dr Arias about the new definition of Coordinated Universal Time (UTC) and the associated decision making process. Dr Arias replied that there have been discussions to agree on a new definition of UTC for the last 10 years. Keeping the relationship between UT1 and UTC relies on adding leap seconds, making UTC inadequate for applications requiring a continuous time scale as a reference. UTC in its present definition is no

longer necessary for celestial navigation, and a survey sent to NMIs indicated that the application of the leap second requires 440 man-hours of work in the laboratories. The proposal is therefore to drop the leap second. The International Telecommunications Union (ITU) has a protracted decision making process involving working parties and study groups. Study Group 7 took over the decision making process in 2009 and a draft resolution is ready to be submitted to the Member States of the ITU. Dr Lewandowski added that Study Group 7 is planning to send a questionnaire with the draft resolution to Member States to get their opinion, in preparation for the vote that will take place at the World Radio Conference in February 2012. It is requested that 70 % of participants support the change for adopting the recommendation.

Dr Inglis asked about the work being undertaken by the BIPM Chemistry Department in the organic area. He queried what would happen if the BIPM were unable to carry out all of the planned work in organic chemistry and where the work would be done. Dr Wielgosz replied that the BIPM chemistry programme is limited to primary calibrator studies and comparisons. No laboratories are ready to organize the comparisons and there is a big difference in workload between organizing comparisons and participating in them. The CCQM has carried out 77 comparisons in the organic chemistry field over the last 17 years, but these have been led by a small number of institutes. If the BIPM does not carry out the purity comparisons in the organic field, NMIs with substantial capabilities and experience in the field (such as the NIST or the LGC) will need to volunteer to do so, although this is a long-term commitment that the NMIs may not want to take on. Dr Inglis asked if additional funding was required to continue with the existing programme of work in organic chemistry. Dr May stated that it was incorrect to say that if the BIPM were unable to carry out the comparisons in the organic field, NMIs such as NIST would take them on. He stated that the BIPM is working in unique areas focusing on the 'metrology of purity' and this is not a long-term activity that the NIST can take on.

Dr Valdés asked if there was a standard for insulin and whether any funding was available from companies for the BIPM's work on insulin. Dr Wielgosz replied that a letter from manufacturers had been sent to the WHO with a copy to the BIPM requesting the need for the development of an international standard for insulin expressed in SI units. It is possible that in the future a pharmaceutical company may be forthcoming with funding for a post-doc position in the insulin standard research programme.

## 8. REPORTS FROM CONSULTATIVE COMMITTEES

### 8.1 Consultative Committee for Mass and Related Quantities (CCM)

Dr Tanaka presented papers on the International Avogadro Coordination (IAC) (document CIPM/2010-27) which is closing in March 2011 and the recent work of the Consultative Committee for Mass and Related Quantities (CCM) (document CIPM/2010-28). The Avogadro group has put considerable effort into modelling the surface layer of the silicon spheres. Work is ongoing to determine the exact chemical composition of the surface layer of the silicon spheres. The latest results in determining the value of the Avogadro constant,  $N_A$ , from the silicon spheres has an uncertainty of  $3 \times 10^{-8}$ . There nevertheless remains a relative difference of the IAC  $N_A$  result of  $+1.6(6) \times 10^{-7}$  to the CODATA 2006 recommended value, which is essentially determined by the NIST watt balance result. Meanwhile, the difference of the IAC  $N_A$  result to NPL's watt balance result is at present  $+1.4(2.0) \times 10^{-7}$  according to NPL's published value and its newly-increased uncertainty.

It may be necessary to have the sphere re-polished to achieve improved results. Resources are available to continue with the work of the IAC although it is likely that the work will be coordinated by the CCM Working Group on the Avogadro Constant (CCM-WGAv). NMIJ will continue to measure diameters, the BIPM will continue to work towards the dissemination of the new definition of the kilogram and the PTB will continue its many activities in support of  $N_A$  measurement via silicon spheres for 2–3 years.

Prof. Göbel complimented the IAC team and commented that it was an excellent example of international collaboration in metrology.

Dr Miles stated that there will be a special issue of *Metrologia* on the Avogadro project in 2011. It will describe all of the contributing experiments.

Dr Schwitz asked where the discrepancy in the IAC Avogadro result for natural silicon has come from. Dr Tanaka replied that the probable cause was the molar mass determinations. This was the motivation for moving to enriched silicon-28. Even with enriched silicon, the molar mass must still be determined (Isotope Dilution Mass Spectrometry, or IDMS, seems to be the best method) and it would be desirable if a second laboratory could confirm

the measurements. It seems unlikely that the molar mass of the spheres made of natural silicon will ever be determined to the required accuracy, as IDMS is not practical in this case. Prof. Göbel stated that NIST has agreed to make measurements using IDMS.

Dr Quinn highlighted a potential dilemma in that there may be many measurements of the Avogadro constant from watt balance experiments but only one from the IAC. Prof. Göbel replied that this is a problem for CODATA.

Dr Schwitz stated that he thought the silicon experiments were not appropriate for the *mise en pratique*. Dr Quinn disagreed; pointing out that work at the BIPM may show that a silicon sphere is a very stable artefact. Dr Davis added that the *mise en pratique* will include the mass of silicon spheres, traceable to fundamental constants. Prof. Kühne commented that by the time of the redefinition of the kilogram, silicon spheres may represent a primary realization of the kilogram. A decision will be needed on which parts of the experiment on the silicon spheres will need to be repeated in the future. Mr Picard noted that it will be particularly important to monitor the surface layers.

Prof. Göbel queried the best way to proceed with the silicon spheres. The IAC will close in March 2011 but coordination work on the Avogadro project could continue within the CCM and CCM-WGAv. There is a question over the ownership of the silicon spheres. They were funded by all of the members of the IAC and they will remain the property of the NMIs that contributed. The proposal is that the spheres would remain at the BIPM in the long term, where the BIPM pool of artefacts could be compared to them. Legal advice may be required to confirm this arrangement. Prof. Kühne stated that under the terms of the contract the spheres will be stored at the BIPM and questioned the need for an extra contract. Prof. Göbel commented that the question is over the ownership of the spheres as they were paid for by the NMIs. The matter needs to be settled formally.

Dr Tanaka gave a brief presentation of the recent work of the Consultative Committee for Mass and Related Quantities (CCM) including the meeting of the CCM which was held from 22–26 March 2010 at the BIPM. This was a special meeting and workshop organized to debate and resolve various important issues related to the new definition of the kilogram and its *mise en pratique*. (The full CCM will meet in May 2011). Various CCM working groups and task groups met during the week, including the WG on Key

Comparisons, which is composed of chairpersons of the WGs. The CCM WGSi-kg organized the workshop, which was held on 25 March 2010. The CCM plenary meeting on the following day formally addressed the redefinition of the kilogram. Two recommendations were adopted at the CCM meeting: Recommendation G 1 (2010) Considerations on a new definition of the kilogram; and Recommendation G 2 (2010) On the use of the international prototype of the kilogram to confirm the traceability of the BIPM prototypes.

The CCM Working Group on Gravimetry (WGG) met at the VNIIM, St. Petersburg, on 22 June 2010 to discuss what arrangements are needed when the BIPM stops hosting future International Comparisons of Absolute Gravimeters (ICAGs). Walferdange, Luxembourg, is the likely site of ICAG 2013, with METAS as the pilot laboratory, although no final decision has been made for 2013 and subsequent comparisons.

Prof. Göbel asked for clarification about a decision taken at the 98th meeting of the CIPM in 2009 regarding the keys for the vault. A mandate was agreed in 2009 whereby the vault could be opened at any time if the IPK was needed for a comparison. Certain procedures must be followed, including obtaining written authority from the CIPM and that the vault is opened in the presence of a member of the CIPM. Dr Inglis asked when the IPK might be required. Mr Picard replied that it may be necessary to compare the IPK and the Si spheres in 2011 or 2012 depending on progress made on the Avogadro project. A test mass for the NIST watt balance may be required during 2011 and, perhaps, for other watt balances as well. He noted that, while the NIST and NRC (ex NPL) watt balances can accommodate 1 kg mass standards, the maximum capacity of other watt balances under construction is somewhat less.

Dr Quinn asked for clarification as to whether the IPK should be cleaned prior to its use in a potential comparison in 2011–2012. For the third verification in 1988 it was decided that the IPK should be cleaned before the comparison. The CIPM should decide if its decision of 1989, that the mass of the IPK is as it is after cleaning, still applies. Prof. Kühne stated that it would be sensible to clean the IPK using the same method as in 1988. Dr Davis stated that cleaning the IPK is part of the current *mise en pratique* although the wording will be checked before further discussion. The CIPM decided unanimously that the IPK should be cleaned prior to its use in next comparisons.

## 8.2 Consultative Committee for Amount of Substance - Metrology in Chemistry (CCQM)

Dr Kaarls presented a paper (document CIPM/2010-24) on the recent work of the Consultative Committee for Amount of Substance - Metrology in Chemistry (CCQM). There are seven permanent active working groups in the CCQM. The *ad hoc* Working Group on Efficient and Effective Testing of CMC claims (EETWG), chaired by Dr Turk, NIST, has been closed, because this Working Group has accomplished its tasks. During the CCQM Working Group meetings in Rio de Janeiro, Brazil, in November 2009, the CCQM *ad hoc* Working Group on the Key Comparison Reference Value (KCRVWG), chaired by Prof. Cox (NPL) agreed that Prof. Cox and Dr Ellison (LGC) would draft a guidance document giving an overview of the possible ways of calculating the Key Comparison Reference Value (KCRV) and considerations on when to apply certain types of statistical calculations. In general, the CCQM participants decided that the use of complicated statistics in key comparisons was not justified. Nevertheless, it was agreed that a CCQM guidance document may help to harmonize the different approaches with respect to the calculation of the KCRV in the different CCQM WGs. Dr Kaarls spoke about the possible redefinition of the mole. The majority of the CCQM is in favour of a redefinition of the mole although there were calls for IUPAC to be more active in communicating the redefinition of the mole to the wider chemical community. Results for the molar mass of  $^{28}\text{Si}$  between PTB and IRMM were discrepant by 0.4 ppm and it is likely that this discrepancy is due to contamination of the  $^{28}\text{Si}$  sample with natural abundance Si at IRMM during manipulations.

Dr Kaarls gave details of the CCQM workshop on Metrology for Forensic Science – Chemical and Biochemical Analysis which was held at the BIPM headquarters on 12 April 2010. Cooperation between the CCQM, BIPM and forensics communities will continue. Dr Kaarls detailed the work of the CCQM Working Groups. Some 225 scientists from the NMIs, DIs and other organizations are directly contributing to the work of the CCQM by attending the CCQM WG meetings and participating in the Key Comparisons (KCs) and Pilot Study comparisons. At present 129 different Pilot Study comparisons and 89 different Key Comparisons have been carried out, are in progress or are planned for the near future. A CCQM workshop is planned for 2011 on Microbiology and milk with possible cooperation with the International Dairy Federation (IDF).

Prof. Göbel thanked Dr Kaarls for his presentation and commented on the extensive workload carried out by the CCQM.

Prof. Mills reiterated that the new definition of the mole should be more widely publicized. The International Union of Pure and Applied Chemistry (IUPAC) and the Interdivisional Committee on Terminology, Nomenclature and Symbols (ICTNS) both support the change in definition. A paper on the redefinition of the mole was published in the IUPAC journal. Prof. Mills discussed the redefinition of the mole with the American Chemical Society (ACS) at a meeting in San Francisco where some delegates expressed the opinion to Prof. Mills that their preference is to keep the current definition.

Dr May stated that it would be timely to have a series of articles in the chemical literature to explain the new SI. Prof. Göbel agreed that this idea should be followed up. Dr May will use his contacts in the ACS to obtain a list of journals.

Dr Wielgosz stated that it is important to explain why there is a need to change the definition of the mole. The change will require the re-writing of many textbooks and it is vital that information about the change is communicated well in advance and in parallel with a campaign to raise awareness of the impending change to the definition of the mole.

Prof. Issaev asked about the level of cooperation between the BIPM and ISO because some ISO documents are used by the CCQM. Dr Kaarls replied that there is close cooperation with ISO/REMCO and in other areas. The importance of the BIPM to have representatives on all relevant ISO TCs was highlighted although this was recognized as not always being possible.

Prof. Issaev raised concerns over quality reviews in the RMOs and Prof. Göbel agreed that there is a need for more harmonization of quality and accreditation procedures.

Two recommendations from the CCQM were noted by the CIPM:

- Recommendation Q 1 (2009): On the possible redefinition of the mole and the kilogram, and
- Recommendation Q 1 (2010): On monitoring the global climate and collaboration with the WMO.

### 8.3 Consultative Committee for Ionizing Radiation (CCRI)

Dr Carneiro presented a paper (document CIPM/2010-19) on the recent work of the Consultative Committee for Ionizing Radiation (CCRI). The CCRI held an extraordinary meeting at the BIPM headquarters on 19 May 2010 to discuss issues prior to the next meeting of the CGPM in October 2011, to produce an interim report on developments within the CCRI and to discuss the possible installation of a linear accelerator (linac) at the BIPM premises. Dr Carneiro presented figures in support of the linac. Six million cancer patients are treated using linacs each year and the medical community has requested an improvement in the accuracy of the delivery of doses from  $\pm 5\%$  to  $\pm 3\%$ . It is estimated that, world-wide, 11% of patients receiving treatments are affected by problems with the measured dose. The installation of a linac at the BIPM would be a major step towards achieving the goal of improving the accuracy of doses. The Working Group on Accelerator Dosimetry (ADWG) is investigating funding for the linac. Dr Carneiro thanked the BIPM for the active role it has taken in support of the linac project, discussed the various stakeholders in the linac project and suggested that a common strategy and action plan for the project should be formulated. Dr Carneiro made a special mention of the BIPM's *Système International de Référence* (SIR) which is used to set a common scale for 65 radionuclides. The SIR is a unique and robust system that is not duplicated anywhere else in the world. The new mammography and brachytherapy dosimetry comparison facilities are also unique. Dr Carneiro concluded his presentation by announcing that Dr Bruce Simpson (NMISA), chairperson of CCRI(II) from 1997 to 2010, has retired and that the new chairperson from 2011 will be Dr Lisa Karam (NIST). The KRISS, Republic of Korea, has made a formal application to join CCRI(I).

Dr Quinn agreed that the SIR is a unique facility and asked how it could be replaced if anything happened to it. Dr Carneiro replied that a backup procedure is in place and the SIR could be reproduced in the event of a catastrophic failure of the main ionization chamber.

### 8.4 Consultative Committee on Thermometry (CCT)

Prof. Ugur reported on the recent work of the Consultative Committee on Thermometry (CCT) (document CIPM/2010-05). He commented that since the last meeting of the CCT in 2008 the committee has implemented the

proposal to separate the administrative work from the scientific work of the CCT. Prof. Ugur presented three recommendations to the CIPM:

- Recommendation T 1 was the proposed mission statement of the CCT as decided in the last meeting of the CIPM (2009). Prof. Göbel asked for comments on the recommendation before putting it to the vote. The CIPM welcomed and accepted Recommendation T 1 as a CCT recommendation.
- Recommendation T 2 was the follow-up of a previous recommendation regarding the re-definition of the kelvin with a renewed timetable. Prof. Göbel invited comments on the recommendation before putting it to the vote. The CIPM welcomed and accepted Recommendation T 2 as a CCT recommendation.
- Recommendation T 3, concerned the relationship of the CCT to the WMO. The CCT agreed that this recommendation was necessary since the instrumentation used for meteorological and climate studies falls within the scope of WG2. A redraft of the recommendation with a wider scope is preferred. Prof. Göbel invited comments on the recommendation before putting it to the vote. The CIPM welcomed and accepted Recommendation T 3 as a CCT recommendation.

Regarding Recommendation T 2, Prof. Ugur expressed concern that the CODATA value for the Boltzmann constant,  $k$ , was derived from only one experiment that had not been repeated. Prof. Ugur is stepping down as President of the CCT after its 26th meeting in the second quarter of 2012. Prof. Ugur's successor will be nominated in the 100th meeting of the CIPM in 2011. Prof. Quinn thanked Prof. Ugur for his work as President of the CCT and commented that it was good to see the CCT in such good shape.

## 8.5 Consultative Committee for Units (CCU)

Prof. Mills presented the work of the Consultative Committee for Units (CCU) since the last CIPM meeting (document CIPM/2010-14). He spoke of the last meeting of the CCU which was held at the BIPM headquarters on 14–16 September 2010. The main topic of that meeting was the proposed revisions to the SI, concerning a possible redefinition of some of the base units and a new format for the presentation of the entire system. The particular conclusion of the meeting was the preparation of Recommendation U 1 (2010) “On the future revision of the International

System of Units, the SI” (document CIPM/2010-06), to be presented to the CIPM for consideration in the drafting of a resolution for adoption by the CGPM at its next meeting in October 2011. The proposed changes to the SI include the redefinition of the kilogram, kg, ampere, A, kelvin, K, and mole, mol, in terms of fixed numerical values of the Planck constant  $h$ , the elementary charge  $e$ , the Boltzmann constant  $k$ , and the Avogadro constant  $N_A$ , respectively. In addition a new format was proposed for the presentation of the whole system of units. There are three aspects to these proposed changes as seen by the CCU, which are as follows:

- The CCU recognized that there remain small but significant discrepancies between the value of the Planck constant deduced from watt balance experiments and the value to be announced from the Avogadro  $^{28}\text{Si}$  work, therefore it is premature to recommend final adoption of the newly proposed unit definition at this time.
- The CCU preferred neither to discuss nor to make recommendations as to the date on which the new SI might be adopted, or the conditions to be satisfied before adopting the new definitions.
- However, the CCU was firmly of the opinion that it is now time to declare to the wider scientific and user public exactly what is to be proposed so that it can be properly and openly discussed. To this end the detailed Recommendation U 1 (2010) “On the future revision of the International System of Units, the SI”, was drawn up.

Prof. Mills gave details of the format for the definitions of the ampere, kilogram, kelvin and mole, and explained the use of the explicit-constant format to define a unit in terms of a fixed numerical value of a fundamental constant.

Prof. Göbel thanked Prof. Mills for his presentation.

Dr Valdés made reference to the presentation he gave on 12 October 2010 which offered an alternative to Recommendation U 1 (2010). The presentation developed by Dr Valdés and Dr Tanaka and Dr Bich at INRIM is based on the distinction between base and derived units and proposes alternative formulation for the individual definitions of the base units. It highlighted the objections to Recommendation U 1 (2010) and proposed an alternative. The alternative proposal has the following advantages:

- It calls for definitions to be more understandable and easier to teach by explaining the relationship between the defined unit and a given fundamental constant in the definition itself.
- It avoids circularity by avoiding the use of the word being defined in the definition.
- It avoids using the word ‘scaling’.

Prof. Göbel stated that he agreed with much of what was suggested in Dr Valdés’ presentation but cautioned that no change be made to the definition of the kilogram based on the Planck constant. He was of the opinion that there are other weaknesses in Dr Valdés’ presentation, such as using the Broglie-Compton frequency, which is not used elsewhere. Dr Kaarls stated that the alternative definitions were less easy to understand than those proposed by Prof. Mills. Dr Stock queried the alternative proposal for the kilogram presented by Dr Valdés as it did not specifically define 1 kilogram. Dr Valdés replied that each definition is in two parts, the first part is explanatory and the second part is the definition.

Prof. Issaev suggested that too much emphasis is being placed on using the Planck constant in the redefinition of the kilogram, which could lead to the exclusion of other methods of realization. Prof. Göbel replied that there is no suggestion that the watt balance is the only way forward and that the door is always open for other methods. Dr Carneiro suggested that any decisions taken now regarding the redefinitions will not last forever as new research will probably lead to improved methods of defining the SI units in the future. The members of the CIPM should decide what would be sufficient to allow presentation of Draft Resolution A to the CGPM at its meeting in October 2011.

Dr Bennett queried if the new definitions will be easy to understand and if there is any merit in having longer, more comprehensive definitions. Prof. Kovalevsky stated that the CIPM should concentrate on publicizing what has been done towards advancing the new definitions of the SI so far and that actual numerical values for the constants are not yet available. It should also be made clear that there is ongoing work to arrive at the new definitions. Prof. Kühne commented that it is evident that numerical values for all constants cannot be fixed yet but that a start can be made. It is unnecessary to be too prescriptive over the wording of the definitions because this will be agreed in the future.

A discussion of Recommendation U 1 (2010) by the members of the CIPM determined that it is not a final proposal on the future revision of the SI, instead it will stimulate debate relating to Draft Resolution A to be presented to the CGPM at its meeting in October 2011.

Dr Schwitz expressed concerns about the use of the word ‘new’ when discussing the redefinition of SI units, asserting that they cannot be classified as ‘new’ until the redefinitions are complete. Dr Thomas replied that ‘new SI’ and ‘new SI unit’ indeed do not appear in the CCU Recommendation.

No objections to Recommendation U 1 were raised. Prof. Göbel stated that he will seek formal approval for the revised Draft Resolution A on the final day of the meeting of the CIPM (as can be seen from page 43 the approval was obtained). Prof. Göbel thanked Dr Mills for his presentation.

## **8.6 Consultative Committee for Electricity and Magnetism (CCEM)**

Dr Inglis reported that the Consultative Committee for Electricity and Magnetism (CCEM) had not met since the last meeting of the CIPM in October 2009, although some of the working groups of the CCEM had met during a meeting of the Conference on Precision Electromagnetic Measurements (CPEM) held in the Republic of Korea in June 2010. The Working Group on Strategic Planning (WGSP) produced a paper on the ‘Grand Challenges’, which is available at <http://www.bipm.org/utis/common/pdf/CCEM-WGSP-2009.pdf>. The Working Group on Electrical Methods to Monitor the Stability of the Kilogram (WGKG) met to update progress on the watt balance experiments.

## **8.7 Consultative Committee for Length (CCL)**

In the absence of Dr Sacconi, the report on the work of the Consultative Committee for Length (CCL) was given by Dr Robertsson, Executive Secretary of the CCL. He reported that there had not been a meeting of the CCL since the last meeting of the CIPM in October 2009. The restructuring of the CCL Working Groups, agreed at the last meeting of the CIPM, has been implemented. The Working Groups met in Singapore in June 2010 and the new structure was successful.

## 8.8 Consultative Committee for Time and Frequency (CCTF)

Mr Énard reported that although there had not been a meeting of the Consultative Committee for Time and Frequency (CCTF) since the last meeting of the CIPM in October 2009, various activities have taken place. An agreement has been reached with EURAMET over the calibration of the Global Navigation Satellite System (GLONASS) and discussions were continuing over the weakness of the definition of UTC. Improvements in the calculation of UTC are ongoing and a new caesium frequency standard from the NPL has been accepted for use in the calculation of UTC. An application has been received from the SP (Sweden) to become a member of the CCTF.

## 8.9 Consultative Committee for Photometry and Radiometry (CCPR)

The report on the activities of the Consultative Committee for Photometry and Radiometry (CCPR) was given by Dr Stock, Executive Secretary of the CCPR, due to the absence of Dr Hengstberger. There has been no meeting of the CCPR since the last meeting of the CIPM in October 2009, although the Working Groups met at the NPL. A comparison analysis workshop was held and a new task group on terahertz radiation established.

A paper reviewing the evolution of optical radiation measurements and their consequent impact on the definition of the candela has been published by some members of the strategy working group. The monograph on *Principles governing photometry* [<http://www.bipm.org/utis/en/pdf/Monographie1983-1.pdf>] of 1983 is being rewritten and will form a new *mise en pratique* for the candela. A discussion has begun in the CCPR if the candela should be redefined in terms of a photon intensity, without any clear conclusion up to now.

Dr Quinn strongly opposes the reformulation of the definition of the candela in terms of photons rather than light. Dr Stock explained that although the current definition of the candela is adequate for the traditional lighting industry, some laboratories would prefer a definition based on photons to make the candela more useful for emerging fields, for example, photon radiometry.

### 8.10 **Consultative Committee for Acoustics, Ultrasound and Vibration (CCAUV)**

Prof. Valdés, President of the Consultative Committee for Acoustics, Ultrasound and Vibration (CCAUV), reported that there had not been a meeting of the CCAUV since the last meeting of the CIPM in October 2009 but that the next meeting of the CCAUV will be held in the week immediately after the current CIPM meeting (18–21 October 2010). Prof. Valdés mentioned the data from the KCDB which showed the linking of seven key comparisons in both acoustics and in vibration. These examples were an excellent demonstration of the effectiveness of the CIPM MRA. Dr Allisy-Roberts will step down as Executive Secretary of the CCAUV from 1 January 2011 and will be succeeded by Dr S. Picard.

Prof. Göbel thanked Dr Allisy-Roberts for her work as Executive Secretary and welcomed Dr S. Picard as her successor.

### 8.11 **Timetable of future meetings**

CCM	9–13 May 2011
CCQM	8–13 April 2011 (WGs)
	14–15 April 2011 (Plenary session)
CCRI(I)	2–6 May 2011 (including Working Groups)
CCRI(II)	20–24 June 2011 (including Working Groups)
CCRI(III)	30 March–1 April 2011
CCRI	24 June 2011
CCT	21–25 May 2012
CCU	Week beginning 1 October 2012
CCEM	14–18 March 2011
CCL	April or June 2012
CCTF	April or June 2012
CCPR	March or April 2012
CCAUV	18–21 October 2010 (including Working Groups)

## 8.12 Changes to CC membership

The following changes were approved.

CCM:	IPQ as Observer
	BEV as Member
	LATU as Observer
CCQM:	INRIM as Member
CCRI(I):	KRISS as Member
CCTF:	SP as Member
CCT:	IPQ as Member

Consideration of other changes was postponed until the next meeting of the CIPM. It was noted that CEM will be invited to the next meeting of the CCEM. CMS/ITRI is from an Associate Economy and therefore cannot be Member or Observer. CMI will be invited to the next meeting of the CCPR to make a presentation.

## 9. REPORT ON THE PRESENT STATUS OF THE CIPM MRA

### 9.1 Report from the Joint Committee of the Regional Metrology Organizations and the BIPM (JCRB)

Mr Mussio, Executive Secretary of the JCRB until 30 September 2010, presented the report CIPM/2010-15. The JCRB continues to operate actively and effectively, meeting twice a year to monitor and discuss the operational aspects of the CIPM MRA. The 24th meeting of the JCRB was held on 16-17 March 2010 at the BIPM headquarters and the 25th meeting on 22-23 September 2010 at Sharm el Sheik, Egypt.

Mr Mussio presented Recommendation 24/1 to the CIPM. The JCRB recommends that the following policy is incorporated into the document on inclusion of the 5 year review period for quality systems (QSs) at NMIs (CIPM MRA-G-02). *The initial and periodic presentations of the QS of DI to the corresponding QS review panel of the RMOs, must be done directly by the responsible person of the DI and not through its NMI. In the same sense, the QS annual reports must be also prepared and submitted directly by the DI.* Changes to the document were approved after a brief discussion to

decide whether some DIs are in fact Delegated Institutes rather than Designated Institutes.

Prof. Mussio also presented Recommendation 25/1 to the CIPM. The JCRB recommended that the CIPM approves the following three documents:

- CIPM MRA-D-05 - Measurement comparisons in the CIPM MRA

This general document on measurement comparisons was submitted to the CIPM in 2009, and following review the CIPM requested a different consideration for Pilot Studies. It was considered that as Pilot Studies have a different process to that for comparisons, so the procedures for conducting Pilot Studies should be excluded from document CIPM MRA-D-05 and a separate document will be prepared.

Dr Wielgosz stated that in the CCQM there are many more Pilot Studies than comparisons and these are not formally part of the CIPM MRA. Dr Kaarls added that Pilot Studies can provide useful supporting information for comparisons but agreed that it was preferable to have the information in a separate document. Prof. Kühne noted that the JCRB had carried out the instructions of the CIPM and document CIPM MRA-D-05 was now ready for approval.

- CIPM MRA-D-04 – Calibration and Measurement Capabilities in the context of the CIPM MRA

This new version of the document includes the new traceability policy for CMCs and a general editorial review. Mr Mussio added that feedback suggested that there was a general consensus to relax the policy, but the JCRB considered that the document should be kept strictly within the terms of the CIPM MRA.

- CIPM MRA-G-02 – Guidelines for the monitoring and reporting of the operation of quality systems by RMOs.

New chapters 4 and 5 include the policy on periodic review of quality systems. The CIPM has already reviewed these documents and its concerns have been fully addressed. The modifications raise no new issues. The guidelines have been accepted by all RMOs as the minimum requirements.

The three documents presented, were approved by the CIPM and will be placed on the BIPM web site.

Mr Mussio stated that the Chairman of the JCRB has been in contact with the International Atomic Energy Agency (IAEA) about reviewing its quality

system. How to review the quality system of an IGO is under discussion by the JCRB. He also stated that the number of DIs is increasing and they often have very few CMCs. This causes a lot of work for the JCRB and the KCDB and the criteria to become a DI have therefore been questioned. At the moment all that is required is a letter from the signatory. A task group will be created to discuss this issue.

Prof. Göbel thanked Mr Mussio for his work as Executive Secretary of the JCRB.

## 9.2 Report on the BIPM key comparison database (KCDB)

Dr Thomas gave a report (CIPM/2010-03) on the KCDB for the period September 2009 to September 2010. As of 11 October 2010 there were 23 300 CMCs in the KCDB. There were also 719 key comparisons (KCs) and 250 supplementary comparisons. The KCDB contained final reports for 65 % of registered comparisons and 1 530 graphs of equivalence. From January to August 2010, the KCDB received on average 7 200 visitors each month. These visitors viewed more than 100 000 KCDB pages and the average duration of each visit is steadily increasing. The next issue of the KCDB Newsletter (Number 14) will be published in December 2010.

Dr Carneiro enquired how nanometrology could be made more visible within the KCDB. Dr Thomas commented that few CMCs are specific to nanometrology and that they are relevant to different areas such as chemistry and length. Creating an area specifically for nanometrology is inadvisable because it crosses subject boundaries, however flagging CMCs that relate to nanometrology is feasible.

Dr Carneiro commented that the KCDB is very successful but questioned its efficiency. To determine the efficiency of the KCDB the number of comparisons made could be compared with the number of CMCs declared to indicate the cost per CMC. The number of CMCs and KCs added to the KCDB in the last 5 years has grown. It was expected that the number of new KCs registered over one year would remain stable, so a benchmarking exercise was recommended. Prof. Kühne stated that each NMI has its own way of presenting CMCs and recommended that the procedure is standardized. The JCRB's request for a workshop on the CMC review process could possibly be extended to include the presentation of CMCs. ILAC would like to establish a joint vocabulary.

A brief discussion followed on the feasibility of organizing a questionnaire for users of the KCDB to determine which communities outside metrology used the database. There are some technical barriers to overcome before this is possible.

### **9.3 Proposed revision of the CIPM MRA**

Prof. Kühne presented documents CIPM/2010-20 and CIPM/2010-21 on the proposed revision of the CIPM MRA. The revision process will be carried out in 2 stages. Firstly, an addendum has been produced which addresses issues such as changes in the names of standards and the agreement with ILAC on the definition of the term “CMC”. If an agreement on the addendum is reached by the members of the CIPM, the document will be presented to the next meeting of the NMI Directors for discussion and approval. The second stage of the revision process is more complex and will involve discussion of the developments relating to the operation of the CIPM MRA during its first 10 years. It is generally agreed that the CIPM MRA needs some revision but does not require a full re-write. It was agreed to go through document CIPM/2010-20 point-by-point.

#### **9.3.1 Change in the name of the arrangement**

It was agreed by the members of the CIPM that the MRA of the CIPM shall be referred to as the “CIPM MRA” in all circumstances.

#### **9.3.2 Reference to States and Economies**

All references to “Members of the Metre Convention” in the CIPM MRA shall be understood as “States Parties to the Metre Convention as well as States and Economies Associates of the CGPM”. Following a discussion about the phrase ‘States Parties to the Metre Convention’, Prof. Göbel concluded that the expression ‘States Parties’ is a terminology used in other international organizations and that it should be adopted. This was agreed by the members of the CIPM.

#### **9.3.3 Changes in references to standards concerning Quality Systems**

ISO Guide 25 has been superseded by the standard ISO/IEC 17025:2005 which includes additional requirements that affect some fields of metrology, mainly for chemistry where ISO Guide 34:2009 establishes requirements for producers of certified reference materials. Similarly, ISO Guide 58 has been

superseded by ISO/IEC 17011:2004. These changes should be included in the revised version of paragraph 7.3 of the CIPM MRA.

Prof. Kühne stated that the NMIs want to specify dated standards which then should be revised when appropriate. ISO/IEC 17011 is an undated standard which applies to accredited bodies rather than NMIs. Prof. Ugur suggested incorporating relevant standards into an annex of the CIPM MRA. Any future changes to the standards would not require a change to the text of the CIPM MRA. Prof. Kühne stated this was an interesting suggestion although it would represent a change to the CIPM MRA and will be considered in the future. Following a discussion on whether or not to use dated standards, the members of the CIPM agreed to adopt dated standards.

#### 9.3.4 Changes in the technical notes

In Technical note T.7 a CMC is expressed as the uncertainty associated to a service. The normal use of the term “CMC” adopted since the signature of the CIPM MRA implies that a CMC includes the quantity to be measured, the method used, the range, the uncertainty and, if any, the influence parameters.

Dr Kaarls noted that Technical note T.7 causes confusion and problems when discussing the subject with ILAC. The changes were agreed by the members of the CIPM.

#### 9.3.5 Changes in the definitions

The BIPM and ILAC have agreed a common definition of the term “CMC” to replace the definition originally used in the CIPM MRA. The CIPM unanimously accepted a joint BIPM/ILAC Working Group document which stated, among others, that “where the term NMI is used it is intended to include Designated Institutes (DIs) within the framework of the CIPM MRA” at its 96th meeting in 2007.

The new definition the term CMC is as follows: A CMC is a calibration and measurement capability available to customers under normal conditions:

- (a) as published in the BIPM key comparison database (KCDB) of the CIPM MRA; or
- (b) as described in the laboratory’s scope of accreditation granted by a signatory to the ILAC Arrangement.

This definition also includes a number of explicative notes (not reported here).

Dr May enquired if ‘calibration and measurement capability’ could be changed to ‘calibration or measurement capability’. Prof. Kühne replied that this would need to be referred back to ILAC. The proposed changes in the definitions were agreed by the members of the CIPM.

### 9.3.6 Amendments to the CIPM MRA

It is proposed that ‘Any amendment to the CIPM MRA shall be approved by consensus of the signatories.’ Currently changes to the CIPM MRA can only be made when all signatories agree. Approval by consensus would interpret a ‘no reply’ as an agreement. Dr Quinn pointed out that there are different definitions of consensus and that the exact definition should be specified to include ‘with no votes against’. Dr Davis proposed the term *nem con*. Prof. Kühne recommended that Mrs Perent and Ms Arlen refine the exact wording so that a general agreement can be reached by the CIPM. He also enquired if the definition of consensus could include ‘no votes against *by a certain date*’. Ms Arlen commented that adding an addendum to the CIPM MRA already constitutes a change to the document. Prof. Kühne added that it will require all CIPM MRA signatories to re-sign the document to bring the addendum into effect. The CIPM agreed that consensus means ‘consensus of signatories with no votes against’. Prof. Göbel reiterated that an explanation of consensus should be included.

### 9.3.7 Entry into force of this addendum

The following wording was agreed by the members of the CIPM. ‘The present addendum entered into force on (date), following the procedure established in paragraph 11.4 of the CIPM MRA’.

## 10. BIPM/ILAC JOINT WORKING GROUP

Mr Henson presented document CIPM/2010-12 on the joint activities between the BIPM and ILAC. He commented that the relationship between the two organizations is very strong. The BIPM and ILAC held a joint meeting in March 2010 and the outputs from that meeting were highlighted in Annex I of document CIPM/2010-12. Mr Henson participated in the meeting of the Accreditation Issues Committee (AIC) of ILAC, which was held in June 2010. The AIC is reviewing three documents: ILAC P-0 *ILAC Policy on Traceability of Measurement Results*; ILAC G2 *Traceability of*

*measurements*; and *ILAC Guidelines on the Accreditation of National Metrology Institutes*. The document CIPM/2010-12 summarizes the BIPM position on each of the three documents. Regarding document *ILAC Guidelines on the Accreditation of National Metrology Institutes*, the BIPM, following consultation with the RMOs, recommended to ILAC that this document be issued as a joint BIPM/ILAC document. This gives the metrology community more control over the content of the document. Further work will be undertaken during late 2010 with a view to finalizing the document between January and June 2011. The issue of accreditation of NMIs will be discussed at the ILAC meeting due to be held in Shanghai in late October 2010. Mr Henson commented that ILAC is always prepared to listen to the BIPM viewpoint and emphasized on the considerable amount of work involved in the preparation of the three documents.

Prof. Kühne proposed that the name of one document is changed from *ILAC Guidelines on the Accreditation of National Metrology Institutes* to *ILAC Guidelines on the Accreditation of Services of National Metrology Institutes*. This was supported by the CIPM.

## 11. **JOINT COMMITTEE FOR TRACEABILITY IN LABORATORY MEDICINE**

Dr Wielgosz briefly summarized the activities of the Joint Committee for Traceability in Laboratory Medicine (JCTLM). Full details of the activities of the JCTLM are available in the Director's Report on the Activity and Management of the BIPM for 2009–2010 (CIPM/2010-01). The JCTLM database was updated in January 2010 to include WG1 Cycle 6 reference materials and WG2 Cycle 4 reference measurement laboratory services, approved by the Executive Committee during the annual meeting held in December 2009. In May 2010, 49 reference measurement laboratory services were removed from the JCTLM database because these laboratories failed to meet the ISO 15195 and ISO/IEC 17025 accreditation application deadline. The WG1 Cycle 7 call for nominations of higher order reference materials and reference measurement methods or procedures and the WG2 Cycle 5 call for nominations of reference measurement laboratory services were announced on the JCTLM website in January 2010. An email notification was sent to 300 potential JCTLM contributors. As of May 2010, 42 nominations for materials, 30 nominations for procedures and

4 nominations for services had been received, and these were sent to review teams for evaluation. An external contractor was appointed to redesign and update the JCTLM database which was necessitated by the revision of ISO 15194 and changes to the JCTLM nomination forms. The new web-based version was made available in March 2010. The BIPM wrote to the European Commission to request that the role of the JCTLM Database in support of the *in vitro* diagnostic (IVD) directive be acknowledged. The Global Harmonization Task Force's specialized group for IVDs has been asked to include requirements for metrological traceability in its specifications for IVDs.

There were no questions from the CIPM. Prof. Göbel thanked Dr Wielgosz for the report.

## **12. CONTACTS WITH OTHER INTERGOVERNMENTAL ORGANIZATIONS AND INTERNATIONAL BODIES**

Prof. Wallard presented the report CIPM/2010-22 which summarizes the BIPM's activities with other intergovernmental organizations and international bodies. The BIPM's work with ILAC is reported separately (see section 10). Mr Henson will update a document which sets out exactly what the BIPM hopes to achieve from its contacts with each intergovernmental organization and international body.

### **12.1 OIML**

Prof. Wallard commented that contact with the OIML is a work in progress and that details of a potential rapprochement between the BIPM and the OIML will emerge over the next 6–9 months following a number of changes in personnel at the OIML.

Prof. Issaev stated that Peter Mason, the new president elect of the CIML from October 2011, will implement Resolution 3 of the 44th meeting of the CIML regarding possible rapprochement between the BIPM and the OIML. A final decision is expected in October 2012.

## 12.2 **WMO, WHO, WTO, CIE, ISO/IEC, ISO/CASCO, Codex Alimentarius Commission, WADA, pharmacopeias and international forensic bodies, and UNIDO**

The Director continued his summary of document CIPM/2010-22 by highlighting the BIPM's interactions with a number of bodies.

Joint activities between the BIPM and the World Meteorological Organization (WMO) will increase following the WMO-BIPM workshop on 'Measurement Challenges for Global Observation Systems for Climate Change Monitoring: Traceability, Stability and Uncertainty' held on 30 March to 1 April 2010 at the WMO headquarters, Geneva, Switzerland. The workshop coincided with the signing of the CIPM MRA by the WMO.

The situation regarding the BIPM's long standing request to be granted observer status on the World Trade Organization's (WTO) technical barriers to trade (TBT) committee has not changed. The WTO has a block on the consideration of any further observers. However, it is understood from the BIML (which attends the WTO TBT committee meetings as an observer) that this block would be lifted and in the near future the pending requests for observer status, including that of the BIPM, will be reviewed. The BIPM will restate its interest in becoming an observer.

Dr Bennett commented that there is no mention of the Versailles Project on Advanced Materials and Standards (VAMAS) in the document CIPM/2010-22. Prof. Wallard replied that the reason for this is because the BIPM had not received any further information from VAMAS. Dr Bennett stated that the CIPM should record its disappointment at the lack of progress with contact between the BIPM and VAMAS following the initial pressure to establish a Working Group on the measurement of properties of materials.

## 13. **JOINT COMMITTEE FOR GUIDES ON METROLOGY (JCGM)**

Prof. Wallard presented a report (CIPM/2010-04) on the recent work of the JCGM and its working groups (the GUM and the VIM). The main committee of the JCGM met on 2 December 2009. Representatives from IUPAC and IUPAP were present. Two main resolutions were adopted, one concerning the nomination by Member Organizations of experts to Working Groups, and another resolution concerning the wording of the JCGM Charter on the production and publication of JCGM documents.

JCGM WG1-GUM (*Guide to the expression of Uncertainty in Measurement*) is available to download from the BIPM website. JCGM WG1 finalized its work on the *Introduction to the GUM and related documents* (JCGM 104:2009), which is also available from the BIPM website ([www.bipm.org/en/publications/guides/](http://www.bipm.org/en/publications/guides/)). Documents JCGM 106 (*The role of measurement uncertainty in conformity assessment*) and JCGM 102 (*Extension to any number of output quantities*) will be approved before the end of 2010.

JCGM WG2-VIM recognizes that the versions of the VIM3 (*International Vocabulary of Metrology – Basic and General Concepts and Associated Terms*) published by ISO/IEC and OIML differ slightly from the main JCGM/BIPM document, and that each of the three texts contain a number of mistakes which will require formal correction. Since the last meeting of the CIPM in October 2009, the JCGM WG2 has drawn up appropriate *corrigenda*, to attach to each version of the VIM3 to obtain a corrected and unique master file, available to further extend the vocabulary. The *corrigendum* applied to the JCGM/BIPM document, both in French and English, was made available on the BIPM website ([www.bipm.org/en/publications/guides/vim.html](http://www.bipm.org/en/publications/guides/vim.html)) in June 2010.

The JCGM *ad hoc* group on measurement software has temporarily ceased activities. Further discussion of its role and mission will take place at the next plenary meeting of the JCGM in December 2010.

Prof. Issaev, editor of the Russian language version of VIM3 will incorporate changes from the *corrigenda* into the Russian version.

## 14. WORK OF THE BIPM

### 14.1 Director's Report for 2009–2010

A draft copy of the Director's Report on the activity and management of the BIPM for 2009–2010 (CIPM/2010-01) was circulated to the members of the CIPM in advance of the meeting. A change was made to the list of acronyms concerning COOMET, otherwise there were no comments and the report was approved.

## 14.2 Report of the management review of the BIPM Quality System

Prof. Wallard reported on the considerable activity in relation to quality matters which has taken place since the last meeting of the CIPM in October 2009 (document CIPM/2010-23). Mr Coelho, Quality, Health and Safety Manager for the BIPM, worked with the BIPM Directors of Department, Heads of Section and other staff members to revise the BIPM Quality Manual (QM) taking into account comments made during an external audit in 2008–2009. This was accompanied by a detailed cross-check of ISO/IEC 17025:2005 against the BIPM's quality requirements. The BIPM's quality policy has been agreed and included in the QM and the revised manual has been approved by the Director.

The CIPM Secretary attended the annual Quality System Management Review which was held on 8 September 2010. The main conclusions and decisions of the review were: thoroughly review current procedures and list them on the BIPM intranet; the BIPM's performance in comparisons has been good. Internal and external audit reports were generally satisfactory and the current method of seeking high quality peer reviewers for the BIPM's scientific work, based on the CIPM-approved document "*Criteria for the selection of visiting reviewers*" should continue. This will be augmented by the QM's internal audits which will place more emphasis on compliance with the BIPM QM procedures and policies.

During 2010, the internal and external audit programme made a number of observations and identified a few minor non-conformities which were agreed between the auditor and the relevant Departments and which are being addressed. With the exception of a minor non-conformity in the internal thermometer service related to records of the laboratory room temperature, the majority of non-conformities indicate a need for enhanced staff awareness of the QM and policy. Following approval of the new and comprehensive QM by the Director, this issue will be dealt with by awareness campaigns and seminars. Mr Coelho will train new staff about quality issues and policy, including ISO 17025.

## 14.3 Safety report

A brief presentation on the progress made with the BIPM Health and Safety system since the last meeting of the CIPM in October 2009 (document CIPM/2010-25) was given by Mr Coelho. New arrangements for the collection and storage of chemical waste have been made by creating a

dedicated storage room in the Observatoire. Internal training on the use of fire extinguishers as well as posture and ergonomics in the workplace has been provided to all staff. Three additional semi-automatic defibrillators have been installed around the BIPM's premises. The BIPM health and safety manual is being reviewed and a presentation to all staff will take place on completion. A manual on environmental good practices is under development and a full health and safety internal audit is under way. Other safety highlights include changes to the health and safety information provided on the BIPM intranet site; updated documents with safety information for short-term visitors; and an updated evacuation plan. Mr Coelho noted that since the last meeting of the CIPM in October 2009 there have been no reported accidents at the BIPM.

Mr Énard enquired if training will be given on how to use the defibrillators. Mr Coelho confirmed that training will be provided. Dr Carneiro asked if the BIPM studies the amount of sick leave taken by its staff. This information is published monthly by many companies in France and the BIPM could carry out a benchmarking exercise to assess its performance against other workplaces. Prof. Wallard replied that sick leave is monitored and that all BIPM staff members have an annual medical examination to determine their fitness to work. Mr Énard enquired if accidents occurring on the way to work are included in the figures of reported accidents. Mr Coelho confirmed that this is the case.

#### **14.4 Depository of the metric prototypes**

The visit to the depository of the metric prototypes at the Pavillon de Breteuil took place at 17:30 on 13 October 2010, in the presence of the President of the CIPM, the Director of the BIPM, and the representative of the Curator of the Archives de France.

The three keys necessary to open the depository were assembled: the key entrusted to the care of the Director of the BIPM, the one deposited at the Archives Nationales in Paris, brought by Mrs C. Béchu, and finally the one kept by the President of the CIPM.

The doors of the vault and the safe having been opened, the presence in the safe of the international prototype of the kilogram and its official copies was verified.

The following indications were noted on the measuring instruments placed in the safe:

temperature:	21 °C
maximum temperature:	21 °C
minimum temperature:	20 °C
relative humidity:	50 %

The safe and the doors of the vault were then locked.

The Director of the BIPM,  A.J. Wallard	For the Curator of the Archives Nationales,  C. Béchu	The President of the CIPM,  E.O. Göbel
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## 15. **METROLOGIA**

Dr Miles presented a brief summary of the report CIPM/2010-26 on *Metrologia*, highlighting in particular the special issue on Materials Metrology (47(2)), which was co-edited by Dr Bennett and Dr Valdés, and the increased number of review articles published in 2010. She reported that negotiations with Institute of Physics Publishing (IOPP) were under way to renew the publishing contract as soon as possible, and she asked the CIPM members to continue to encourage the submission of high-quality scientific and review articles to the journal. Dr Miles drew attention to various issues that had arisen during the year, including questions of publishing ethics as well as a colour-matching problem that occurred when IOPP switched from lithographic to digital printing for their European print runs of the covers of issues 47(1) and 47(2). After a brief discussion Prof. Göbel thanked Dr Miles for her report and wished her and the journal continued success.

## 16. ADMINISTRATIVE AND FINANCIAL AFFAIRS

### 16.1 “*Rapport aux Gouvernements*” for 2009

Mrs Perent presented the *Rapport annuel aux Gouvernements des Hautes parties contractantes sur la situation administrative et financière du Bureau international des poids et mesures en 2009*. Mrs Perent commented that the *Rapport annuel aux Gouvernements* for 2010, which will include the financial statements prepared in accordance with the IPSAS will be published in French and English.

### 16.2 *Quietus* for 2009

Mrs Perent drew the attention of the CIPM to the first page of the auditors’ report 2009 on the 2009 financial statements presented in the *Rapport annuel*, and the CIPM unanimously gave *quietus* to the Director and the Financial and Administrative Director of the BIPM for the 2009 accounts.

### 16.3 Member States in financial arrears

Mrs Perent presented a report on the contributions and subscriptions in arrears noting that the contributions unpaid for up to 3 years amount to about 1.5 million Euros as at the time of the CIPM meeting. This sum relates to unpaid contributions from China, Croatia, Italy, Pakistan, Romania, South Africa, the United States of America and Bolivarian Republic of Venezuela. With the exception of Pakistan, which also has arrears of some 34 thousand Euros for 2009, these unpaid contributions relate to 2010. At the time of the CIPM meeting, the United States of America had paid only 30 % of its contribution for 2010. The outstanding balance of 70 % would be paid in November 2010.

There are four Member States with contributions in arrears for more than 3 years. These four States (Cameroon, Dominican Republic, Islamic Republic of Iran, and Democratic People’s Republic of Korea) have arrears of 3.983 million Euros, of which 3.836 million Euros are distributed contributions among the other Member States. The BIPM sent a *Note verbale* in February 2010 to each of the four States concerned reminding them to fulfil their financial obligations. Each State has been invited to

contact the BIPM to come to a rescheduling agreement. It was clearly stated in each *Note verbale* that if they continue to default, the CGPM will, at its next meeting in October 2011, be asked to take a decision regarding their exclusion. This follows the procedure outlined in Resolution 8 adopted by the CGPM at its 23rd meeting (2007).

The Islamic Republic of Iran has arrears of 1.393 million Euros, out of which 1.354 million Euros are distributed among the other Member States. The Islamic Republic of Iran sent a *Note verbale* to the BIPM via the embassy in Paris which indicated that it wishes to continue its membership and was ready to undertake discussions regarding its arrears. An Iranian delegation will visit the BIPM to discuss the situation. At the time of the CIPM meeting, no rescheduling agreement had been reached so the CIPM was asked to approve the inclusion of a draft resolution in the convocation to recommend to the CGPM to take a decision regarding the exclusion of the Islamic Republic of Iran. If a rescheduling agreement is reached and a first payment is received from the Islamic Republic of Iran before the meeting of the CGPM in October 2011, the resolution recommending the CGPM to take a decision regarding the exclusion of the Islamic Republic of Iran will be withdrawn.

A *Note verbale* was sent to the embassy of the Dominican Republic in February 2010 and the ambassador was clear that the Dominican Republic did not want to be excluded. A meeting was held with the Ambassador of the Dominican Republic in Paris at the BIPM headquarters in June 2010. The BIPM was orally informed that according to subsequent talks between the ambassador and the government of the Dominican Republic, as soon as it has sufficient funds it will start settling its debt. This position was confirmed by the ambassador in September 2010. As of 15 October 2010 no rescheduling agreement had been negotiated and no funds had been received by the BIPM. The Dominican Republic has arrears of 1.097 million Euros, out of which 1.088 million Euros are distributed among the other Member States. The CIPM was therefore asked to approve the inclusion of a draft resolution in the convocation to recommend to the CGPM to take a decision regarding the exclusion of the Dominican Republic. If a rescheduling agreement is reached and a first payment is received from the Dominican Republic before the meeting of the CGPM in October 2011, the resolution recommending the CGPM to take a decision regarding the exclusion of the Dominican Republic will be withdrawn. Contact has been made with the Director of the NMI in the Dominican Republic.

A *Note verbale* was sent to the representative of the Democratic People's Republic of Korea in France in February 2010 concerning the financial arrears. The Democratic People's Republic of Korea has arrears of 0.867 million Euros, of which 0.768 million Euros are distributed contributions among the other Member States. A further *Note verbale* was sent in June 2010 but the representative was not optimistic about the prospect of negotiating a rescheduling agreement. Mr Henson confirmed that he has had no reply after he tried to contact the NMI of the Democratic People's Republic of Korea. The CIPM was therefore asked to approve the inclusion of a draft resolution in the convocation to recommend to the CGPM to take a decision regarding the exclusion of the Democratic People's Republic of Korea. If a rescheduling agreement is reached and a first payment is received from the Democratic People's Republic of Korea before the meeting of the CGPM in October 2011, the resolution recommending to the CGPM to take a decision regarding the exclusion of the Democratic People's Republic of Korea will be withdrawn.

A rescheduling agreement was negotiated with Cameroon in 1999 but it has stopped paying since 2001. Cameroon has arrears of 0.626 million Euros, all of which constitute distributed contributions among the other Member States. A *Note verbale* was sent to the Cameroon embassy in Paris in February 2010. Mrs Perent and Mr Henson met with a *Ministre Conseiller* at the embassy. Cameroon wishes to remain a Member State and discussions centred on what was required for it to maintain its membership. A *Note verbale* was received from Cameroon on 4 October 2010 stating its intentions. Despite this progress, no definite agreement has been reached, so the CIPM was asked to approve the inclusion of a draft resolution in the convocation to recommend to the CGPM to take a decision regarding the exclusion of Cameroon. If a rescheduling agreement is reached and a first payment is received from Cameroon before the meeting of the CGPM in October 2011, the resolution recommending the CGPM to take a decision regarding the exclusion of Cameroon will be withdrawn. Contacts will be maintained with Cameroon to reach an agreement.

Unsettled subscriptions of Associates currently total about 51 thousand Euros. The unsettled subscriptions are from Bolivia, Costa Rica, Cuba, Ecuador, Georgia, the Former Yugoslav Republic of Macedonia and the Philippines.

Mr Érard enquired if Member States that are being considered for exclusion will be invited to attend the meeting of the CGPM. Mrs Perent and

Prof. Wallard confirmed that these States will not be invited, as their advantages and prerogatives have been suspended in application of the Regulations annexed to the Metre Convention.

Prof. Göbel invited the members of the CIPM to vote on Draft Resolution F - On exclusion of defaulting Member States and for the preparation of a separate resolution for each State. A separate vote was held for each of the four defaulting Member States (Cameroon, Dominican Republic, Islamic Republic of Iran, and the Democratic People's Republic of Korea). In each case the members of the CIPM voted unanimously for the draft resolution recommending the CGPM to take a decision regarding the exclusion of the defaulting Member State.

#### **16.4 Changes to the BIPM's accounting system**

Mrs Perent presented document CIPM/2010-29 on the BIPM's transition from cash accounting to accrual basis of accounting, as approved at the previous meeting of the CIPM in October 2009. New accounting rules and policies based on IPSAS have been developed together with a new chart of accounts beginning with the financial statements for 2010, which involved restating the financial data for 2009. The presentation highlighted the main differences between the two accounting systems. In summary, an accrual basis of accounting system records all transactions when they occur and not when cash is received or paid. A cash accounting system records all transactions on their cash occurrence, any income is included in the financial statements when it is received and any expenditure is registered when it is paid. The accrual basis of accounting adopted by the BIPM uses the International Public Sector Accounting Standards (IPSAS), designed by the IPSAS Board of the International Federation of Accountants (IFAC) to apply to the general purpose of financial statements of all public sector entities. Finance and Administrative Department staff have received training in IPSAS.

She pointed out that the accrual basis of accounting gives information on the performance and financial capital maintenance of the BIPM. Financial statements have been designed and consist of a statement of financial position, a statement of financial performance, changes in net assets, a cash flow statement, notes to the financial statements and Budget outturn.

Mrs Perent also mentioned that the present management tools were designed to respond to the needs of cash accounting and cannot provide the

appropriate information necessary for the accrual basis of accounting. Therefore some additional management tools would be required.

The changeover required a considerable amount of work, and Mrs Perent thanked all those involved in the preparation and implementation of the accrual basis of accounting over the last 2 years.

Prof. Göbel thanked Mrs Perent and all staff at the BIPM involved in the changeover on behalf of all the members of the CIPM.

Mr Érard commented that the information presented on the depreciation policy was very complex and may require some revision. Mrs Perent noted this comment and replied that the BIPM had carefully reviewed the lifetime of its assets, and before the adoption of its policy on depreciation, had reviewed depreciation policies in operation in some NMIs. Dr Carneiro commented that the accrual basis of accounting system better reflected the work of the BIPM but he agreed with Mr Érard that there were too many depreciation categories. He enquired if data could be presented for each department to give a clearer idea of the cost of individual projects. Mrs Perent replied that it is indeed envisaged in a future stage.

Dr Inglis also thanked Mrs Perent and the Finance, Administration and General Services Department for their work involved in the change from cash accounting to accrual basis of accounting.

## **16.5 Estimated out-turn for 2010**

Prof. Wallard presented the estimated out-turn for 2010 (document CIPM/10-30). Dr Valdés enquired how the budget will be affected when the BIPM receives the outstanding financial contributions from the USA in November 2010. Prof. Wallard replied that this sum was already included in the estimated out-turn for 2010.

## **16.6 Budget for 2011**

Prof. Wallard presented the budget for 2011 (document CIPM/10-31). Dr Quinn commented that the accrual basis of accounting will highlight future liabilities of the BIPM.

Mrs Perent recalled that the financial regulations adopted by the CIPM in 2009 set a Reserve Fund to cover fluctuations in payments of annual

contributions from Member States and a Capital Investment Fund aimed at supporting the infrastructure of the BIPM and any unexpected expenses. The maximum amount of the Reserve Fund, shall be determined by the CIPM when approving the Budget.

She asked the CIPM to decide on a proposal to set the Reserve Fund at 35 % of the dotation of the ensuing financial period, the Capital Investment Fund being constituted of the remaining funds, including the contributions for the said financial period from States that have acceded to the Metre Convention after adoption of the said dotation. She also asked the CIPM to approve that sums be automatically transferred from the Capital Investment Fund to the Reserve Fund or from the Reserve Fund to the Capital Investment Fund to be in accordance with this decision.

Dr Carneiro commented that: if the BIPM acquires a linac its Capital Investment Fund would be depleted; an auditor's report should be included with the financial statements; and an auditor would be better placed to decide the level of reserves the BIPM should maintain. Mrs Perent replied that the financial statements, including details of the financial position, will be audited. Prof. Göbel stated that the CIPM can assess if a Reserve Fund of 35 % of the dotation is sufficient, although the advice of an auditor may be required. Members of the CIPM were invited to vote on the distribution of the BIPM's financial reserves between the Reserve Fund and the Capital Investment Fund and maintaining the Reserve Fund at the level of 35 % of the dotation. The CIPM unanimously approved the budget for 2011 and the split between the Reserve Fund and the Capital Investment Fund.

## **16.7 Possible additional sources of funding for the BIPM**

A report prepared by the BIPM was presented (document CIPM/2010-08) on possible additional sources of funding of the BIPM. The report gave a detailed account of the various additional sources of funding that could be considered and the associated pros and cons of 'topping up' the BIPM dotation via grants and subventions. Guidance was sought from the CIPM on what was considered to be appropriate in terms of additional sources of funding. Prioritizing projects will be vital to attract external funding and an ethics policy will be required to assist in deciding which sources of funding to pursue. The risks associated with additional sources of funding will be examined to assess any conditions attached to the funding and the possibility of running into any problems in the future. The help of an external expert

may be required to advise the BIPM on additional sources of funding as it was noted that it takes a considerable proportion of the BIPM's resources to pursue external funding opportunities. If the BIPM is successful in attracting additional sources of funding there is a risk that this funding may displace some of the dotation from the Member States.

Prof. Göbel stated that if the BIPM enters into a contract with a company, that company may want to have an exclusive preview of any results. Dr Kaarls warned that there is a risk associated with doing nothing on this issue. The BIPM needs to be open-minded and consider all sources of funding, although there is a need for a strict policy on funding. Dr Kaarls did not expect the BIPM's attempts to secure additional sources of funding to be so successful that it would result in governments deciding to reduce their financial contributions. Prof. Ugur stated that he would like to know the position of the bureau before discussing additional sources of funding. Prof. Göbel agreed that the bureau will have to discuss conditions of acceptance.

Prof. Kühne anticipated no problems in accepting additional voluntary funding from Member States or donations from charities or foundations if no conditions from these bodies are attached. Problems may arise if contracts with commercial companies are involved and if the BIPM was obliged to restrict information to the donor or if there was a requirement to suppress information. Any agreements must guarantee that results are available to all Member States. Dr Kaarls added that any additional funding must be for projects that are within the scope of the programme of work. Mrs Perent stated that the BIPM's financial regulations require such prerequisite. Dr Carneiro added that the bureau must develop a policy on additional funding to ensure it does not conflict with existing policy.

Dr Valdés stated that if the BIPM enters a new area of research where major companies are interested in its research, donations could possibly support the entire project. Dr Carneiro stated that the BIPM must be very clear about its purpose in the research and any knowledge that is developed must be royalty free. The BIPM will have to ensure that it remains free to pursue its own goals without any interference from potential donors.

Mr Henson stated that one of the most difficult areas for seeking additional funding was from private organizations. He suggested that a risk assessment may be required each time a source of additional funding is found rather than having a set of rules to cover all occasions. It will then be possible to deal with all additional sources of funding on a case-by-case basis.

Prof. Göbel replied that some rules will be required but each source of funding could still be examined on a case-by-case basis.

Prof. Wallard reminded the members of the CIPM that on two occasions in the past when the BIPM sought additional sources of funding it was unsuccessful, despite the considerable amount of effort required. The BIPM's staff would need to work very hard for small returns. He was unconvinced that seeking additional sources of funding was worthwhile. Prof. Kühne suggested that the BIPM organize a workshop on insulin, possibly in collaboration with the WHO, to which companies could be invited, to showcase the work that the BIPM is carrying out in this area. He also mentioned that contributions from stakeholders could be in cash or in kind, such as supply of secondes or equipment to help support the BIPM's work.

Prof. Ugur suggested that allowing companies to advertise on the KCDB could generate additional funding. Mrs Perent replied that this would raise questions about the BIPM's independence.

Dr Inglis emphasized that the BIPM needs to consider alternative methods of funding for its projects. The International Avogadro Project was funded by some of the NMIs. Not all NMIs took part but the project has been very successful. Considerable effort was required to recruit the NMIs that did take part. A similar idea could be pursued for the linac project, with those NMIs that want a linac at the BIPM headquarters providing the funding and resources. Any concerns about access to the linac could be dealt with afterwards. Dr May enquired if support for the linac could be sought from developing economies and UNIDO on the grounds that it will have significant benefits for people's health. This could be used as a catalyst to attract funding.

Dr Quinn stated that it was the responsibility of all members of the CIPM to contact people they know to try and find additional sources of funding. Mr Henson supported this statement commenting that relationships are very important when it comes to securing funding. Prof. Wallard stated that, while the BIPM is at present not eligible for funding by the European Metrology Research Programme (EMRP), EURAMET may be able to negotiate additional funding from the EMRP if the CIPM can persuade the Member States from Europe to apply pressure through EURAMET. Mr Henson added that at the moment there are rules which prevent the EMRP from providing any funding to the BIPM.

Prof. Göbel summed up the discussion by encouraging members of the CIPM to investigate possible sources of additional funding. The BIPM will prepare a draft for a third party funding policy setting the conditions under which the BIPM can accept funding for the bureau's consideration.

## **16.8 BIPM staff: promotions, departures and recruitment**

Prof. Wallard explained recent changes to the BIPM staff. Information about staffing changes to 30 June 2010 is included in the Director's Report 2009/2010 (document CIPM/2010-01). Changes which have taken place since 1 July 2010 were summarized.

Ms Isabelle Andernack was recruited as Accountancy Administrator to the Finance, Administration and General Services Department and Mr Benjamin Rolland was recruited as a Technician in the Electricity Department. Mr Aldo Dupire was recruited as the new Head of the Workshop Section and will formally take over following the retirement of Mr José Sanjaime on 31 December 2010. Mr Alain Jaouen (Electricity Department) and Mr Manuel de Carvalho (Workshop Section) have been placed on the BIPM's invalidity scheme. Recruitment is under way for three vacancies: a Research Fellow in the Chemistry Department for a two-year fixed-term appointment to work on the angiotensin project; a Principal Physicist to fill the vacancy left by the nomination of Mr Picard as Director of the Mass Department on Dr Davis's retirement; and a Technician in the Ionizing Radiation Department for a two-year fixed-term appointment.

In addition, a vacancy notice for one IT Officer will soon be published to fill a vacant position.

Forthcoming retirements include Dr Richard Davis (Director of the Mass Department) on 31 October 2010, Mr José Sanjaime (Head of the Workshop Section) on 31 December 2010 and Prof. Andrew Wallard (Director of the BIPM) on 31 December 2010.

By application of Rule 10.7 of the *Regulations, Rules and Instructions applicable to staff members of the BIPM (RRI)*, members of the CIPM are informed that Alain Picard is nominated Director of the Mass Department from 1 November 2010 after Richard Davis's retirement on 31 October 2010.

By application of Rule 10.8 of the RRI, members of the CIPM are informed that the exceptional grade 14 in the BIPM salary scale was awarded on 1 January 2010 to Mrs Perent, Financial and Administrative Director.

The members of the CIPM were invited by the Director to approve the title of Honorary Principal Research Physicist for Dr Davis on his retirement on 31 October 2010 in recognition of his outstanding contribution to the work of the BIPM. The proposal received considerable support and was unanimously approved by the CIPM. Dr Davis thanked the CIPM for the honour.

## **16.9 Amendments to the BIPM staff Regulations, Rules, and Instructions**

Mrs Perent presented a summary of document CIPM/2010-16 on the proposed amendments to the Regulations, Rules and Instructions (RRI) applicable to staff members of the BIPM. The proposed draft amendments were circulated to the members of the CIPM for approval. The main points of the draft amendments were:

- Clarification of the BIPM's policy on non-discrimination and the inclusion of non-discrimination on grounds of handicap.
- An amendment to the Applications Review Board procedure.
- Alignment of the French and English versions of the rules governing the specific education allowance for a handicapped dependent child.
- Changes to the provisions on management of the health, incapacity and death insurance benefits so that the benefits served are at least equivalent to those of the French social security system.
- Changes to the rules on special leave to cover staff members and staff member's children in registered partnerships.
- A reduction in the time limit within which an absentee ballot and a vote by proxy should be received when electing staff representatives.
- An extension of the household allowance granted to a staff member when his/her partner receives a gross remuneration which does not exceed 26 685 *points* per year.
- A change to the wording of the rule on complaints, receivable complaints and deadlines for submissions so that it includes reference to

the ILOAT rules, rather than incorporation of the rules of the ILOAT in the RRI.

Prof Göbel invited the members of the CIPM to vote on the proposed Amendments to the RRI. There was unanimous acceptance.

## **17. OTHER BUSINESS**

### **17.1 World Metrology Day**

Prof. Wallard spoke about World Metrology Day 2010 which was held on 20 May 2010 and which was very successful. The theme was Measurements in science and technology – a bridge to innovation. The key product was a poster which was downloaded from the World Metrology Day website more than 7 000 times. Related events took place in 17 countries (Belgium, Brazil, Canada, Costa Rica, Ethiopia, Hungary, India, Japan, Luxembourg, Mexico, St. Lucia, Tunisia, Turkey, the UK, the USA, Vietnam, the Russian Federation) and AFRIMETS, some of which were not Member States. The theme for World Metrology Day in 2011 will be Chemistry.

Dr Carneiro enquired if there was any possibility of forming a partnership with the UN for World Metrology Day. Prof. Wallard replied that UNESCO had been approached but expressed no interest.

### **17.2 Physiological Quantities and Nanometrology Workshops**

Prof. Wallard gave a presentation on the BIPM Workshops on Physiological Quantities and SI Units which took place at the BIPM Headquarters on 16-17 November 2009 and Metrology at the Nanoscale held at the BIPM headquarters on 18–19 February 2010.

The BIPM Workshop on Physiological Quantities and SI Units brought together the various interested communities, principally those concerned with traceable, reliable and comparable measurement, and those responsible for writing and applying specification standards and/or health and safety legislation in order to identify potential challenges and to identify what the next steps will be. The workshop was held in response to a proposal by the CIPM and was limited to six areas chosen by the BIPM as the scope of physiological quantities is very broad. Contact should be established

between the CCEM and the International Committee for Non-Ionizing Radiation Protection (ICNIRP). Effects induced by magnetic fields on the human body have not been considered in the framework of the CCEM and an appropriate action from the CCEM Working Group on Strategic Planning may be required. It was considered important for the Working Groups on Strategic Planning of the CCEM and of the CCPR to consider the case of radiation at Terahertz frequencies. This field may be usefully investigated by the creation of a joint group between the CCEM and the CCPR. The report of the BIPM Workshop on Physiological Quantities and SI Units is available on the BIPM Website ([www.bipm.org/utis/common/pdf/rapportBIPM/2010/05.pdf](http://www.bipm.org/utis/common/pdf/rapportBIPM/2010/05.pdf)).

The Workshop on Metrology at the Nanoscale aimed to bring together representatives from the NMIs with other stakeholders, such as nanomaterial manufacturers, regulatory authorities and standardization bodies involved in nanotechnologies, to answer the following question: What activities are required to establish an effective international infrastructure for metrology at the nanoscale? The workshop was very dynamic and feedback from participants was positive. A follow-up workshop is planned for a few years time, but it is not included in the next programme of work. The report from the workshop is available on the BIPM Website ([www.bipm.org/utis/common/pdf/rapportBIPM/2010/06.pdf](http://www.bipm.org/utis/common/pdf/rapportBIPM/2010/06.pdf)).

Dr Tanaka commented that the EU is developing a rating for nanotechnology products which will have an impact on markets. He suggested that there is a need to determine what constitutes a nanotechnology product and that metrology is not represented at nanotechnological levels. Prof. Wallard replied that issue is being addressed via liaison between the BIPM and ISO/TC 229 through Dr Viallon and Mr Henson.

### **17.3 BIPM-WMO Workshop on Climate Change**

The WMO-BIPM Workshop on Measurement Challenges for Global Observation Systems for Climate Change Monitoring: Traceability, Stability and Uncertainty took place on 30 March to 1 April 2010 at the WMO headquarters in Geneva, Switzerland. The workshop focused on how satellite-based, ground-based and other monitoring techniques can be improved by the adoption of best-practice metrology. There was good consensus over traceability of measurements and the satellite-based

meteorological community agreed that there is a need to pay close attention to calibration of instruments before, during and after missions. The workshop provided the opportunity to complete negotiations with the WMO when the WMO Secretary-General, Michel Jarraud, signed the CIPM MRA. The WMO and the BIPM have established a common strategy to identify the need for accurate measurements and to ensure that the recommendations of the workshop are fully followed up, implemented and monitored. The result is a commitment of two of the world's intergovernmental organizations to collaborate to tackle metrology and measurements issues in one of the most important challenges facing the world at the moment. A report is being finalized and will be circulated widely.

#### **17.4 Other business**

Prof. Göbel stated that this is the last meeting of the CIPM with Prof. Wallard as the Director of the BIPM. He described how Prof. Wallard quickly became an essential part of the BIPM after taking over as Director in 2004 and recommended to the CIPM tough decisions on priorities. He also introduced a number of up-to-date management practices. Prof. Wallard has been very successful in attracting secondees to the BIPM and in increasing awareness of international metrology. He can also be proud of developing the relationship with ILAC and the considerable time and effort put into increasing the number of Member States and Associates of the CGPM, which after a long period of standing still are now increasing. A special seminar will be held at the BIPM Headquarters in May 2011 in honour of Prof. Wallard. Prof. Göbel stated that the bureau discussed assigning the status of Director Emeritus to Prof. Wallard. This was approved unanimously by the CIPM.

Prof. Wallard thanked the members of the CIPM for the honour and said that the Director can only achieve success with the support of the BIPM's staff. He thanked his colleagues on the CIPM for their support and wise advice and the members of the bureau for their support and friendship.

Prof. Göbel wished Prof. Kühne success in leading the BIPM and commented that he has the full support of the CIPM. Prof. Kühne thanked Prof. Göbel.

Prof. Göbel noted that this is his last meeting as President of the CIPM. He thanked the members of the CIPM for their support over the years and handed over the Presidency to Dr Inglis.

Dr Inglis thanked Prof. Göbel and said that he was always impressed with Prof. Göbel's ability to come to a calm consensus and that the members of the CIPM appreciated his time as President. Dr Inglis stated that the role of President of the CIPM is daunting but that he accepted it with honour.

## **18. DATE OF NEXT MEETING**

The 100th meeting of the CIPM will take place at the Pavillon de Breteuil on 24 May 2011 and 10–14 October 2011. The President closed the meeting by thanking the members of the CIPM for their support and contributions.



## Jan de Boer

29 June 1911 – 15 February 2010

Jan de Boer was born in Haarlem, Holland, on 29 June 1911 and after a short illness died on 15 February 2010 in Doorn, in his 99th year.

He began his university studies in 1928 at the University of Amsterdam and commenced his doctoral studies in the laboratory of A.M. Michels in 1932. His doctoral thesis in 1940 was entitled, “*Contribution to the theory of compressed gases*”. This was the beginning of a long life in theoretical physics, much of it in the field of thermodynamics. He became Director of the Institute for Theoretical Physics at the University of Amsterdam in 1946, a post he held until his retirement from the University in 1981.

His first international publication was entitled, “*Isotherms of nitrogen between 0 °C and 150 °C and at pressures from 20 to 80 atmospheres*” by Michels, Wouters and de Boer, which appeared in *Physica*, Vol. 1, 1934. There followed in the 1930s many more publications on the calculations of isotherms and then on molecular interactions and quantum mechanical calculations related to equations of state, almost all published with Michels as the first author. From about 1938 onwards his name appeared first on the list of authors for his papers on theoretical physics, where it stayed until his last theoretical paper in *Physica*, by this time in Volume 62 in 1972, on the lambda transition in liquid helium. There were in addition many review papers on theoretical aspects of physics and in his later years he became very interested in fundamental and philosophical questions related to quantities and units. He continued to write on these matters up until shortly before his death.

In parallel with his work on theoretical physics, very early in his career he became interested in units and international activities related to agreement on units. He was Secretary of the IUPAP SUN Commission (Symbols, Units and Nomenclature) from 1947 until 1979. This was a very influential position which brought him right to the heart of the intense discussions that were taking place on units and systems of units, leading to the adoption of the International System of Units by the CGPM at its 11th meeting in 1960. From 1954 until 1960 he was a member of the Executive Committee of the IUPAC, a period during which he was heavily involved with the European Physical Society, being on its Executive Committee from 1968 and its publications board from 1969 until 1981. He was also, from 1952 until 1995, a member of the Advisory Panel of the ISO Technical Committee 12 for

Quantities and Units. From 1955 until 1960 he was a member of the Council of CERN.

Jan de Boer was elected to the International Committee for Weights and Measures (CIPM) in November 1953 on which he remained until February 1994, when he was elected an honorary member on his retirement. As a member of the CIPM, he took part in the discussions in the late 1950s on the possible changes to the Metre Convention that had been proposed at the CGPM at its 9th meeting in 1948. At the CGPM in 1954 a draft revision was discussed but it was decided that more time was needed and the CIPM was asked to set up a Commission to prepare a new text for the 11th meeting of the CGPM in 1960. Jan de Boer was nominated a member of this Commission. At the same time he was also asked to serve on a Commission to prepare a proposal for an international system of units and nominated President of the Consultative Committee for Thermometry (CCT). He remained President of the CCT until 1968 and was instrumental in the preparation and adoption of the IPTS-68.

A complete new text of the Convention was proposed to Member Governments in February 1960 and discussed at the 11th meeting of the CGPM in the October of that year but no decision was taken as there seemed to be no great urgency. The main point at issue had been whether or not it would be possible under the 1921 Convention to create an ionizing radiation section at the BIPM, but this question had been resolved by the simple decision of CGPM at its 11th meeting to create such a section. The CGPM did, however, adopt the proposal of the CIPM for the creation of the International System of Units, the SI. It also adopted a new definition of the metre based on the wavelength of light from a krypton lamp and by so doing consigned the international prototype of the metre to history. Jan de Boer was closely associated with all of the discussions in the CIPM and took an important part in meetings of the CGPM on these matters.

In 1962 he was elected Secretary of the CIPM, a post he held until 1989. This was a period of great change for the BIPM; not only did it include the creation of the Ionizing Radiation Section, bringing with it new science, but the BIPM doubled in size from about 35 total staff to about 70. By the end of this period, work at the BIPM had expanded to include the two macroscopic quantum effects, laser wavelength and frequency standards, cryogenic radiometry and the establishment of International Atomic Time. During this period there were also important changes to the staff statutes as well as to the pension fund, areas in which he provided firm and wise guidance to successive Directors and to the CIPM in all these matters. His past participation in the Council of CERN brought particular insight into the

problems of staff management and relations in international organizations that were of great benefit to the BIPM.

At the 16th meeting of the CGPM in 1979, proposals were made by Spain, strongly supported by the French and British delegations during the meeting, for changes to the Metre Convention. The CGPM established a working group of fourteen Member States to examine these proposals and with his long experience of the BIPM, the CIPM and meetings of the CGPM, Jan de Boer was the natural choice as President. The working Group met at the Pavillon de Breteuil in October 1980 under his Presidency and the conclusion, supported by a large majority of the delegates of the thirteen Member States present, was that no changes to the Convention should be made. The report of the meeting was drawn up by Jan de Boer and sent to Member Governments in 1981. In 1983 he presented it to the CGPM at its 17th meeting where it was duly accepted.

The Commission for Units, set up in 1954 to prepare for the adoption of the SI by the CGPM at its 11th meeting in 1960, continued to meet annually after 1960. It soon became clear, however, that the number and importance of the questions submitted to this Commission were not diminishing and it was Jan de Boer who proposed in 1964 that the Commission be transformed into a permanent Consultative Committee for Units (CCU). This was accepted by the CIPM and he was appointed its first President. One of the tasks given to the CCU was to coordinate the work on units of the other international organizations concerned in these matters; among these of course were the ISO, in its TC12, and the IUPAC, in its SUN Commission. Jan de Boer was closely associated with both of these. His broad knowledge of science and wide experience in other bodies concerned with units made him ideally suited to the task of presiding over the CCU, not only for his responsibilities during meetings but also in the many contacts that the President of the CCU has with scientists from universities and others outside the metrology community who communicate many ideas and proposals related to units to the President of the CCU.

Among the many tasks undertaken by the CCU in the years that followed was the preparation of successive editions of the basic text on the SI known as the SI Brochure. This was, and remains, one of the most important tasks of the CCU.

The CCU met for the first time in April 1967 and the last meeting Jan de Boer presided over was the 10th, which took place in July 1990. He remained President until 1995 but ill health prevented him from attending the 11th meeting, held in February 1995. At the request of the CIPM, this

meeting was chaired by Ian Mills who was subsequently appointed President of the CCU by the CIPM at its meeting in October of that year.

In 1991 Jan de Boer was presented with the insignia of the *Légion d'Honneur* by Professor J. Hamburger, President of the Académie des Sciences, at a reception held in the gardens of the Pavillon de Breteuil on the occasion of the 19th meeting of the General Conference on Weights and Measures. He was the recipient of many honours and awards in his home country, the Netherlands, among which were membership of the Royal Netherlands Academy of Science, Knight in the Order of the Netherlands Lion and Commander in the Order of Orange Nassau. From 1960 to 1981 he was President of the Governing Board of the Dutch Foundation for Fundamental Research on Matter (FOM).

Jan de Boer was a man of great intellectual and personal stature. He took a deep personal interest in the affairs of the BIPM and was highly respected by the staff. Those of us who had the privilege of working with him in the CIPM, but above all in the bureau of the CIPM, will remember with pleasure the deep and friendly discussions we had with him on all the matters that came before us, many of which were serious but some light hearted and wide ranging. We also remember his wife Netty, who predeceased him, his constant companion on all his visits to Sèvres and to the many meetings of the bureau of the CIPM that took place in different countries. In this way Jan de Boer and his wife together became an admired example of culture and humanity.

## LIST OF ACRONYMS AND INITIALISMS USED IN THE PRESENT VOLUME

ACS	American Chemical Society
ADWG	Working Group on Accelerator Based Dosimetry
AFRIMETS	Inter-Africa Metrology System
APMP	Asia Pacific Metrology Programme
BEV	<i>Bundesamt für Eich- und Vermessungswesen, Vienna (Austria)</i>
BIPM	International Bureau of Weights and Measures/ <i>Bureau International des Poids et Mesures</i>
CARICOM	Caribbean Community
CC	Consultative Committee
CCAUV	Consultative Committee for Acoustics, Ultrasound and Vibration/ <i>Comité Consultatif de l'Acoustique, des Ultrasons et des Vibrations</i>
CCEM	Consultative Committee for Electricity and Magnetism/ <i>Comité Consultatif d'Électricité et Magnétisme</i>
CCL	Consultative Committee for Length/ <i>Comité Consultatif des Longueurs</i>
CCM	Consultative Committee for Mass and Related Quantities/ <i>Comité Consultatif pour la Masse et les Grandeurs Apparentées</i>
CCPR	Consultative Committee for Photometry and Radiometry/ <i>Comité Consultatif de Photométrie et Radiométrie</i>
CCQM	Consultative Committee for Amount of Substance/ <i>Comité Consultatif pour la Quantité de Matière</i>
CCRI	Consultative Committee for Ionizing Radiation/ <i>Comité Consultatif des Rayonnements Ionisants</i>
CCT	Consultative Committee for Thermometry/ <i>Comité Consultatif de Thermométrie</i>
CCTF	Consultative Committee for Time and Frequency/ <i>Comité Consultatif du Temps et des Fréquences</i>

CCU	Consultative Committee for Units/ <i>Comité Consultatif des Unités</i>
CGPM	General Conference on Weights and Measures/ <i>Conférence Générale des Poids et Mesures</i>
CIE	International Commission on Illumination/ <i>Commission internationale de l'éclairage</i>
CIML	International Committee of Legal Metrology/ <i>Comité International de Métrologie Légale</i>
CIPM	International Committee for Weights and Measures/ <i>Comité International des Poids et Mesures</i>
CIPM MRA	Mutual Recognition Arrangement
CMC	Calibration and Measurement Capabilities
CMI	<i>Ceský Metrologický Institut</i> /Czech Metrology Institute, Prague and Brno (Czech Republic)
CMS/ITRI	Centre for Measurement Standards of the Industrial Technology Research Institute, Hsinchu (Chinese Taipei)
CODATA	Committee on Data for Science and Technology
Codex Alimentarius:	Commission under the Joint FAO/WHO Food Standards Programme
COOMET	Euro-Asian Cooperation of National Metrological Institutions
CPEM	Conference on Precision Electromagnetic Measurements
DI	Designated Institute
EETWG	Working Group on Efficient and Effective Testing of CMC claims
EMRP	European Metrology Research Programme
EU	European Union
EURAMET	European Association of National Metrology Institutes
GLONASS	Global Navigation Satellite System
GUM	Guide to the Expression of Uncertainty in Measurement
HITRAN	High-resolution Transmission Molecular Absorption Database
IAC	International Avogadro Coordination
IAEA	International Atomic Energy Agency

ICAG	International Comparisons of Absolute Gravimeters
ICNIRP	International Committee for Non-Ionizing Radiation Protection
ICTNS	Interdivisional Committee on Terminology, Nomenclature and Symbols
IDMS	Isotope Dilution Mass Spectrometry
IEC	International Electrotechnical Commission
IGO	Intergovernmental Organization
ILAC	International Laboratory Accreditation Cooperation
ILOAT	Administrative Tribunal of the International Labour Organization
INRIM	<i>Istituto Nazionale di Ricerca Metrologica</i> (Italy)
IOPP	Institute of Physics Publishing
IPK	international prototype of the kilogram
IPQ	<i>Instituto Português da Qualidade</i> , Lisbon (Portugal)
IPSAS	International Public Sector Accounting Standard
IRMM	Institute for Reference Materials and Measurements, European Commission
ISO	International Organization for Standardization
ISO CASCO	International Organization for Standardization, Committee on Conformity Assessment
ISO REMCO	International Organization for Standardization, Committee on Reference Materials
ISO TC	ISO Technical Committee
ITU	International Telecommunications Union
IUPAC	International Union for Pure and Applied Chemistry
IUPAP	International Union for Pure and Applied Physics
IVD	<i>in vitro</i> diagnostic
JCDCMAS	Joint Committee on Coordination of Assistance to Developing Countries in Metrology, Accreditation and Standardization
JCGM	Joint Committee for Guides in Metrology
JCRB	Joint Committee of the Regional Metrology Organizations and the BIPM

JCTLM	Joint Committee for Traceability in Laboratory Medicine
KC	Key Comparison
KCDB	Key Comparison Database
KCRV	Key Comparison Reference Value
KCRVWG	Key Comparison Reference Value Working Group
KRISS	Korea Research Institute of Standards and Science, Daejeon (Korea, Republic of)
LATU	<i>Laboratorio Tecnológico del Uruguay</i> (Uruguay)
LGC	Laboratory of the Government Chemist (United Kingdom)
Linac	Linear accelerator
LNE	<i>Laboratoire National de Métrologie et d'Essais</i> (France)
METAS	Federal Office of Metrology, Wabern (Switzerland)
NEWMET	North-East and West Africa Metrology Programme
NIM	National Institute of Metrology, Beijing (China)
NIST	National Institute of Standards and Technology, (United States of America)
NMI	National Metrology Institute
NMIA	National Measurement Institute (Australia)
NMIJ/AIST	National Metrology Institute of Japan, National Institute of Advanced Industrial Science and Technology (Japan)
NMISA	National Metrology Institute of South Africa (South Africa)
NPL	National Physical Laboratory (United Kingdom)
NRC	National Research Council, Ottawa (Canada)
OIML	International Organization for Legal <i>Metrology/Organisation Internationale de Métrologie Légale</i>
PTB	Physikalisch-Technische Bundesanstalt, Braunschweig and Berlin (Germany)
QM	Quality Manual
QS	Quality System
RMO	Regional Metrology Organization
RRI	Regulations, Rules and Instructions
SADC	Southern African Development Community

SI	International System of Units
SIM	<i>Sistema Interamericano de Metrología</i> /Inter-American Metrology System
SIR	International Reference System for gamma-ray emitting radionuclides/ <i>Système international de référence</i>
SP	<i>Sveriges Tekniska Forskningsinstitut</i> /Technical Research Institute of Sweden, Borås (Sweden)
TAI	International Atomic Time/ <i>Temps atomique international</i>
TBT	Technical barriers to trade
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNIDO	United Nations Industrial Development Organization
UTC	Coordinated Universal Time
UT	Universal Time
VAMAS	Versailles Project on Advanced Materials and Standards
VIM	International Vocabulary of Metrology
VNIIM	D.I. Mendeleev Institute for Metrology, Rostekhregulirovaniye of Russia, St Petersburg (Russian Federation)
WADA	World Anti-Doping Agency
WGAC	Working Group on the Avogadro Constant
WGG	Working Group for Gravimetry
WGKG	Working Group on Electrical Methods to Monitor the Stability of the Kilogram
WGSI-kg	Working Group on Changes to the SI kilogram
WGSP	Working Group on Strategic Planning
WHO	World Health Organization
WMO	World Meteorological Organization
WTO	World Trade Organization