Bureau international des poids et mesures

Comité international des poids et mesures

98th meeting (October 2009)

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.

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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^2) 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 (CCEM), 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 γ-rays, charged particles), Section II (Measurement of radionuclides), Section III (Neutron measurements), Section IV (α-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 13 October 2009

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    Vice-President.

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STAFF OF THE
INTERNATIONAL BUREAU OF WEIGHTS AND MEASURES

on 13 October 2009

Director: Prof. A.J. Wallard

Deputy director/Director designate: Prof. M. Kühne

Mass: Dr R.S. Davis
Ms P. Barat, Dr H. Fang, Mrs C. Goyon-Taillade, Mr A. Kiss, Mr A. Picard

Time, frequency and gravimetry: Dr E.F. Arias
Ms A. Harmegnies, Dr Z. Jiang, Ms H. Konaté, Dr W. Lewandowski,
Dr G. Panfilo, Dr G. Petit, Dr L. Robertsson, Mr L. Tisserand,
Dr L.F. Vitushkin

Electricity: Dr M. Stock
Dr M. Bradley, Mr R. Chayramy, Dr E. de Mirandés, Mr N. Fletcher,
Mr R. Goebel, Mr A. Jaouen, Dr S. Solve

Ionizing radiation: Dr P.J. Allisy-Roberts
Dr D.T. Burns, Mr S. Courte, Ms C. Kessler, Dr C. Michotte, Mr M. Nonis,
Dr S. Picard, Dr G. Ratel, Mr P. Roger

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Ms T. Choteau, Ms A. Daireaux, Dr E. Flores Jardines, Mr F. Idrees[1],
Dr R. Josephs, Ms C. Mesquida, Mr P. Moussay, Dr M. Petersen,
Dr J. Viallon, Dr S. Westwood

Publications and Information technology:
Dr J.R. Miles, Mr L. Le Mée

BIPM key comparison database: Dr C. Thomas[2]
Dr S. Maniguet

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Mrs C. Fellag Ariouet, Mrs F. de Hargues, Ms C. Planche

Quality, Health and Safety: Mr B. Coehlo

Finance, administration and general services: Mrs B. Perent
Ms S. Arlen, Mr F. Ausset, Mrs L. Dell'Oro, Mrs D. Etter,
Mrs M.-J. Martin

Receptionist: Mrs I. Neves
Security officers: Mr E. Dominguez[3], Mr C. Neves[3]
Housekeeping assistants: Mrs A. Da Ponte, Mrs A. Mendes de Matos,
Mrs M.-J. Fernandes
Gardeners: Mr C. Dias Nunes, Mr A. Zongo

Workshop and site maintenance: Mr J. Sanjaime
Workshop: Mr F. Boyer, Mr M. de Carvalho, Mr S. Segura, Mr B. Vincent
Site maintenance: Mr P. Benoit, Mr P. Lemartrier

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

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1 Also Mass.
2 Also Publications.
3 Also site maintenance

International Committee for Weights and Measures

Proceedings of the sessions
of the 98th meeting
(13 – 16 October 2009)

Agenda

1. Opening of the meeting; quorum; agenda
2. Report of the Secretary and activities of the bureau of the CIPM (October 2008 – September 2009)
3. Membership of the CIPM
4. Member States of the BIPM and Associates of the CGPM
5. Report on the present status of the CIPM MRA
6. BIPM/ILAC joint working group
7. Report on steps taken to implement the report from Dr Bennett on materials metrology and the MoU with VAMAS
8. Reports from Consultative Committees
9. Joint Committee for Traceability in Laboratory Medicine (JCTLM)
10. Contacts with other intergovernmental organizations and international bodies
11. Follow-up from the 23rd meeting of the CGPM
12. Preparation for the 24th meeting of the CGPM
13. Work of the BIPM
14. *Metrologia*
15. Administrative and financial affairs
16. Other business
17. Date of next meeting

1. OPENING OF THE MEETING; QUORUM; AGENDA

The International Committee for Weights and Measures (CIPM) held its 98th meeting from Tuesday 13 October to Friday 16 October 2009 at the Pavillon de Breteuil, Sèvres.

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

Also attending: M. Kühne (Deputy Director of the BIPM; Director Designate); T.J. Quinn (Emeritus Director of the BIPM); I.M. Mills (President of the CCU, present for part of the meeting); F. Joly (Secretariat); J.R. Miles (Publications); S. Arlen (Legal Adviser of the BIPM). Also in attendance for parts of the meeting: B. Perent (Administrator, Head of the Finance, Administration and General Services Section of the BIPM) and the following Executive Secretaries of Consultative Committees and other contact persons: P.J. Allisy-Roberts, E.F. Arias, R.S. Davis, C. Michotte, L. Mussio, A. Picard, M. Stock, C. Thomas, R.I. Wielgosz.

Prof. Göbel, President of the CIPM, opened the 98th meeting of the CIPM. He noted that Dr Gao Jie had resigned. With nearly all members present (17 out of 18), the quorum was satisfied according to Article 12 of the Regulations annexed to the Metre Convention. Later during the meeting Dr Quinn informed the CIPM that Prof. Giacomo, Emeritus Director of the BIPM, could not attend the present meeting for health reasons and he regretted to note that this was the first CIPM meeting that Prof. Giacomo has missed in more than 50 years. Prof. Göbel asked Dr Quinn to convey to Prof. Giacomo the best wishes of the CIPM.

The agenda was accepted without change and the minutes of the 2008 meeting were accepted without comment. The CIPM then discussed the membership of the CIPM bureau and Prof. Göbel announced that he will resign as President of the CIPM in 2010. Dr Barry Inglis was elected to succeed him as President of the CIPM after the meeting of the CIPM in October 2010.

The CIPM decided the extension for two months of the term of Dr Wallard's appointment as Director of the BIPM until 31 December 2010.

Prof. Göbel invited the Secretary of the CIPM, Dr Kaarls, to present his report.

2. REPORT OF THE SECRETARY AND ACTIVITIES OF THE BUREAU OF THE CIPM (OCTOBER 2008 − SEPTEMBER 2009)

All the important matters arising in the report of the Secretary are taken up later in the meeting.

2.1 Meetings of the bureau of the CIPM

The bureau of the CIPM ("the bureau") has met on three occasions since the last meeting of the CIPM: in March, June and October 2009 at the BIPM Headquarters in Sèvres. In addition, the Secretary of the CIPM has made several visits to the BIPM and has held a number of discussions with the Director.

The bureau also held its regular liaison meetings with the OIML and with the ILAC in March 2009.

2.2 CIPM Membership

The bureau has received a letter of resignation from Professor Gao Jie. He has been a member of the CIPM for 16 years and the CIPM will miss his attendance.

The bureau urges current Members to consider new candidates, especially if they can maintain long-term membership and provide the CIPM with suitable expertise and experience.

2.3 The next Director of the BIPM

Prof. Dr M. Kühne, elected Director designate by the CIPM in 2008, took up his duties on 1 April 2009 as Deputy Director of the BIPM.

2.4 Member States of the BIPM (Member States) and States and Economies Associates of the CGPM (Associates)

The number of Member States has increased to 53 as the Republic of Croatia acceded to Membership of the BIPM on 23 December 2008 and the Republic of Kazakhstan on 31 December 2008. Both these States were previously Associates. The bureau is pleased to note the increase in Members - the previous accessions being Malaysia, Greece and Serbia in 2001. Kenya - also currently an Associate - has acceded to the Metre Convention and will become a Member on 1 January 2010. The CIPM will remember that the financial scenario on which the programme of work was prioritized at its meeting in October 2008 was based on an additional two Members: a target which has now been passed. A significant number of other States have declared their intention to become Members of the BIPM and are involved in discussions with the BIPM. This is a very encouraging development.

Although two Associates have become Members, the number of Associates has risen to 28, after Paraguay became an Associate on 6 May 2009, Peru on 28 May 2009 and Ghana on 17 September 2009. The BIPM is in touch with several other States which have declared their intention to become Associates. More details can be found in section 4.

2.5 Situation in relation to payments of the contributions by Member States and subscriptions from Associates for 2009

A number of Member States and Associates still have to pay their contributions or subscriptions for 2009, and the BIPM has sent reminders to the relevant Member States and Associates. The total outstanding arrears amount to 1 681 387 euros at the end of September 2009, representing 13.7 % of the 2009 budget. The largest unpaid contribution is that of the United States of America which has, so far, only paid 30 % of the amount concerned. The BIPM is, however, in regular contact with the US State Department regarding this matter.

2.6 Member States in financial arrears for more than 3 years

Four States continue to be in arrears for more than three years: Cameroon; the Dominican Republic; the Islamic Republic of Iran; and the Democratic

People's Republic of Korea. The total sum outstanding is about 3.8 million euros. The BIPM has maintained its contacts with the States concerned through their Embassies in Paris and the situation is as follows:

Despite the renewed and greatly intensified contacts with the Government of the Islamic Republic of Iran, no agreement has yet been reached. There have been several contacts with the Embassy. Its staff is aware that if there is no settlement, the next step is to alert the Iranian Government that a draft Resolution could be prepared for the next meeting of the CGPM and which could lead to a decision in favour of its exclusion.

The Director and the Metrology Director of the national metrology institute (NMI) of the Dominican Republic paid a visit to the BIPM headquarters in February 2009. At that time, it appeared that the Dominican Republic was prepared to settle its arrears of 1 040 645 euros over a period of two years. The Metrology Director has subsequently left but further contacts have been made with the Embassy and the NMI and it appears that the situation is still being discussed at a high political level.

The BIPM has met with representatives of the Democratic People's Republic of Korea (DPRK) and made the proposal that the arrears of 813 904 euros could be repaid through a rescheduling agreement. There has been no response from the Embassy to this proposal. The BIPM has again sent a *Note Verbale* warning the Embassy that the next step would be that the BIPM prepares a draft Resolution for the next meeting of the CGPM which could lead to a decision in favour of its exclusion.

In 2001 Cameroon stopped paying its agreed instalments to the rescheduling agreement agreed with the CIPM in 1999; its arrears amount to 573 792 euros. This information had again been sent by the BIPM to the Embassy of the Cameroon in Paris but there has been no response from the Embassy.

2.7 BIPM's "limited outreach" programme: assistance to new RMOs, potential new Member States or Associates, and developing countries

2.7.1 At its 23rd meeting, the CGPM decided that the BIPM should undertake a limited outreach programme to developing countries as a means to attract new Members and Associates. As part of this activity, the BIPM has continued to assist potential applicants - either for Membership or Associate status - with their enquiries. This assistance has been greatly helped by the

BIPM staff's attendance at RMO General Assemblies or at meetings organized by RMOs, at which the States which are potential applicants for Membership or Associate status, are also present. A further point of contact is through meetings of States contemplating the formation of a new RMO such as with GULFMET and NEWMET. The case of these new RMOs or sub-RMOs will be reported later. Both these groupings are aware of the CIPM policy towards the establishment of a new RMO and especially the requirement that at least one member of the RMO must be a Member of the BIPM. In addition the "new" RMOs are aware that they need to create a strong technical infrastructure in order to comply with the requirements of the CIPM MRA and to be able to play a role which is similar to that of existing RMOs.

2.7.2 The BIPM, as the current secretariat to the Joint Committee on Coordination of Assistance to Developing Countries in Metrology, Accreditation and Standardization (JCDCMAS), organized the annual meeting in March 2009. The BIPM's objectives were to reduce any expectations that the JCDCMAS would ever be able to mount a significant or a fully coordinated programme for MAS investments. However the value of an annual working level meeting of those concerned was recognized. This was also in accordance with the line taken by the BIPM that there should be a more informal grouping with new Terms of Reference and a much reduced set of activities. As a result, a refocused group is likely to emerge from the current ongoing debates between JCDCMAS partners. The BIPM Director has written to the other current members of JCDCMAS along these lines. Any remaining secretariat activity will formally pass from the BIPM in March 2010.

2.7.3 The BIPM hosted a Forum on Coordination of NMI International Activities in March 2009, chaired by Dr Tanaka. It provided an opportunity for an exchange of views on current activities. No specific proposal for greater coordination of activities emerged although representatives accepted that, from time to time, there could be overlaps if two or more programmes of support for a specific developing country were active simultaneously. The possibility of a further meeting, which would provide an opportunity to exchange information was supported, although there was no commitment to do this on a regular basis.

2.8 BIPM matters

The major areas on which the bureau has focussed during the last year concerned the BIPM's pension fund, staff salaries and allowances, the transition to new accounting policies based on accrual rather than cash accounting policies, and a number of changes which are proposed to the BIPM's Financial Regulations. The bureau also had a number of discussions on the programme of work for 2013-2016 and the various actions needed for the preparation of the next meeting of the CGPM. These issues form separate items on the agenda.

2.8.1 Pensions and salaries

There have been a number of exhaustive discussions on these issues in the meetings of the bureau. At one meeting, members of the bureau met with representatives of the Joint Pensions Administrative Section of the Coordinated Organizations who had provided advice on the draft of the proposed amendments. The Secretary also made specific visits to the BIPM and the BIPM's management met with the relevant staff commission on several occasions. The overall result of the proposals will help ensure the long-term financial sustainability of the Pension Fund. This will be through a mixture of changes to the existing scheme, which have to take into account the acquired rights of staff, as well as a more substantial modification to the scheme for staff members recruited after the entry into force of the proposed amendments. The bureau's review of staff salaries and allowances has shown that they are broadly in line with those in similar organizations and are required to attract and retain the high-quality and diversity of the staff needed by the BIPM.

The bureau strongly recommends that the CIPM should approve these proposals which should be seen as a complete package.

2.8.2 Amendments to the BIPM's financial regulations and new accounting policies

The bureau discussed a number of amendments to the Financial Regulations which are proposed to the CIPM with the intention of having clear and updated financial regulations for the effective operation of the BIPM. With regard to the revised accounting policies, the proposed changes will result in

a much clearer planning and budgetary framework for the BIPM. Their implementation will require significant efforts from the staff as these new accounting policies will apply, for the first time, to the 2010 financial statements. Since they include both 2010 and 2009 data, it will be necessary to restate the 2009 financial data. This will lead to financial information for a full *quadrennium* under a common set of policies.

2.8.3 Quality System

There are several issues to report to the CIPM on the BIPM's quality system.

As members will know, Dr Köhler, the previous quality manager, passed away at the end of 2008. Mr Michael Streak, then on secondment from NMISA (South Africa) had a background as a quality manager and so was able to carry out the functions until he resigned in April 2009. During this time, there was a full external audit of the quality system and then a presentation to experts from several RMOs at the time of the JCRB in March 2009. The overall outcome of these two events was that the BIPM's system was operating satisfactorily although there were, of course, several useful suggestions for improvements.

During the year, there have been a number of external audits of individual science sections, all of which have been successful with no complaints, errors or non-conformities reported.

The provision of the uncertainties of the BIPM's calibration and measurement services on the KCDB website has been well received by NMIs which take traceability to the SI through the BIPM.

In September 2009, a new Quality, Health and Safety Manager was appointed.

A redrafting of the key quality policy documents is being carried out, essentially to bring together a number of existing, separate, documents and to add a description of the BIPM's overall management arrangements.

The annual Quality Management review was held on 1 October (see section 13).

2.8.4 The BIPM's IT system

The BIPM undertook a major review of its IT infrastructure as parts of the current system were becoming obsolete. There was also scope to improve

effectiveness, reliability and security. The review began with a number of internally generated options drafted by the principal IT Officer. Given the potentially substantial expenditure involved in renewal of the IT infrastructure, the BIPM management took the view that an external consultancy was needed to assess the BIPM's internal proposals and, where necessary, to offer additional views. The consultancy report is expected in the near future.

2.8.5 Short Annual Report to Governments

The bureau discussed a number of issues in relation to the contact the BIPM has with Governments and official authorities between meetings of the CGPM. The CIPM may remember a number of remarks on the subject from some delegations at the last meeting of the CGPM in 2007. The remarks were that, although there were regular formal publications and reports, these mainly addressed the BIPM's scientific and technical work. The bureau therefore agreed a proposal by the Director to issue a short report which conveyed a number of messages about financial and Membership issues and which was directed at a more general audience such as Government officials. The first of these short reports was approved by the bureau in June 2009 and was published in September 2009.

The bureau also welcomed a proposal that there could be a special meeting of government officials, not too far in advance of the meeting of the CGPM. The aim would be to make an early assessment of their views on the CIPM's proposals for the programme of work and budget for 2013–2016. It could also possibly pre-empt some of the discussions or answer questions that would normally be put during the meeting of the CGPM.

2.8.6 Terminology

The bureau has considered a draft Resolution on the terminology used to describe the organs of the BIPM. If approved by the CIPM, this draft Resolution would be presented to the CGPM in 2011. The details can be found in section 12, which deals with the next meeting of the CGPM.

2.8.7 Draft Programme of Work

At its meeting in June 2009, the bureau considered a first report from the Director about the general content of the programme of work for 2013-2016. It gave a general endorsement of the main activities proposed and asked the Director to draft a working paper for consideration by the CIPM. See section 12.

2.9 CIPM MRA issues

2.9.1 The JCRB

2.9.1.1 The JCRB met in March 2009 at the BIPM and in September 2009 in Kazan, Russia. There does not appear to be any reduction in the level of its activities or any need for a reduction in the number of meetings. The work of the Committee will be reported in detail in section 5.

The main issues considered by the JCRB at its 22nd meeting, held at the BIPM were:

- further work, particularly taking note of remarks from the chemistry community, on the CIPM's traceability policy statement;
- modifications to the CIPM policy document on the approval of new RMOs, as requested by the CIPM at its last meeting, and the preparation of a new version for the approval of the CIPM in October 2009;
- inclusion of the uncertainty contributions from the device under test in CMCs and calibration certificates.

2.9.1.2 A report of the 23rd meeting of the JCRB will be presented in section 5.

2.9.1.3 The CIPM MRA logo is now authorized for use by 74 laboratories - an increase of 4 since last year.

2.9.1.4 Professor Luis Mussio continues his position as JCRB Secretary on secondment from the LATU (Uruguay) with an extension of his initial two-year appointment until March 2011. This arrangement is made possible with the help of additional voluntary financial support kindly provided by the

PTB, Germany. The bureau is grateful for the secondment support offered by LATU to the BIPM.

2.9.2 Signatories of the CIPM MRA

There have been no new signatories to the CIPM MRA since the last meeting of the CIPM. The number therefore remains constant at 74 institutes from 47 Member States, 25 Associates and 2 international organizations, and covers a further 124 institutes designated by the signatory bodies.

2.9.3 Other Signatories: the World Meteorological Organization (WMO)

The bureau of the CIPM has kept in touch with the developments in relation to the interest of the WMO in signing the CIPM MRA. There have been a number of exchanges led by the BIPM Director and it finally appears that there is convergence on the roles, obligations and responsibilities of the laboratories which the WMO will designate.

2.9.4 Work with the ILAC, and the accreditation community in relation to the CIPM MRA and the Key Comparison Database

2.9.4.1 The activities in relation to the work with ILAC have been relatively less intense during the past year. Nevertheless, as will be reported in section 6, there is continued dialogue over:

- the recognition of the result of a CMC review following the CIPM MRA process so that accreditation bodies can automatically update an accredited scope for NMIs that choose this route; and
- the ILAC policy on traceability.

2.9.4.2 On 9 September 2009, the KCDB covered 664 key comparisons and 190 supplementary comparisons. Among these key comparisons, 350 had their Final Reports approved and posted in the KCDB, providing a total of about 1320 graphs of equivalence displayed in the KCDB. The results of 104 RMO key comparisons are published in the KCDB. Linkage has also been carried out for 24 bilateral key comparisons subsequent to full-scale Consultative Committee key comparisons; their results are added on the

appropriate graphs of equivalence. On the same date, 21 366 CMCs were also published in the KCDB.

2.9.4.3 The 11th KCDB newsletter was issued in June 2009. The newsletter maintains a very high standard of reporting and continues to include contributions from NMIs as well as the BIPM. It contains news about the database itself as well as case studies and feedback from the JCRB meetings or other relevant meetings. The latter is an important contribution to the flow of information from the JCRB to RMO technical committee chairs and to NMIs. The BIPM was concerned that a number of people who should be informed about the work of the JCRB and CIPM appeared not to have heard about key decisions. As a complement to the action points now circulated by the JCRB Secretary to the RMO representatives, the KCDB newsletter contains full reports.

2.9.5 Ten years of the CIPM MRA

The International Metrology Congress held in Paris during June 2009, included a plenary session on the CIPM MRA which was successful and which enabled the speakers to reach a wider audience than the NMIs. Similarly, the NCSLI meeting in July 2009 contained several major talks about the CIPM MRA, including the keynote address delivered by one of the Vice-Presidents of the CIPM, Dr Barry Inglis.

The ten-year anniversary of the CIPM MRA symposium was held just before this meeting of the CIPM and will be reviewed in section 5.

2.10 Regional Metrology Organizations

2.10.1 Following the CIPM's approval of AFRIMETS as a member of the JCRB at its meeting in October 2008, the RMO has been very active, with a number of internal meetings as well as a general Assembly which was well attended.

2.10.2 The Director attended a meeting on "GULFMET", organized by the Gulf Standards Organization. The current members are: the United Arab Emirates, Bahrain, Saudi Arabia, Oman, Qatar, and Kuwait. There is a high degree of enthusiasm amongst these States and the bureau welcomes this regional initiative. Saudi Arabia was expected to be the State which would

accede to the Metre Convention and so enable GULFMET to make an application to the CIPM for approval. However this is taking more time than anticipated.

2.10.3 The bureau noted that the Deputy Director had attended a meeting at which Egypt, Libya, Ethiopia, Nigeria and Ghana (together with the additional possibility of Sudan) discussed the formation of NEWMET. The proposal is that NEWMET would extend its scope along the northern part of Africa with a strong lead from Egypt, and will form part of the AFRIMETS substructure.

2.11 Actions as a result of the meeting of the 23rd General Conference on Weights and Measures (CGPM): developments since the prioritization of the programme of work approved by the CIPM in October 2008.

2.11.1 The decisions taken by the CIPM in October 2008 were implemented in the programme of work for the BIPM which started on 1 January 2009. However, as reported earlier, two new Member States have acceded to the BIPM, which was the basis of the financial assumptions. The future accession of Kenya from 1 January 2010 to become a Member has also been reported and there is every possibility that there may be two or perhaps three new Associates or Members in the near future. The Director therefore proposed to the bureau that a number of staff appointments be approved. These were in the support staff area and an international liaison officer. The CIPM's approval for the three posts (a secretary/publications secretary on a fixed-term two-year appointment, an administrator accountant to assist with the implementation and running of the new accountancy system and the international liaison officer) was obtained by correspondence. A full explanation of the background was given to the members of the CIPM in the Director's letter of 3 July 2009.

2.11.2 The Director and the CIPM bureau will continue to review the possibility that, within the programme of work approved by the CGPM at its 2007 meeting, additional scientific activities could be added to the programme of work in the light of the financial situation as well as other considerations.

2.12 Relations with other bodies and with the French authorities

2.12.1 International Organization for Legal Metrology (OIML)

The bureau has maintained its interest in the OIML in relation to a *rapprochement* or merger. After the CIPM's discussion on this topic last year, Dr Inglis represented the BIPM at the CIML meeting in Sydney on 28-31 October 2008, followed by a discussion. His report on the BIPM's activities was followed by a lively discussion.

There has been continued collaboration between the BIPM and the BIML, ranging from joint presentations, sharing of presentation information and some technical exchanges. There has been no progress, due to a lack of resources on both sides, on a number of planned leaflets which would describe the activities of the two bodies in selected fields of metrology. However a recent NMI secondment to the BIPM will allow the production of a number of draft documents.

2.12.2 March liaison meetings

The bureau represented the BIPM in the usual tripartite meeting (BIPM/OIML/ILAC) and in bilateral meetings with the other two organizations. During the tripartite meeting, the existing three bodies decided to issue an invitation, which has been accepted, to Rob Steele, the new Secretary General of ISO to join the meetings in March 2010. This was driven by a desire to work more closely with the new management of the ISO, to try and reinvigorate the ISO "TAG4" group and to persuade the ISO technical committees to take more account of the VIM and GUM.

The main issues to emerge were:

- that the OIML has reinvigorated its committee on legal metrology and developing countries;
- the OIML is attempting to create a stronger link with the regional legal metrology bodies;
- there will be a revision of the OIML draft law on metrology which is often used by developing countries. The BIPM has accepted an invitation to collaborate;
- that ILAC is reviewing its policy document on traceability - a point which led to an agreement that there should be a tripartite declaration on

traceability principles written for general audiences. The OIML was given the leading position but the BIPM would step in if nothing emerges in the near future;

- that, as the NATA subsidy for the ILAC secretariat is being eliminated, ILAC has had to restrict some of its international liaison activities. However, that activity at the BIPM is considered a top priority and will therefore continue;
- broad agreement with the BIPM's line on the JCDCMAS (see paragraph 10.2) and that disbanding the group would be viewed negatively by a number of bodies.

The bilateral meeting with the OIML concentrated on the *rapprochement* issue and initiatives in the Middle East.

The main issues from the bilateral meeting with ILAC were:

- that two of the BIPM's main contacts (Mike Peet and Yoshi Uematso) were leaving the organization;
- there was no need for a revision of the BIPM/ILAC MoU;
- the BIPM undertook to amend the CIPM MRA text as a number of references to standards were obsolete and needed to be updated;
- there should be a common BIPM/ILAC policy on the inclusion of uncertainty contributions from the device under test in CMCs and calibration certificates;
- there should be a Regional Metrology Organizations/Regional Cooperation of Accreditation Bodies (RMO/RCAB) meeting in 2010; and
- ILAC would consult its membership to see if it would like new service level categories incorporated in the KCDB to meet the needs of the accredited sector. Any information would be fed back to the Consultative Committees.

2.12.3 Changes in the BIPM's links with the *Ministère des Affaires étrangères et européennes français (MAE)*.

The bureau was informed by the BIPM that the French government had made a number of administrative changes to the Ministries which the BIPM

works with. Essentially, the result is that the BIPM will continue to deal with the *MAE* over protocol and the formalities related to BIPM Membership, etc. The *MAE* would also be responsible for matters in relation to the meetings of the CGPM.

However financial responsibility for the BIPM contribution had been transferred to the *Ministère de l'Économie, de l'Industrie et de l'Emploi*. This Ministry is also responsible for the LNE and for legal metrology in France, including relations with the OIML. M. Luc Érard has helped arrange a meeting at the BIPM, which he attended, with the Director and the Head of the Finance and Administration Section of the BIPM at which the Ministry representatives were briefed on the work of the BIPM and at which a number of financial issues were addressed.

2.13 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	2006	2007	2008	2009
I.	Ordinary funds	7 405 481.57	8 035 603.86	8 564 535.51	9 170 045.97
II.	Pension fund	11 872 421.60	12 088 858.38	12 359 859.62	12 232 125.88
III.	Special fund for the improvement of scientific equipment	0.00	0.00	0.00	0.00
IV.	Staff loan fund	229 312.25	238 715.51	248 729.00	252 288.72
V.	Building reserve fund	365 499.97	114 602.35	0.00	0.00
VI.	*Metrologia*	0.00	0;00	0.00	0.00
VII.	Medical insurance reserve fund	581 222.28	555 390.57	523 843.30	479 104.91
	Totals	20 453 937.67	21 033 170.67	21 696 967.43	22 133 565.48

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

There was some discussion on use of the terminology “Member States of the BIPM”. Dr Kaarls reminded the CIPM that this terminology had been introduced on the advice of the BIPM’s legal adviser, considering that the treaty called the Metre Convention had created an organization called the BIPM, and the States ratifying the Metre Convention became Member States of that organization. He acknowledged that this change in wording had caused some discussion in a number of States. Prof. Issaev requested a written document clarifying the reasons for the change, which he could distribute to interested parties. Prof. Göbel agreed that it was important to inform governments of the reasoning behind the new terminology. Dr May commented that, while he was wary of changing names, the BIPM was at the same time the name of the organization and the name of its headquarters. Dr Quinn commented that in this case a proposal to change the name of the BIPM would mean amending the Metre Convention as pursuant to its Article 1 the BIPM was the organization created by the Metre Convention.

A number of CIPM members spoke about a future rapprochement with the OIML. Dr Kaarls observed that the bureau of the CIPM remained open-minded as to future relations with the OIML, but that for the time-being the OIML Presidential Council decided to reconsider its position. Further discussion on relations with the OIML was postponed until the relevant item of the agenda (§10.1).

Discussion on the BIPM Quality System, on the possible exclusion of Member States having financial arrears for more than six years, and on amendments to the Regulations of the BIPM Pension Fund was also delayed until the relevant items of the agenda (§§13.2, 15.3 and 15.9).

Dr Chung asked what would be the effect of the administrative changes to the French Ministries with which the BIPM deals. Dr Kaarls explained that the contribution of France would henceforth be paid to the BIPM through the *Ministère français de l'Économie, de l’Industrie et de l’Emploi*. Mrs Perent added that diplomatic relations with France would continue to be through the *Ministère français des Affaires étrangères et européennes*. The changes meant that the BIPM would now have to deal with the two Ministries. Dr Chung commented that this was also the situation in the Republic of Korea.

3. MEMBERSHIP OF THE CIPM

As mentioned by Prof. Göbel and in Dr Kaarls' report, Prof. Gao Jie who had been a member of the CIPM for 16 years has resigned. This leaves one vacancy on the CIPM. No other notice of planned resignations was given.

The CIPM discussed the various CVs under consideration. There was general agreement that it would be appropriate to replace Prof. Gao Jie with another member from Asia. A vote will be held by correspondence in three months' time.

4. MEMBER STATES OF THE BIPM AND ASSOCIATES OF THE CGPM

The following changes in Membership of the BIPM and Associates of the CGPM have occurred since the 97th meeting of the CIPM:

- the accession of the Republic of Croatia, formerly Associate since June 2005, on 23 December 2008;
- the accession of the Republic of Kazakhstan, formerly Associate since September 2005, on 31 December 2008;
- the association of the Republic of Paraguay on 6 May 2009;
- the association of the Republic of Peru on 28 May 2009; and
- the association of the Republic of Ghana on 17 September 2009.

Prof. Göbel noted that, as reported by the Secretary, as of 1 October 2009 there were 53 Member States and 28 Associates of the CGPM, and there would be 54 Member States as of 1 January 2010, following the accession of Kenya. Prof. Wallard added that the BIPM was in close contact with a number of other Associate States that were considering becoming Members.

Prof. Göbel commented that these results were very encouraging, and congratulated the Director and his team.

5. REPORT ON THE PRESENT STATUS OF THE CIPM MRA

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

Prof. Mussio, Executive Secretary of the JCRB, presented his report CIPM/2009-22, on the activities of the JCRB since the last meeting of the CIPM. The JCRB held its 22nd meeting from 16-17 March 2009 at the BIPM headquarters, and its 23rd meeting from 23-24 September 2009 in Kazan, Republic of Tatarstan, Russian Federation. Document CIPM/2009-22 outlined the main items under discussion, and listed the actions and resolutions approved by the JCRB at the two meetings.

Prof. Mussio noted that responsibility for assuring the five-year review period for CMCs lay initially with the NMIs; reports from the NMIs to the RMO QS groups should include this information and should be fed back to the JCRB. He noted that a very useful meeting had been held between the chairs of the RMO QS WGs. It is anticipated that such a meeting will be held every two years to facilitate the transfer of information. No process was in place to treat the case of an NMI disagreeing with the result of an RMO QS review. SIM is currently preparing an appeal process, and will share it with the other RMOs; each RMO remains in charge of drawing up its own procedures.

In an effort to improve communication with the NMIs in the RMOs, after each JCRB meeting a short report is produced by the Executive Secretary and sent out to the RMOs. It is hoped that the contents of the report are duly fed back to the technical experts. Upon the request of the BIPM Director and the acquiescence of the Director of LATU, Prof. Mussio's term as Executive Secretary of the JCRB has been extended until March 2011.

Prof. Mussio presented three documents for approval by the CIPM. The first (CIPM/2009-23) was a revised draft of CIPM MRA-P-01 "Procedure for approval of a new RMO to the JCRB", which had been discussed by the CIPM in 2008. It was subsequently discussed by the JCRB which made some recommendations to the CIPM. After very brief discussion the document was approved with just one editorial change: the title of section 3 should be changed from "Definition of an RMO" to "Criteria for acceptance of an RMO".

The second document (CIPM/2009-25) was CIPM MRA-D-05 "Measurement comparisons in the CIPM MRA", which is a compilation of preceding reports. Dr Quinn underlined that this was a very important document in the CIPM MRA. He recommended that it should be renamed *Guidelines for CIPM key comparisons*, to supersede the existing *Guidelines for CIPM key comparisons* dated 1 March 1999 (modified by the CIPM in October 2003).

Prof. Mussio noted that no change in policy was proposed in the document, except with regard to pilot studies. The JCRB recommends stipulating that "*The results of pilot studies are not considered* sufficient *support for calibration and measurement capability*". The CIPM discussed the document at some length.

Various views were expressed as to the value of the results of pilot studies. There was general agreement that if the results of a pilot study were needed to support CMCs, then it should instead be run as a key or supplementary comparison. Dr May commented that in the chemical field a pilot study could never become a key comparison during the process of the study, because pilot studies were used to explore new techniques, and a key comparison could only be launched once enough high-quality work existed. Dr Bennett and Dr Kaarls commented that the CCs should not run supplementary comparisons, but Prof. Mussio and Dr Allisy-Roberts replied that in reality in some cases they do so. Dr May called for further discussion as to what was meant by the different types of comparison. Dr Carneiro agreed that it was important to establish clear definitions and include them in the document. With regard to pilot studies and support of CMCs, the CIPM agreed that the words "in general" should be inserted in the proposed sentence: "*The results of pilot studies are* in general *not considered sufficient support for calibration and measurement capability*".

Prof. Mussio noted that the RMOs had called further for discussion as to which laboratories could participate in comparisons within the CIPM MRA, and in particular whether or not private companies could participate; this subject would therefore be tabled at the next meeting of the JCRB. The CIPM were in full agreement that only institutes participating in the CIPM MRA could participate in key and supplementary comparisons and contribute to the key comparison reference values. Private companies could only participate if they had been officially nominated as a designated institute in that area. The CIPM asked Prof. Mussio to transmit this clear message back to the JCRB. Prof. Wallard explained that the question had arisen in the regions because without donations from companies, some

comparisons might not take place. It was clarified that only institutes participating in the CIPM MRA should have their measurement results published in the graphs of equivalence and associated tables published in the KCDB and used in the calculation of the comparison reference value.

Prof. Göbel drew the discussion on CIPM/2009-25 to a close, concluding that the CIPM was not yet ready to approve the document. He asked Prof. Mussio to take it back to the JCRB for revision in the light of the CIPM's discussion, noting that the document should describe the situation as it should be, rather than the situation as it is now.

The third document (CIPM/2000-24) entitled "Traceability in the CIPM MRA" was the JCRB's recommended policy on traceability. Prof. Mussio explained that the new draft took account of the discussion in the CCs following the CIPM's statement in 2008 concerning traceability of CMCs. The original viewpoint had been that an NMI established either a primary realization of a unit, or established traceability to another primary realization. In fact this does not cover many cases in the field of chemistry. The new draft document was a more general document. It was clear that there were many exceptions to the general policy, and this draft document stated the general policy as well as the procedure for handling exceptions.

The CIPM welcomed the idea of treating the exceptions separately and agreed with the JCRB's proposal that a list of the exceptions should be maintained by the BIPM and made available through the "CIPM MRA documents" part of the BIPM website. After some rewording and inclusion of an extra footnote to clarify the meaning of primary realization in route 1, the document was approved by the CIPM. The full statement reads as follows:

Traceability in the CIPM MRA

A National Metrology Institute (NMI) or other Designated Institute (DI) publishing Calibration and Measurement Capabilities (CMCs) in the BIPM Key Comparison Database (KCDB) has two choices for establishing its traceability route to the SI:

- 1. via a primary realization or representation of the unit of measurement concerned, in which case traceability must be declared to its own demonstrable realization of the SI;
- 2. via another NMI or DI having relevant CMCs with appropriate uncertainty published in the KCDB or through calibration and measurement services offered by the BIPM, in which case traceability must be declared through the laboratory providing the service.

In exceptional cases, where neither of these two routes can be strictly applied, alternative paths for establishing the traceability to recognized standards may be proposed to the CIPM through the corresponding Consultative Committee. The list of these exceptions could be maintained by the BIPM and could be available in the CIPM MRA documents part of the BIPM website. The list of exceptions for each field should be periodically reviewed by the corresponding Consultative Committee.

Note 1: In order for a primary realization or representation of the unit of measurement to be considered valid, it requires the approval of the relevant Consultative Committee.

Note 2: The NMI or DI must make available a full assessment of the uncertainty budget and the traceability route for its measurement activity when submitting CMCs for intra- and inter-Regional review.

Note 3: For auxiliary influence quantities, not part of the main traceability path to the SI for a particular measurand and with uncertainties that can be shown to make only a minor contribution to the total combined uncertainty of the CMC, an NMI or other DI is free to use measurement services provided by laboratories accredited by a signatory to the ILAC Arrangement.

Note 4: Traceability route 1 includes the case of NMIs or DIs using certified reference materials (CRMs) or high-purity primary chemical reference materials that have been value-assigned by applying their own measurement capabilities as described and recognized within published CMCs.

Finally, the CIPM approved Resolution 23/5 of the JCRB, which summarized the position that the BIPM, represented by Prof. Mussio, should take at the next meeting of the ILAC Accreditation Issues Committee (AIC):

- *ILAC policy for estimation of uncertainty* − this document is considered unnecessary;
- *Accreditation of NMIs* − the purpose of the document must be clarified before further effort is invested in it;
- *ILAC policy for traceability* − the use of the KCDB should be further encouraged among accreditors to ensure that the CMCs of accredited laboratories are consistent with the CMCs of the NMIs from which they derive traceability.

5.2 Report on the BIPM key comparison database (KCDB)

Dr Thomas, Coordinator of the KCDB, presented a summary of her report CIPM/2009-04 on the evolution of the KCDB over the last year. She commented that the KCDB Office continues to receive a considerable amount of data to be published each week, in terms of results of comparisons as well as CMCs. There is no indication that this flow of data will decrease with time.

She drew attention to two new BIPM key comparisons that have been recently registered in the KCDB: BIPM.RI(I)-K6 on measurement of absorbed dose to water in high-energy photons, and BIPM.RI(I)-K7 on measurement of air kerma in mammography beams. These are specific "BIPM key comparisons" in the sense that they are ongoing series of bilateral comparisons.

She pointed out that data to be published are being received from a great number of RMO comparisons. When the final report of an RMO key comparison is approved, it is published as a PDF file and the corresponding results are added to the graphs of equivalence of the master CC key comparison. She cited CCAUV.A-K1 as an example of linking the results from several RMO comparisons to a CC key comparison. Final reports of RMO (or CC) supplementary comparisons are also published in the KCDB, and can be included in the *Metrologia Technical Supplement*; in the case of supplementary comparisons, no graphs or tables are published in the KCDB.

Dr Thomas noted that some CCs had decided not to include full matrices of degrees of equivalence in their comparison reports, recognizing that most users look at the graphs of results rather than the matrices. She added that graphs of CCTF-K001.UTC are no longer published in the KCDB, as a link to *Circular T* is considered to be sufficient by the time metrology community.

There was a brief discussion on how long the data from key comparisons are considered valid. The CIPM recognized that this time depended on the field, and was for the CC KCWGs to judge. Dr Allisy-Roberts commented that in the field of radionuclides, a phased programme had been put in place to delete old data from the KCDB; by the end of 2009, data more than 25 years old will have been deleted; this limit would be reduced to 20 years old by the end of 2011. It was suggested that a default period of validity could be set, and adjusted as necessary by the CCs, but no new rule was adopted.

Prof. Göbel thanked Dr Thomas and the KCDB Office for their hard work.

5.3 Symposium to celebrate 10 years of the CIPM MRA

The CIPM briefly discussed the Symposium held to celebrate the 10-year anniversary of the CIPM MRA, held in Paris on 8 and 9 October 2009. Prof. Wallard remarked that it had been a very successful event, which had included many excellent talks, demonstrating the importance and use of the CIPM MRA in the world at large.

Dr Inglis drew attention to two particular benefits of the CIPM MRA that had been highlighted in the talks: Dr Louw, acting Chief Executive Officer of NMISA, had talked about the development of national and regional metrology infrastructures in Africa as a result of the CIPM MRA, and Prof. Jornada, President of INMETRO, had shown that the CIPM MRA was important when discussing needs in metrology with the Brazilian government. Dr Inglis congratulated everyone involved in what he considered to be a very valuable event.

Prof. Issaev reported that a two-day symposium had also been organized in the Russian Federation to celebrate the 10-year anniversary of the CIPM MRA. Nearly 1000 people had attended, and a copy of the CIPM MRA text translated into Russian was distributed to all participants.

The CIPM recognized the importance of clear communication and the need to pay attention to the words chosen to communicate with the external community, particularly the regulators. It was regretted that very few regulators had been able to attend this symposium. Prof. Wallard commented that the BIPM had no mandate to talk to national regulators, but invited the CIPM members to make suggestions as to what should be done. Prof. Göbel commented that there was a gradual but ongoing improvement in relations with the regulators.

The CIPM members were also encouraged to see the positive message of support for the CIPM MRA received from ISO.

5.4 Proposed revision of the CIPM MRA

Prof. Wallard noted that any changes to the CIPM MRA must be approved by the signatories at meetings of NMI Directors. At the recent meeting of NMI Directors (7 October 2009) there had been general consensus for a number of minor revisions to the text of the CIPM MRA.

These revisions included: update references to standards; schedule of implementation; transition period; definition of CMCs as approved by CIPM 2007; and various other editorial points. Prof. Wallard commented that the NMI Directors were generally in favour of explicit mention of the role of RMOs in reviewing Quality Systems, but generally against modifying the text of clauses 7.2 and 7.3. Comments and suggestions from the NMI Directors were still coming in, and he would wait for further comments before distributing a revised draft.

The CIPM members agreed with Prof. Kühne's suggestion that there should be a clause requiring a review of Quality Systems, but without explicitly stating the criteria. The nature of the mandatory peer reviews (i.e. whether they be on-site or not) should be left for the RMOs to decide.

5.5 Authorship of comparison reports

Dr Kaarls called for the BIPM to draft a guidance document on whose names should be listed as authors of comparison reports. Prof. Göbel considered that good scientific practice should be followed, and there was no need for special CIPM or BIPM guidance on this. Prof. Ugur suggested that the issue could be included in the protocol of a comparison, rather than being addressed globally by the CIPM.

Dr May said that he would indeed welcome a guidance document. He explained that a problem had arisen with a recent NIST-run pilot study, on which a report had been published by another NMI without passing by the usual NIST review process. He suggested that if the CIPM did not want to establish a policy, the CIPM could ask the CCs to decide.

Prof. Göbel suggested that the JCRB could be asked to develop a policy for the CIPM's consideration. Recognizing that the JCRB itself was not involved in comparisons, and the JCRB meetings were not attended by many chemists, the CIPM agreed that the JCRB should be asked to set up a working group to address the issue and make a proposal to the CIPM.

6. BIPM/ILAC JOINT WORKING GROUP

Prof. Wallard presented document CIPM/2009-51 reporting on joint BIPM/ILAC activities. He noted that both sides considered the BIPM/ILAC MoU to be satisfactory. The BIPM and the ILAC held a joint meeting in

March 2009 and the outputs of the meeting were outlined in CIPM/2009-51. Overall the level of activity has been slightly lower than in previous years, partly as a result of two key individuals in ILAC having left. Recently, and as reported in Section 5.1, new drafts of various documents being prepared for the ILAC General Assembly had been brought to the attention of the BIPM, namely ILAC P-10 *ILAC Policy on Traceability of Measurement Results*, ILAC G-2 *Traceability of measurements*, and *ILAC Guidelines on the Accreditation of National Measurement Institutes*. These documents are closely related to the NMI community, and the BIPM wants to ensure that the NMI points of view were represented. Prof. Wallard informed the CIPM that Prof. Mussio now participates in meetings of the ILAC Accreditation Issues Committee (AIC), responsible for reviewing these documents. The next AIC meeting would be held in October 2009.

The document CIPM/2009-51 summarized the BIPM's position on each of the three documents. In particular, the BIPM's position in the discussion of the document *ILAC Guidelines on the Accreditation of National Metrology Institutes* is to give support to those NMI signatories of the CIPM MRA that have chosen to be accredited, by setting mechanisms that will avoid duplication by:

- ensuring that the CMC technical review process carried out in the framework of the CIPM MRA is accepted by the accreditation bodies for automatic updates of the NMIs' accredited scope;
- giving guidelines for the selection of the assessors and availability of information resulting from the assessments, in such a way that these assessments can be used to support the quality system reviews carried out by the RMOs;
- ensuring that the principles set out in the CIPM traceability policy statement (see section 5.1) are fulfilled.

Prof. Wallard underlined that collaborating with the ILAC on this document in no way implied that the BIPM preferred accreditation to self-declaration. He added that there was no commitment to producing joint documents with ILAC.

Finally, he drew attention to a problem raised by the CCM-WGFF, which had detected that a number of laboratories providing calibrations in flow had been accredited with uncertainties much smaller than those of the NMIs through which they claim traceability to the SI. Prof. Wallard informed the CIPM that he had drawn ILAC's attention to this apparent inconsistency, and the problem would be raised at the next AIC meeting.

Prof. Göbel thanked Prof. Wallard for his report and invited questions.

Dr Valdés called for ILAC to address the issue that testing laboratories usually state no uncertainty in their accreditation certificates. He noted that the ILAC delegate at the CIPM MRA Symposium had sidestepped this issue. Dr Kaarls agreed that it was important to address the question with ISO CASCO. However he acknowledged that many communities (including the medical community) were not favourable to the idea of stating uncertainties. Prof. Göbel thought that continuing contacts with ILAC should gradually help improve the situation, and noted that the issue was also tabled at the annual BIPM/ILAC meetings.

Prof. Wallard noted that the ILAC Executive was broadly sympathetic. He added that the JCGM-WG1 (GUM group) has an activity on conformity assessment, and both ILAC and OIML collaborate in this. Once a corporate document was produced, it would be shared by all bodies which have worked on the project.

Prof. Kühne suggested that a joint BIPM/ILAC working group could be established, to meet to address specific issues when they arose.

Dr Carneiro was concerned to see interactions between the BIPM and the ILAC slowing down. He pointed out that in Europe there is dialogue at the regional level between the EA and EURAMET, as well as at the national level, for example in Denmark between DANIAmet and DANAC. However, all these bodies are awaiting publication of the final version of the ILAC paper on accreditation of NMIs. If the document was not issued soon, the NMIs would have to face cumbersome procedures to maintain their accreditation. Prof. Wallard explained that in fact an earlier version of the document had been broadly in-line with the BIPM's point of view. However there were now new ILAC authors and the more recent version of the document had apparently changed direction. The BIPM would participate actively in the discussions on it during the forthcoming AIC meeting. It was hoped that the document would then be discussed between the RMOs and RABs at their meeting at the BIPM in March 2010.

Dr Schwitz requested that the draft document be made available to the CIPM. He voiced his objection to the term "accreditation of NMIs", suggesting that "accreditation of NMI services" would be preferable. Dr Nava-Jaimes commented that the technical competence of national accreditation bodies was often insufficient to allow accreditation of the NMI. He remarked that there remained difficulties at the national level even if

there were good interactions at the highest level between the BIPM and the ILAC.

Dr Quinn called for the CIPM and NMI Directors to make a firm statement that the CIPM MRA includes enough requirements regarding QS reviews. His call was strongly supported by Dr Kaarls, who believed it important to respond to the ILAC's belief that accreditation was equivalent to the review by RMOs of NMIs' quality systems. In fact the RMO process is more detailed and comprehensive.

Dr Kaarls mentioned that it was important also to address the weak part of the CIPM MRA system at present, which was that the RMOs did not all operate in the same way. Dr Chung noted that although the APMP did not require the NMIs to make a presentation on their quality systems, they required the submission of full supporting documentation and the papers were scrutinized by the APMP TCQS Committee. Even if not all the APMP rules were formulated in writing, they applied a strict review and she believed that the APMP criteria were indeed stricter than those of the other RMOs. Dr Kaarls commented that it was important for all RMOs to demonstrate that they operated equivalently.

Dr Carneiro noted that in Denmark all the metrology institutes were accredited, and peers from foreign metrology institutes acted as technical assessors. His experience was that the peer-reviewers kept the accreditors on their toes. All the QS documentation is produced in English so that it is internationally available. Then the only extra work required for the CIPM MRA process is a presentation to the EURAMET TCQ.

7. REPORT ON STEPS TAKEN TO IMPLEMENT THE REPORT FROM Dr BENNETT ON MATERIALS METROLOGY AND THE MoU WITH VAMAS

Prof. Wallard presented a brief report on CIPM/2009-33, summarizing various activities within five of the Consultative Committees addressing needs in materials metrology. He noted that the activities of the CCs were reported in more detail elsewhere (see section 8), and these particular activities had been highlighted by the Executive Secretaries. The VAMAS Chairman had contacted him a few weeks earlier, nominating contact persons in each area and proposing four studies of interest (given in Annex A of document CIPM/2009-33). Although this draft list of pilot

studies was still being developed by VAMAS, Prof. Wallard asked that the proposals be discussed at the next meeting of the appropriate CCs.

Prof. Göbel was disappointed about how slowly the work was progressing. Dr Bennett agreed that there had been slow but steady progress within the Consultative Committees. He would keep discussing with Dr Sims, Chairman of VAMAS, as to how to push progress on the VAMAS side. There was broad agreement that it was important for VAMAS to identify needs. Dr Kaarls noted that for VAMAS to suggest as a study "a review of existing CCQM studies" was not helpful. What was needed was a list from VAMAS on what areas were missing. On a positive note Dr Bennett reported that the future special issue of *Metrologia* on materials metrology was progressing well. Prof. Wallard said that he would draft a letter to the VAMAS chairman reporting on the present meeting.

8. REPORTS FROM CONSULTATIVE COMMITTEES

8.1 Consultative Committee on Electricity and Magnetism (CCEM)

Dr Inglis, President of the CCEM, presented his report CIPM/2009-52 on the 26th meeting of the CCEM, held at the BIPM headquarters on 12 and 13 March 2009. This CCEM meeting was preceded by meetings of five of the seven CCEM Working Groups, and reports from all the Working Groups were received and discussed.

Much discussion concentrated on matters related to fundamental constants − particularly with respect to progress in the watt balance experiments around the world − and on a future *mise en pratique* of the definition of electrical units which gives a non-exhaustive list of methods that might be used for realizing these units. The CCEM approved this document in principle. It also reconfirmed its position of 2007 on the redefinition of SI base units, recommending that the numerical values of the Planck constant (h) and the elementary charge (e) be fixed. This would have the advantage of bringing traceability for electrical quantities formally into the SI, and allowing a full exploitation of the advances and established infrastructure of the Josephson and quantum Hall quantities.

A compendium of precise ac measurements of the quantum Hall effect has been produced and published in *Metrologia* (see *Metrologia,* 2009, **46,** R1-R11). This shows how the quantum Hall resistance can be used as a

reliable quantum standard of ac resistance, with an uncertainty of the order of a few parts in 10^8. Dr Inglis noted that the WGACQHR had now been closed, but interested parties can participate in a discussion forum that was continuing online.

Dr Inglis noted that work related to the CIPM MRA had reached a certain level of maturity, and he encouraged all the CCEM Working Groups to devote time to discussing scientific issues as well as dealing with questions related to key comparisons and CMCs.

WGSP presented a draft document on future challenges in electromagnetic metrology. The document was aimed at stimulating cooperation between NMIs as well as between the CCEM and the other CCs, including the CCPR, CCTF and CCQM. The document will be reviewed again by the WGSP before being published on the BIPM website. To ensure the document is acted upon it was decided to focus on single electronics and single photonics.

The CCEM also set up a Task Group charged with determining the need for a working group to study the electromagnetic properties of materials. The committee discussed at some length the proposed work plan for the BIPM Electricity Section and supports the development of the ac QHE work to determine a more accurate value of R_K and the ac JVS for future comparisons of ac voltage.

Prof. Göbel thanked Dr Inglis for his interesting report, and invited questions.

Dr Hengstberger commented that the CCPR already had an active programme on single photonics and asked what the CCEM expected to contribute in this area. Dr Inglis clarified that there was no attempt to duplicate efforts undertaken elsewhere, but the CCEM WGSP had identified photonics as one of the important areas to which the EM community could usefully contribute in the future. It was thought that this was an area in which effective interaction between the CCs should be encouraged. Mr Jonathan Williams of the NPL had been nominated as chairman of the Task Group, as he already has good contacts with the radiometry field.

Dr Valdés commented that the electrical characterization of nanostructures was a very big field, and asked what role was foreseen for the BIPM in this area. Dr Inglis explained that the focus of the report was looking ten to fifteen years into the future. Although two of the three proposed projects for work at the BIPM could probably be undertaken within the next work programme, the third was aimed further in the future. Dr McLaren agreed

that for the time being there remained concerns about the reproducible production of nanostructure materials.

Prof. Göbel asked when the strategic planning document was likely to be published. Dr Inglis hoped that it would be available on the BIPM website within the next four months.

There were no official recommendations from the CCEM in 2009, but the CIPM noted the reconfirmation by the CCEM of their previous recommendation E 1 (2007), on proposed changes to the SI.

8.2 Consultative Committee on Amount of Substance − Metrology in Chemistry (CCQM)

Dr Kaarls, President of the CCQM, read his report CIPM/2009-50, on the activities of the CCQM and its working groups over the last year. The 15th annual meeting of the CCQM was held at the BIPM headquarters in April 2009, preceded by meetings of the CCQM's seven working groups and a workshop entitled "Frontiers of Traceability in Chem/Bio Measurements and Primary Methods".

Dr Kaarls commented that the interest of NMIs and other (potential) designated institutes in the work of the CCQM and its working groups continues to increase. High-priority areas of work include food analysis and microbiology, analysis in the healthcare sector (diagnostics, therapeutics, and pharmaceuticals), environmental measurements, purity analysis, and the forensic sciences. In addition to its seven permanent working groups, the CCQM currently has three *ad hoc* working groups:

- *Ad hoc* Working Group on the Redefinition of the mole, chaired by Dr Milton (NPL);
- *Ad hoc* Working Group on the KCRV and its Uncertainty, chaired by Prof. Cox (NPL);
- *Ad hoc* Working Group on Efficient and Effective Testing of CMC Claims, chaired by Dr Turk (NIST);

Most of the CCQM working groups also held meetings mid-year, and joint sessions between certain working groups are held to examine areas of overlap such as the field of protein analysis (dealt with by experts in the Organic Analysis Working Group (OAWG) and the Bioanalysis Working Group (BAWG)). The working groups are due to meet again in November 2009, hosted by INMETRO (Brazil).

Dr Kaarls remarked that a meeting of the CCQM Working Group Chairs held at the BIPM headquarters on 12 and 13 March 2009 had dealt particularly with the choice of method for calculating the key comparison reference value and its uncertainty, and how to ensure the most efficient way of testing CMC claims. The way to calculate the KCRV is a subject of ongoing debate, and Prof. Cox, in association with Dr Ellison (LGC) and Dr Duewer (NIST) will give related tutorials at the occasion of the November meetings of the working groups, and develop written guidelines.

The CCQM heard a number of presentations related to the International Avogadro Project, including talks on the isotope ratio measurements of natural and enriched silicon, and the IDMS (isotope dilution mass spectrometry) method used to determine the molar mass of silicon. Concerns were expressed about the isotope measurements of natural and enriched silicon: particularly that only one measurement on silicon impurities had been made and by only one laboratory, and that this laboratory was not an NMI. It was felt that this was not a sound basis on which to found decisions affecting the redefinition of base units of the SI. Dr Kaarls noted that the PTB were now working on isotope measurements. The CCQM (with the exception of one Member) generally supported the proposal for a redefinition of the mole based on a fixed numerical value of the Avogadro constant. However, as noted above, it wished to see agreement in the isotope amount ratio measurements, and felt that there was not enough dialogue with the wider chemical community about the proposed changes.

The CCQM continues to cooperate with a large number of other bodies, including the Codex Alimentarius Commission, the IAEA, IFCC, ISO REMCO, ISO CITAC, various Pharmacopoeias, WADA, WHO, and WMO. It was waiting to hear back from the CCM-WGV about possible collaboration in the field of viscosity measurements.

CCQM Workshops on “forensic science and metrology” and “microbiology” are planned for 2010: the former in conjunction with the CCQM meetings at the BIPM headquarters in April.

Dr Kaarls presented Recommendation Q 1 (2009) on the possible redefinition of the mole and the kilogram. The CIPM noted Recommendation 2009 Q1 of the CCQM as containing crucial conditions for any sound scientifically based redefinition of the kilogram and the mole, especially the need for independent measurements of the isotope amount ratios of silicon on samples at both natural and enriched isotopic composition and the need for a wider consultation of the chemical measurement community.

Dr Kaarls expressed his thanks to the BIPM staff for their support, commenting that the annual CCQM and CCQM WG meetings at the BIPM headquarters represented a heavy logistical burden.

Prof. Göbel thanked Dr Kaarls for his report and invited questions.

Dr Quinn remarked that the remarkable success of the CCQM was in large part thanks to the energy of its President, Dr Kaarls. He recalled that when Dr Astin, then Director of the NBS, United States, had first proposed in 1978 that the CIPM should take up an activity in the field of reference materials, the CIPM had initially been somewhat reluctant to take it on, although they did not refuse. Although the CGPM was enthusiastic, when it was discussed again 12 years later, the CIPM was again reluctant but Dr Lyons (then Director of the NBS) was instrumental in pushing it forward. The CCQM was eventually created in 1993, and it is now inconceivable that there would not be a Consultative Committee on metrology in chemistry. It was created at just the right time and chose just the right person for the job.

Prof. Mills followed up the comments about discussions with the wider chemical community, noting that he personally did his best to spread the word in the chemistry community. Early in the year he had published a short paper in *Chemistry International* on the subject, co-authored with Dr Milton. He had also spoken at the ICTNS meeting in Glasgow. The subject was also discussed at the General Assembly IUPAC.

Dr May strongly recommended that Prof. Mills consider publishing an editorial in the journal *Analytical Chemistry*, which has a broad circulation reaching industrial chemists as well as the academic chemical community.

Prof. Issaev asked if OIML participated in any CCQM activities, noting that the OIML was interested in a range of chemical subjects, including certified reference materials, gas analyses, and laboratory medicine. Dr Kaarls replied that the OIML was aware of the activities of the CCQM, and he had discussed their relationship with the CCQM with Dr G. Harvey (Second Vice-President of the CIML); as yet, however, there had been no request from the OIML for closer participation. Dr Kaarls was prepared to invite the OIML to participate at meetings of the CCQM, and asked what they might contribute. Prof. Issaev suggested that the question should be discussed during the next bilateral BIPM-OIML meetings.

Dr Valdés commented that one reason for the low level of development within the OIML in the field of chemistry might be that there were few expert chemists within that organization. Dr May agreed that there was often

a lack of communication between colleagues dealing with scientific and legal aspects of metrology.

Dr Inglis noted the CCQM's interest in the nanoscale workshop. Following up on the CCEM WGSP proposal that this area should be considered as a possible work area for the BIPM, he underlined that the reproducibility of "nano" materials was already a subject of concern.

Dr Sacconi drew attention to the significant cost of travel associated with the numerous meetings related to the CCQM.

Prof. Issaev drew attention to 2011 being the International Year of Chemistry, and Prof. Wallard confirmed that the theme of World Metrology Day 2011 would be centred on chemistry.

8.3 Consultative Committee for Ionizing Radiation (CCRI)

Dr Carneiro, new President of the CCRI, made a brief presentation on recent activities of the CCRI and its three sections. He pointed out that 2009 had marked the 50th anniversary of the creation of this Consultative Committee (originally called the CCEMRI), and the meetings of the CCRI Sections in 2009 had celebrated the occasion with a series of invited seminars.

Dr Carneiro spoke about how, in many cases, metrology is not the core interest of the designated institutes dealing with ionizing radiation measurements. This can lead to difficulty in establishing uncertainty budgets. He also spoke about how the CCRI is a large Consultative Committee working in areas of public interest including health, industry and the environment. It also faces the grand challenge of reducing the level of uncertainty in the primary measurements, particularly for dosimetry in the health domain. He mentioned the work that has begun on identifying the CCRI's strategic plan, including listing the stakeholders, institutions and end-users. This has been discussed at a preliminary stage by the CCRI Sections and endorsed by the overall CCRI. The Strategic Plan is now in the hands of the Section Chairmen to produce their contributions. Dr Carneiro talked about the Measurement Groupings Table which had been reviewed and updated. He also presented the linear accelerator (linac) proposal which had been discussed and fully endorsed by the CCRI. Support for the linac proposal has also been expressed by other organizations, including the WHO which has written a letter to the Director of the BIPM.

Dr Allisy-Roberts drew attention to a question raised during the CCRI meeting as to how dosimetry comparisons organized by the IAEA

throughout the IAEA/WHO SSDL (Secondary Standard Dosimetry Laboratory) Network might be included in the KCDB. The issue has been discussed between the BIPM and the IAEA. As the Agency takes part in all the regional comparisons, each SSDL can be linked to the global network through the RMO.

Prof. Kühne clarified how to deal with the different types of SSDL which are members of the IAEA/WHO SSDL Network. A paper on the topic had been prepared and endorsed at a recent meeting of the JCRB in Kazan, Russian Federation. Dr Kaarls remarked that the same question might arise in other fields. Some of the laboratories might not fulfil the CIPM MRA requirements for publication of their results in the KCDB. Prof. Kühne stated that there is no need for a new agreement, but the way the CIPM MRA approaches the case was clarified and it depended on whether a laboratory has been designated in the CIPM MRA as the national laboratory with responsibility for dosimetry. Dr Kaarls mentioned that the problem had arisen because of an approach by an SSDL in Georgia. Prof. Göbel requested that the JCRB document should be made available to the CIPM.

Dr Hengstberger spoke about the IAEA/WHO SSDL Network which had existed, especially in many developing countries, before other forms of designation existed. The network was the only assurance of quality for these laboratories and is prevalent even today in regions such as Africa. This can cause problems with the establishment of NMIs when there is an existing laboratory present and a merger of their activities is proposed. The merger of the NMI and SSDL in Kenya was successfully achieved, however such mergers are often difficult and can cause confusion at the decision-making level. There is no reason why the two systems should not exist in parallel until the SSDL becomes a designated institute as appropriate.

Prof. Göbel stated that he appreciated the generic approach of the Measurement Groupings Table and suggested that other CCs could consider adopting a similar approach to make CMC presentations for review more straightforward.

8.4 Consultative Committee for Units (CCU)

Prof. Mills, President of the Consultative Committee for Units (CCU), presented his report (document CIPM/2009-46). He spoke about how the

CCU prefers explicit-constant-type definitions[1], and he gave examples of the wording in the proposed new format of presentation for all new definitions of the SI base units. The CCU believes that the explicit-constant form is more fundamental, and better separated from consideration of practical realization. He spoke in detail about the proposed changes to the definitions of the kilogram, ampere, kelvin and mole and how he believes that the changes should be made simultaneously. Prof. Mills presented the proposed redefinition of the mole at the IUPAC General Assembly in Glasgow in August 2009. Although there were some opponents, there was a general acceptance of the proposal based on a fixed numerical value of the Avogadro constant. Preliminary work on a revised draft of chapter 2 of the next SI Brochure has been started and was circulated to the CIPM.

Prof. Göbel stated that there were two issues to discuss: general re-definition of the base SI units and the timing of any changes.

Dr Tanaka spoke about how most delegates at the CCM share the viewpoint that more evidence is needed on the estimated drift of the mass of the international prototype of the kilogram (IPK) and how substantial discrepancies remain between the results of experiments producing numerical values for the fundamental constants.

Dr Valdés noted that the definitions of some SI base units shown in the presentation by Prof. Mills were different from those stated in the current SI Brochure, although the underlying principle was not affected (for example for the metre) and expressed concerns about the wording of explicit-constant definitions. He stated that the aim is to achieve definitions of the units by fixing numerical values of the constants. In the current definition of the metre it is clear that one referred to a length, which is the distance travelled by light in a fraction of a second; quantities may no longer be mentioned in the new explicit-constant definitions. In addition, in most of the proposed new definitions, the unit being defined is repeated in the definition, which seems to imply circularity. For example, the metre is defined using the speed of light in metres/second.

Prof. Ugur commented that if the definition of the kelvin is changed, calibration certificates may have to be changed and uncertainties will increase. He wondered what consequences this will have. He said he approves of having a homogenous system for the whole SI, but has concerns that if the change significantly affects the uncertainties of ITS-90 there will

[1] An explicit-constant-type definition for a unit is a definition in which the unit is defined indirectly by specifying explicitly an exact value for a constant of nature.

be an economic impact on every user of temperature measurements. Dr Quinn believes this is an incorrect assumption and stated that the ITS-90 will be completely unaffected by the change. Original temperature scales were based on the freezing and boiling points of water. As scales have evolved, the changes have not been passed on to industry. Dr Stock agreed with Dr Quinn, stating that what will change is the difference between the ITS-90 and the thermodynamic temperature scale. Prof. Kühne said that there may admittedly be some disadvantage in the region of the triple point of water, but for higher temperatures there will be an overall gain.

Dr Inglis thanked Prof. Mills for his very clear presentation. He was happy with the presented changes, but had concerns about the proposed timing. He believes a change to the SI will generate to a lot of interest around the world, and any further change to the mass of the international prototype of the kilogram a few years after the redefinition would be viewed in a very negative way. Prof. Mills replied that there will not be another change in the definition of the kilogram, rather a change in the estimate of the mass of the international prototype of the kilogram. Dr Inglis accepted this but warned that this will not be clear to the general public.

Dr Bennett asked about corrections to certificates issued after the definitions are changed. This could leave NMIs in a difficult position. He also stressed that the CIPM should carefully consider how it can communicate the new definitions to the general public. The consequences of the presentational aspects are far-reaching and it should be remembered that changes to the SI are not just about scientific arguments.

Prof. Kühne spoke about distinguishing between fixing the numerical value of the Planck constant h, and disseminating mass which will require the drawing up of a *mise en pratique* for the new definition. He added that for the first time there would be a full understanding of the drift of the mass of the international prototype of the kilogram (IPK).

Prof. Göbel agreed that a consistent set of experimental data for the value of h are not yet available. The Avogadro result is still preliminary and needs further correction for the copper and nickel impurities in the IAC programme. He asked what is the argument against waiting for another four years. Prof. Mills replied that he hoped that the finalized IAC result would be available within the next year. However, the CCU believed that although new and improved experimental results will undoubtedly appear in the next five years, there will be nothing lost and much to be gained by going ahead with the revisions to the SI that are now proposed.

Prof. Issaev believes that the redefinition of the kilogram and the implementation of the new definition should be carried out at different times. Implementation could occur three to five years later.

Dr Quinn stated that the robustness of the Planck constant is underestimated by the CIPM. The uncertainty of the CODATA value results from the combination of all the results available. He does not think the current value will change by more than 5 parts in 10^8. All that is needed for completion is the value of the Avogadro constant obtained from enriched ^{28}Si.

Prof. Göbel summarized the discussion.

- There was some consensus that the new definition of the kilogram should be based on a fixed numerical value of the Planck constant *h*.
- There was some consensus in support of explicit-constant wording for the new definitions.
- There was as yet no consensus on the timescale for the changes. This will be reconsidered by the CIPM in 2010.

8.5 Consultative Committee for Time and Frequency (CCTF)

Mr Érard, President of the CCTF, presented his paper on the recent work of the Committee. He spoke about how more research and development into optical clocks is required before the second can be redefined and how the accuracy of TAI, UTC and TT has improved by an order of magnitude since 1988. Reports from the CCTF Working Groups were presented at length. There was a lively discussion about the possibility of creating other KCs in the field of frequency, and it was decided that there would be only one key comparison based on the results of the *Circular T*. The proposed work programme for the BIPM in the period 2013-2016 was provisionally approved. There were three main points in the programme: integration of multiple GNSS data to clock comparisons for TAI; accuracy of frequency transfer for application to optical clock comparisons; and use of secondary representation of the second for improving the accuracy of TAI.

Prof. Ugur asked about the role of the BIPM in synchronizing the GNSS time systems. Mr Érard clarified the question by stating that the BIPM is harmonizing rather than synchronizing the systems. Dr Arias stated that each GNSS time is independent and the BIPM has no practical role in synchronization of their time systems. However it is important for the BIPM to be able to provide the reference to steer them, and also compare them.

UTC, which includes leap seconds, is not considered a suitable time scale for steering the GNSS.

Dr Kaarls commented that the geodetic community will soon restart its project on Laser pulse 2-way transfer via satellites and asked whether the CCTF has any plans to make use of this facility. Dr Arias replied that the OP and Observatoire de la Côte d'Azur are running experiments as part of the Time Transfer by Laser Link (T2L2) which is beginning permanent operation using the satellite JASON. An international forum to discuss T2L2 issues meets at the same time as the CCTF TWSTFT group. The 2nd international meeting of the T2L2 forum will be held soon.

Prof. Issaev asked about the BIPM's plans in the field of gravimetry until 2013. Mr Érard replied that it is not within the remit of the CCTF. However, gravimetry is important for a number of the BIPM's scientific sections.

Mr Érard presented four Recommendations to the CIPM:

- Recommendation CCTF1 (2009): Updates to the list of standard frequencies.
- Recommendation CCTF3 (2009): On the weakness of the present definition of UTC.
- Recommendation CCTF4 (2009): Concerning adoption of a common terrestrial reference system by the CGPM.
- Recommendation CCTF5 (2009): Alignment of Geodetic References and synchronization of Time References to international standards.

Recommendation CCTF1 (2009): Updates to the list of standard frequencies.

Dr Bennett asked whether the revised frequencies would have an impact on the *Mise en pratique* of the definition of the metre. Mr Érard replied that this is a common list of frequencies with no difference between the *Mise en pratique* of the definition of the metre and the secondary representations of the second so the *Mise en pratique* of the definition of the metre would be automatically updated. Dr Sacconi mentioned that because the list is shared, attention should be given to the wording at the top of the recommendation so that it states "frequencies for the practical realization of the metre, secondary representations of the second, and for other applications". Prof. Ugur questioned whether, for consistency, the number of digits in the uncertainty should be changed. Dr Thomas explained that the frequency of an optical transition can be stated to parts in 10^{17}. However if it is related to the SI second based on the caesium atom uncertainty is increased. Dr Kaarls proposed that a footnote should be inserted in the recommendation to

explain this. The Recommendation was adopted by the CIPM as Recommendation CCTF1 (2009), subject to minor modifications by Dr Sacconi and Dr Kaarls.

Recommendation CCTF3 (2009): On the weakness of the present definition of UTC.

Dr Arias commented that it is not satisfactory to have a time scale with steps in it, especially when the steps are irregular and cannot be predicted. The Recommendation was adopted by the CIPM.

Recommendation CCTF4 (2009): Concerning adoption of a common terrestrial reference system by the CGPM.

The Recommendation was adopted by the CIPM.

Recommendation CCTF5 (2009): Alignment of Geodetic References and synchronization of Time References to international standards.

The Recommendation was adopted by the CIPM.

8.6 Consultative Committee for Length (CCL)

Dr Sacconi, new President of the Consultative Committee for Length (CCL), presented his report on the recent work of the CCL and the outcome of the 14th CCL meeting in 2009. He spoke about the new structure of the CCL.

Dr Sacconi presented briefly the Recommendation CCL2 (2009): Updates to the list of standard frequencies, a list prepared by the Frequency Standards Working Group and independently approved by the CCTF and the CCL. As it is identical to the Recommendation CCTF1 (2009) it has already been approved by the CIPM.

Prof. Kühne asked about the terms of reference of the CCL's Discussion Groups (DGs). Dr Sacconi replied that the terms of reference of the DGs will be discussed at a future meeting of the WGs.

Prof. Wallard commented on the enormous progress made by the CCL in terms of its structure, its reporting activities and addressing the CIPM MRA issues at a high level. He was very pleased to see these significant improvements.

Dr Carneiro spoke about the WG on nanometrology. He raised concerns that similar WGs on nanometrology may be set up by other CCs, with a great deal of overlap between them. Dr Sacconi agreed that it was necessary to give some attention to this problem. Prof. Göbel added that a Workshop on Metrology at the Nanoscale will be held at the BIPM in 2010 and it will be

important for future meetings of the CIPM to discuss how best to coordinate the activities of the various CCs, with regard to nanometrology. An agenda point relating to this issue should be part of the next CIPM meeting.

Dr May stated that there are similarities between the situation regarding nano(technology) and bio(sciences), as both are new frontiers that have an impact on many disciplines. He suggested that each CC should hold a workshop to find out what is the situation in the various NMIs. Prof. Göbel commented that there was a need to coordinate the "nano" activities of the different CCs.

Prof. Issaev asked about the collaboration with ISO 229. He raised concerns that the activity is based on standards and that it needs to be closely related to metrology. Dr Sacconi confirmed that a number of delegates from the CCL attend ISO 229 meetings and Prof. Wallard mentioned that the BIPM is an active liaison member of ISO 229.

Dr Sacconi presented the Recommendation CCL1 (2009) to the CIPM: Supporting key comparison CCL-K11 in national metrology laboratories, in which the CCL recommends that the BIPM should provide support to the development of the CCL-K11. Prof. Wallard supported the current version of the Recommendation considering that available expertise at the BIPM can cover the expected needs. Prof. Göbel did not feel further discussions were needed and the CIPM noted Recommendation CCL1 (2009).

8.7 Consultative Committee for Photometry and Radiometry (CCPR)

Dr Hengstberger, President of the Consultative Committee for Photometry and Radiometry (CCPR), presented his report CIPM/2009-55 on the recent meeting. He spoke about how the CCPR covers a considerable number of quantities involved in CMC claims and organizes six supporting KCs. The CCPR has decided on a ten-year repeat cycle for the key comparisons and the schedule for the second round has been formulated to avoid overburdening participants. Pilot laboratories have already been selected for all key comparisons of the next cycle, which extends until 2020. Work has started to prepare the first key comparisons of the new cycle.

The CCPR has reviewed the proposal from the CCU for the rephrasing of the candela definition in explicit-constant form. The Consultative Committee agreed with this proposal, after some modifications of which the President of the CCU has been informed. There is an ongoing exchange of information between the CCPR and the CIE regarding the definition of the candela. The

Strategic Planning WG has completed its position paper on *Radiometry, photometry and the candela: evolution in the classical and quantum world*. The paper will be submitted for publication in *Metrologia*, under the authors' own names, as it has not officially been endorsed by the CCPR.

Prof. Göbel asked whether the spectral responsivity comparison in the spectral range from 10 nm-200 nm (CCPR-K2.d) was the only new CCPR key comparison. Dr Hengstberger replied that it was not a new comparison but represented an extension of an existing comparison to a new wavelength range.

Prof. Göbel raised the question of whether it was necessary to start again with the KCs after only ten years considering some of them took a long time to finish. Dr Hengstberger replied that a ten-year cycle was especially useful for new laboratories that need to demonstrate their capabilities. He also pointed out that radiometric and photometric artefact-based standards are not as stable as those of other fields and that ten years is a reasonable period to check the realizations.

Prof. Issaev suggested that in the future there should be just one CC for frequency, encompassing the scope of several existing CCs. Dr Hengstberger replied by pointing out that frequency (wavelength) is just one of the CCPR's considerable number of quantities and he could not see how frequency could encompass all of these.

8.8 Consultative Committee for Mass (CCM)

Dr Tanaka, President of the Consultative Committee for Mass (CCM), presented a report on the IAC, highlighting that the most important measurements now were the molar mass of enriched ^{28}Si samples and natural silicon. Following his report to the CIPM in 2008, the natural silicon result leads to a value for N_A that now differs by 20.1 parts in 10^8, and enriched ^{28}Si by 13.3 parts in 10^8 from the CODATA value. This represents a much reduced departure, but unexplained discrepancies remain between the values of h obtained through the two approaches. Results are still preliminary and further work is required. He mentioned that an extension to the IAC programme, which had initially been due to end in the second quarter of 2010, had been signed during the 2009 Meeting of Directors and it would now run to the end of 2010. Dr Tanaka also mentioned the discovery that the silicon oxide layer is contaminated by copper and nickel.

Prof. Göbel asked if the results for enriched silicon were still preliminary. Dr Tanaka confirmed that they are still preliminary results.

Dr Kaarls asked if there are further studies going on to determine what is happening in the surface layers as different techniques give different results. Dr Tanaka replied that further studies are ongoing but it was thought that surface contamination may have occurred during the polishing process.

Prof. Göbel asked how much copper and nickel is in the oxide layer. He suggested that a quantitative analysis should be carried out and also proposed that the silicon oxide layer could be removed, followed by a thermal oxidation to remove the copper and nickel.

Prof. Kühne mentioned that during the CCU meeting there had been several presentations on the IAC. He mentioned that at the IRMM isotopically enriched silicon samples were used to determine the isotope ratios. During that process it is likely that the enriched silicon was contaminated by natural silicon and a correction factor was applied. The factor depended on measurements made by an institute in Warsaw. He suggested that another independent determination should be sought because the correction factor used by IRMM is several times the uncertainty.

Prof. Kühne also mentioned that when the natural silicon determination was carried out, samples of enriched silicon were used to determine the sensitivity of the spectrometers. He wondered whether contamination of these samples also needed to be addressed.

8.9 Consultative Committee for Thermometry (CCT)

Prof. Ugur, President of the CCT, reported that the CCT was working harmoniously. The meeting planned for 2009 had been postponed until 2010, as the scientific results on measurement of the Boltzmann constant were not ready for discussion. The plan was to deal with more bureaucratic matters by correspondence in advance of the meeting, in order to reserve the maximum amount of meeting time for discussion of scientific issues. A CCT workshop on strategic planning would also be held.

Prof. Ugur drew attention to document CCT/08-19/rev, prepared by the CCT-WG3 on uncertainties; this document treats uncertainties in the realization of standard platinum resistance thermometer (SPRT) subranges of the ITS-90. The document has been made openly available on the CCT website. He commented that the CCT-WG9 on thermophysical properties

was also active under the chairmanship of Dr Baba (NMIJ/AIST), and Dr Baba acted as liaison to VAMAS.

Finally, he welcomed the BIPM's decision to restart an internal activity in thermometry, and asked if this was covered by the BIPM Quality System. Dr Davis confirmed that, although the BIPM's activity in thermometry was limited to provision of an internal service, such measurements supported the BIPM's external calibrations and must therefore be covered by the QS. He commented that the BIPM took this seriously, and a comparison with LNE was currently under way.

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

Prof. Valdés, President of the CCAUV, reported that although there had been no meeting of the CCAUV within the last year, coordination continues through email contact. He gave a brief summary of progress with the various CCAUV comparisons.

8.11 CCU membership criteria

The CIPM recognized that the mission of the CCU is different from that of the other CCs, and the general criteria for CC membership do not apply to the CCU. After a brief discussion document CIPM/2009-31 was approved, along with the following criteria for membership of the CCU.

a. The CCU seeks the active participation of:
   - International Unions[2], International Commissions or Committees[3], and other Intergovernmental Organizations or International Bodies[4] which have a specific interest in units and which help to implement the recommendations of the CCU approved by the CIPM;
   - up to seven National Metrology Institutes or similar National Institutes[5] chosen on the basis of expertise and coverage of a number

[2] Currently IAU, IUPAC and IUPAP.
[3] Currently CIE, CODATA Task Group on Fundamental Constants, ICRU and IFCC.
[4] Currently IEC, ISO, and OIML.
[5] Currently CEM, NIM, NIST, NMIJ/AIST, NPL, PTB, and Rostekhregulirovaniye of Russia.

of the world languages for which the CCU formal documentation is translated; and

- personal members[6], who are individuals with a long-term involvement in matters related to units, having actively contributed to publications on units, and having a global view and understanding of science as well as knowledge on the development and functioning of the International System of Units.

b. Some experts may be invited as guests on an individual one-off basis in order to report on specific developments of technical and research work related to units under discussion.

c. The CCU has no observers.

8.12 Timetable of future meetings

CCEM	2nd week of March 2011
CCQM	15-16 April 2010 (plus 7 days previously)
CCU	13-15 September 2010
CCTF	2012
CCL	2012
CCPR	early March 2012
CCM	22-26 March 2010 (special meeting on redefinition)
CCM	9-13 May 2011
CCT	3-7 May 2010
CCAUV	3 days during the week starting 18 October 2010
CCRI working groups	18-19 May 2010

[6] Currently M. Himbert and T.J. Quinn.

8.13 Changes to CC membership

The following changes were approved.

CCEM:	INMETRO as Member
CCL:	INMETRO as Member
	IPQ as Observer
CCQM:	INMETRO as Member
	IPQ as Observer
	NIMT as Observer
CCRI(I):	CIEMAT as Observer
	ITN as Observer

Consideration of other changes was postponed to the next meeting. It was noted that NIS (Egypt) would be invited to the next meeting of the CCT to make a presentation. IPQ (Portugal) would be invited to send supporting documentation for its application for membership of the CCM, CCPR and CCT, and would be invited to attend their next meetings in order to make presentations.

8.14 CC Rules and Policy

Prof. Wallard presented document CIPM/2009-26 on the rules of procedure for the Consultative Committees (CCs) and their working groups and workshops. The document represented a combined effort by all the Executive Secretaries and did not represent a change in policy but rather a summary of best practice. It was confirmed that CC Members and Observers had to come from Member States. Representatives of laboratories in Associates of the CGPM could be invited to attend as Guests on a case-by-case basis.

It was noted that the document should include a link to the separate set of criteria that apply to membership of the CCU (see section 8.11). The CIPM approved the document in principle, and Dr Allisy-Roberts was asked to make the final minor changes to the wording.

9. JOINT COMMITTEE FOR TRACEABILITY IN LABORATORY MEDICINE

Dr Wielgosz presented a brief summary of his report CIPM/2009-06 on the activities of the Joint Committee for Traceability in Laboratory Medicine (JCTLM). The JCTLM continues to be very active. A meeting of the JCTLM Members and Stakeholders entitled "International and National Systems for Traceability in Laboratory medicine − Future Challenges and Activities" was held after the meeting of the JCTLM Executive Committee in December 2008, and a NIST/JCTLM/CCQM workshop on "Measurement and Standards Needs for Next-Generation Healthcare Delivery" was held just after the joint meeting of the JCTLM WGs in July 2009. The JCTLM Database was updated in January 2009 to include WG1 Cycle 5 reference materials, and WG2 Cycle 3 reference measurement laboratory services approved by the Executive Committee during its meeting in December 2008. The WG1 Cycle 6 and WG2 Cycle 4 calls for nominations, respectively of higher order reference materials and reference measurement methods or procedures, and reference measurement laboratory services, were announced on the JCTLM website in January 2009.

There were no questions from the CIPM. Prof. Göbel thanked Dr Wielgosz for his report and commented that the JCTLM activity was clearly very successful; he expressed his thanks to all involved.

10. CONTACTS WITH OTHER INTERGOVERNMENTAL ORGANIZATIONS AND INTERNATIONAL BODIES

The Director presented his report CIPM/2009-10 summarizing the BIPM's activities in relation to other intergovernmental organizations and international bodies. He reminded the CIPM that the BIPM's work with ILAC was reported separately (see section 6).

10.1 OIML

Prof. Wallard commented that, as reported by the Secretary, the responses from the CIML members concerning a further rapprochement or merger between the BIPM and the OIML had in general been negative. The main

arguments raised by the President of the OIML were that such rapprochement would not bring financial benefits and would be costly.

The CIPM briefly discussed the various issues involved, and several members of the CIPM expressed the view that the door should be left wide open to the OIML with a view to a future rapprochement or merger. Dr Inglis commented that significant resistance was encountered at the national level, with a view to protecting the national legal metrology bodies. Prof. Kühne encouraged the OIML and the BIPM to continue to work closely together, and called for closer cooperation also at the regional level between the RMOs and the regional legal metrology organizations. Dr Hengstberger encouraged also the NMIs and legal metrology bodies to collaborate closely at the national level.

It was agreed the CIPM should continue to reflect as to possible solutions, so as to be ready to receive any future approach from the OIML.

Dr Quinn noted that in case of any future merger there would be no need to establish a new Convention, which would be prohibitively expensive. The text of the Metre Convention was sufficiently flexible to cover all activity related to metrology.

10.2 WMO, WHO, WTO, ISO/IEC, ISO/CASCO, Codex Alimentarius Commission, WADA, pharmacopoeias and international forensic bodies, and UNIDO

Continuing his summary of CIPM/2009-10, the Director highlighted the BIPM's interactions with a number of bodies.

He noted that relations with the World Meteorological Organization (WMO) had already been mentioned in the Secretary's report, and he was hopeful that the WMO would soon sign the CIPM MRA.

Following a change in the ISO management, the BIPM has re-established high-level contacts with ISO. The ISO Secretary-General gave a presentation during the CIPM MRA ten-year anniversary celebrations, and has been invited to attend the annual tripartite meetings between the BIPM, OIML and ILAC. Over the coming year the BIPM and ISO will work to create better understanding on policy matters, especially concerning the implementation of traceability in ISO committee draft papers.

Annual meetings are arranged between the CIE Central Bureau and the BIPM to discuss matters of common interest, and the CIE and BIPM are collaborating to produce some complementary or even joint documentation.

Activities with the IAEA have increased over the last few months, in particular concerning the proposed linear accelerator at the BIPM headquarters and with a view to formalizing some of the traceability links with the Secondary Standard Dosimetry Laboratories. The draft text of a BIPM-IAEA MoU is currently with the IAEA for discussion.

Prof. Wallard noted that he had devoted considerable personal effort into developing close relations with UNIDO and was pleased to hear the positive message from UNIDO delivered at the CIPM MRA Symposium.

A substantial redrafting of the terms of reference of the JCDCMAS is being considered, with a view to replacing the formal Joint Committee with an informal group that would meet on an *ad hoc* basis.

Dr Tanaka drew attention to the "Forum on coordination of NMI international activities", which was held at the BIPM headquarters on 19-20 March 2009. The objectives of the Forum's Steering Committee were to facilitate the exchange of information between the various NMI International Offices, and to identify opportunities for cooperation, collaboration and coordination among them. The forum also aimed to develop more efficient and effective ways of conducting programmes aimed at helping the development of metrology in emerging economies.

The March meeting concluded that there was a need to facilitate information exchange on a daily basis, and a need for further discussion on two topics. The first concerned cooperation between the international activities of NMIs, sharing national strategic plans with regard to measurement systems, and reviewing international strategies and activities developed by the NMIs with respect to interactions with other NMIs and economies in the global environment. The Steering Committee suggested that this issue should be discussed at future meetings of NMI Directors, in a half-day additional session. The second area for discussion concerned national technical assistance and capacity building activities. It shared views of NMIs as recipients, deliverers and coordinators to facilitate related RMO activities. It was suggested that this could be addressed at meetings held alongside meetings of the JCRB at the BIPM headquarters, or alternatively at the meetings of NMI Directors as suggested above.

Prof. Göbel asked Dr Tanaka to clarify what role he expected the BIPM to take in this, and Dr Kaarls reminded him that the CGPM concluded at its last

meeting that the BIPM should maintain only a limited outreach activity. Dr Tanaka called for the issue to be discussed at meetings of NMI Directors, and requested that a member of the BIPM staff help coordinate actions and distribute documentation.

Prof. Wallard noted that the NMIs involved in this work were doing so for national reasons and there was not much opportunity for overlap and coordination. He said that the BIPM would continue to be reactive rather than pro-active in this area. However, he agreed to schedule discussion on the issues requested at future meetings of NMI Directors, and Prof. Göbel agreed that the subject would be considered again once the position of International Liaison Officer was filled at the BIPM.

10.3 Joint Committee for Guides on Metrology (JCGM)

Prof. Wallard briefly summarized his report CIPM/2009-07, highlighting the decisions taken by the JCGM at their meeting on 5 December 2008 at the BIPM headquarters. In particular, the JCGM had asked the Working Group 1 (GUM) to start working on a revision of the GUM, and had asked the Working Group 2 (VIM) to meet to discuss the process for the review of the VIM. The VIM group held this meeting in September 2009 at the BIPM headquarters, and would present their proposal to the next meeting of the JCGM, to be held on 2 December 2009. The JCGM also created an *ad hoc* group to work on the problem of "Software in Metrology". The main objective of this group was to produce a guide for the development and assessment of measurement software. Discussions were proceeding by email and their first report would be presented to the JCGM in December 2009.

Dr Thomas commented that various problems had arisen during publication of the VIM3 document. In particular, the various partner organizations had published different versions of the document on the public web. There was no official "master file" from which these individual versions had been produced. The JCGM-WG2 had now decided to produce corrigenda sheets, but would have to produce three separate lists of corrigenda to address the three different versions, and this was clearly a most unsatisfactory situation.

She noted that at their last meeting, in September 2009, the JCGM-WG2 had decided that a master file should be created and used as the basis for all future versions to be published. The JCGM-WG2 had asked that the BIPM take on the job of producing this master file, but Dr Thomas pointed out that

if this was to be done it would require an appropriate level of funding and staffing.

Concerning the non-uniqueness of the definition of "certified reference material" in the literature, the JCGM-WG2 opinion was that it was now for ISO to revise its documents in the light of the VIM3 definition, since there is an inconsistency between ISO/IEC Guide 99 and ISO Guide 30. Unfortunately the ISO representative to the VIM group had been unable to attend the meeting in September 2009.

The JCGM-WG2 was proposing to meet not more than twice per year, and for not more than 3 days each time.

Prof. Göbel commented that the CIPM was aware of the difficulties of the VIM group, and noted that the master file originated from ISO. He noted that for any further document it was clear that a master file was required. However both he and Dr Kaarls expressed their reluctance to see work start already on a new edition of the VIM. Prof. Göbel added his opinion that two meetings a year was two meetings too many, and it would be better to close the group for a few years. The bureau of the CIPM would continue to monitor the activities of the JCGM-WG2.

Prof. Issaev commented that difficulties had arisen with producing Russian versions of ISO Guide 99 and VIM3 (based on the BIPM version); these were being translated separately, but it was proving difficult to harmonize the definitions between the two. He requested a copy of the master file of the VIM3 document.

11. FOLLOW-UP FROM THE 23RD MEETING OF THE CGPM

11.1 Draft criteria to assess upgrade from Associate status to Member State status; Draft Resolution on the revision of the status of Associate of the CGPM

Mrs Perent presented document CIPM/2009-34 on the status of Associates of the CGPM. She reminded the CIPM that in Resolution 5 adopted at its 23rd meeting in 2007, the CGPM invited the CIPM to draw up criteria that would enable the CIPM to review whether it would be appropriate for an Associate State to become a Member. The issue had been examined by the CIPM in 2008 (see CIPM/2008-38); the present report proposed the draft

criteria and addressed the financial and institutional questions concerning Associate status and its possible modification. This is in response to the much greater role played by a number of Associate States of the CGPM in the work carried out under the Metre Convention than was envisaged in 1999, when the status of Associate was created by the CGPM, and the scientific and economic benefits gained by the Associate States from their participation in the CIPM MRA.

It was proposed that the minimum annual subscription of Associates (presently 0.05 % of the annual dotation of the BIPM) be increased to 0.1 % in order to bring it closer to the effective cost of the advantages obtained. Secondly, the CIPM would carry out an annual review of all the states which have been Associates for at least 5 years to determine whether it would be appropriate for an Associate State to become a Member. The review would be based on pre-defined criteria linked to the extent of actual participation in the CIPM MRA. In addition, it was proposed that an Associate State fulfilling the criteria adopted by the CIPM would also be required to pay an annual subscription, increasing each year so that it reaches, in 5 years, an amount equivalent to 90 % of the annual contribution it would pay as a Member State. This progressive increase would be applicable starting on the 1st of January of the second year following the CIPM decision to encourage an Associate State to become a Member. Once started, this progressive increase would not be reversible. As long as an Associate State does not fulfil the minimal conditions used to identify whether it should be encouraged to become a Member State, it would continue to benefit from the advantages of its Associate Status and its subscription will continue to be determined as during the initial 5-year period.

The review by the CIPM of the situation of States which have been Associates for at least 5 years would be based on the fulfilment of the following three criteria:

- Signature of the CIPM MRA by the Associate's NMI;
- Participation in comparisons published in the KCDB;
- Having one or more CMC listed in the KCDB.

Dr Hengstberger supported the proposal outlined in CIPM/2009-34. He said that although it might have some small effect on numbers, he did not believe that it would dissuade many African States from participating. He noted that many African States already contribute to ISO at a very high rate, and it was important that the value of participation in the activities of the BIPM be recognized. Prof. Wallard added that of course the proposed increased

subscription level after 5 years applied only to those States whose NMIs had published at least one CMC. Dr Hengstberger noted that the NMIs that did not yet have CMCs did not yet benefit directly from the system, although, as Prof. Wallard reminded him, all signatories could benefit from it in their discussions with governments.

After brief discussion on the importance of participation in regional comparisons, to support CMC claims, the CIPM unanimously approved the document and the proposed criteria. On the basis of these new criteria the following Associates will be encouraged to become Members: Belarus, Costa Rica, Cuba, Jamaica, Latvia, Lithuania, Panama, Slovenia, and Ukraine.

Prof. Wallard noted that a Draft Resolution would be put to the CGPM in 2011 to propose a revision of the status of Associate State along the lines described in CIPM/2009-34, and he would now write to the Associate States listed above to encourage them to take the necessary steps to become Members.

11.2 Draft criteria to assess applications from Economies to become Associates of the CGPM

Mrs Perent reminded the CIPM that in Resolution 6 adopted at its 23rd meeting (2007) the CGPM had expressed the desirability of setting criteria for assessing applications from “Economies” wishing to become Associates. She presented draft criteria in document CIPM/2009-41.

The CIPM recognized that the issue was politically sensitive, and it was important to choose the wording carefully. The document was revised slightly in the light of the discussions, and the new version CIPM/2009-41.Rev.1 was presented later in the meeting. The CIPM agreed that it should be left to the CGPM to decide on a case-by-case basis the acceptance of Economies as Associates. The decision of the CGPM should be based on the following criteria:

- An Associate Economy should be a Territorial Entity.
- The Territorial Entity should possess its own Metrology Institute within its territory.
- The participation of the Territorial Entity in the activities of the BIPM should be considered beneficial for the strengthening of the world’s measurement system.

- Intergovernmental organizations are not considered "Territorial Entities" in this context.

It was noted that it will be necessary to clarify the status of CARICOM, which, as an intergovernmental organization does not satisfy the above criteria. It was agreed that the specific case of CARICOM should be addressed by the CGPM in order to decide whether or not it should continue to be an "Associate Economy" on an exceptional basis.

12. PREPARATION FOR THE 24TH MEETING OF THE CGPM

12.1 Draft programme of work and budget 2013 – 2016

Prof. Göbel commented that discussion on the draft programme of work 2013−2016 was the major point of the current meeting. The proposed programme of work needs to be finalized at the time of the CIPM meeting in 2010, and it may be that another meeting of the NMI directors should be held at the BIPM headquarters early in 2011 to present the programme of work. He noted that it was important for the NMI directors to support the proposed programme of work, as in most cases governments ask their views.

Prof. Wallard introduced document CIPM/2009-13, which gave a draft outline of the programme of work and budget 2013-2016. He expressed his thanks to the BIPM's staff who had assisted in drawing up the outline programme of work, and emphasized that at present it is a working document; Prof. Kühne, who will present the programme of work to the CGPM at its next meeting, will take responsibility for its development over the next year. He noted that the subject had been addressed at two meetings of the CIPM bureau, and in June 2009 the bureau had approved the broad areas of activity but recommended some further changes in the structure of the document. The idea was to produce a programme of work with a number of stand-alone chapters, with an executive summary as a first chapter highlighting the essential nature of the key scientific projects. A second chapter of the document would include a general statement on the mission and impact of work of the BIPM, another one will give in more details the scientific programme of work and a final one will include the resources required to deliver this programme and the budget.

Prof. Wallard pointed out that the top priorities remained the watt balance, mass activities, and TAI. The main issue to consider in the Ionizing

Radiation programme was the question of having a linear accelerator (linac) located on the BIPM site. He noted that in the final draft it would also be necessary to consider the demands of future new Member States; if there was an increased demand for calibrations services due to these new Member States then it might be necessary to recruit more technical staff. The chemistry and biosciences programme will be finalized once the results are available from a study currently under way on metrological activities in the field of biosciences. On the nanosciences, the basis of a future study is depending on the results of the BIPM Workshop on Metrology at the Nanoscale, to be held at the BIPM headquarters in February 2010. On liaison work, the projects are more detailed than in previous programmes.

Prof. Wallard pointed out that one important area that had not been included from the programme of work was that of gravimetry. Although some gravimetry expertise was required for the watt balance and other activities, the plan was to stop hosting the series of International Comparisons of Absolute Gravimeters (ICAGs) at the BIPM headquarters as a result of prioritization of activities. He asked the CIPM to endorse this decision, which coincided with the retirement of the key member of staff in this area.

He invited the CIPM members' comments on the presentation and content of the draft document related to the programme of work and whether additional details on the BIPM's mission statement were needed, as well as their approval of the criteria used to judge the priorities.

Prof. Göbel opened the discussion by inviting comments on the structure of the document. There was general support from the CIPM that the mission statement should be shorter and stronger. Dr Carneiro called for an introductory "vision statement" to set the background for the longer "mission statement", which in turn would set the stage for the programme of work. Mr Érard called for the executive summary also to address the mandate, challenges and strategy of the BIPM. There was general agreement that it was important to address the interest of carrying out the proposed work at the BIPM headquarters rather than (or as well as) at the NMIs. Dr May suggested that inter-section activities should be highlighted, and Dr Tanaka also drew attention to the importance of the BIPM's coordination activities, suggesting that the relation between the laboratory and coordination activities should be highlighted.

Dr Hengstberger asked Prof. Kühne to emphasize that the BIPM is expanding in some activities. Dr Kühne pointed out that over the last two programmes of work, this expansion was at the expense of other activities which have been stopped.

Dr Quinn suggested that the mission statement should quote article 1 from the Metre Convention, because everything else can be derived from that. Dr Hengstberger commented that in fact it was the reasons for establishing the Metre Convention − in particular to facilitate trade − that should be highlighted. Dr Kaarls considered that reducing technical barriers to trade was too limited to introduce the programme of work nowadays. He agreed that the document should make clear the benefits to society.

Dr Schwitz called for the document to address today's situation, and to show how the NMIs interconnect through the BIPM. Dr Inglis added that it was important to set out the big picture of metrology, as non-scientific national officials might not be familiar with the work of the national metrology institutes.

Prof. Göbel thanked the CIPM for their comments and postponed more detailed discussion of the content until after the presentations by the Heads of the scientific sections.

When discussions resumed, Prof. Göbel invited comments on the proposed linac, and on the nanometrology and biosciences programmes.

There was much discussion about the linac project, centring on the importance of the BIPM becoming involved in the fields of high-energy photons and electrons. There was general agreement that the BIPM should indeed be active in these fields, although concern was expressed about the question of funding. Given the CIPM's support for the project, Prof. Kühne will now lead a study to examine the various options on the long term and their corresponding costs, including the possibility of using other beams. He will present a finalized document to the bureau of the CIPM in June 2010, and it will be necessary to hold a meeting of the NMI Directors in advance of that, in order to secure their support.

It was noted that it might be difficult to get funding from another international organization. Dr Quinn suggested that perhaps one-off funding could be requested from NMIs already equipped with linacs, as they would be the immediate beneficiaries. Prof. Kühne pointed out that Cameroon was the only Member State without a linac.

Prof. Göbel turned the discussion to gravimetry, noting that the bureau of the CIPM considered that this − and particularly the ICAGs − was probably not a long-term priority for a laboratory activity at the BIPM headquarters. However, if the BIPM does not host future ICAGs, then it must discuss other possible options with the International Association of Geodesy (IAG) as the ICAGs are considered a joint BIPM-IAG activity.

Prof. Issaev called for the BIPM's excellent gravimetry site to be protected. He suggested that the VNIIM could perhaps pilot the next ICAG, but still using the BIPM site.

The CIPM members were, however, reluctant to see the BIPM lose all its competence in gravimetry, particularly as gravimetry measurements are necessary for the watt balance experiment as well. There was some discussion of whether other bodies (perhaps the VNIIM and IAG) could fund one person each to maintain gravimetry as an activity at the BIPM headquarters. The bureau of the CIPM and the BIPM Director will follow up the future ICAG options with IAG but given the available resources and the priorities for BIPM laboratory activities, the CIPM decided that gravimetry activity at the BIPM will be terminated at the end of the present programme of work unless an alternative source of funding is found.

Prof. Göbel asked Dr Wielgosz to comment on the possible role of the BIPM in the area of bioscience, and in particular on whether the BIPM should become involved in the measurement of proteins and nucleic acids. Dr Wielgosz was wary of pre-empting the results of a study on future needs in bioscience that is currently under way, but noted that it was of course a very important area in healthcare, diagnostics and therapeutics. He explained that there is currently a paradigm shift; until now biological molecules have in general not been value-assigned in SI units, but improvements in technology and methods of synthesis mean that physico-chemical characterization of biologicals is now possible, with the result that properties of new molecules can now be assigned in SI units. Dr Wielgosz believed it is essential for the BIPM to take charge of this move to measurements within the SI. He informed the CIPM that the BIPM had recently been contacted by the WHO and other organizations about measuring the activity of insulin in SI units as opposed to the traditional WHO units, and he foresaw that the pharmaceutical industry would be asking the NMIs to value-assign such molecules in the not-too-distant future. The BIPM programme would be developed in the light of the results of the study which is presently in progress, but at present a modest programme was proposed in the 2013-2016 programme of work, requiring an initial investment of about 1 million euros for mass spectrometry equipment.

There was broad agreement from the CIPM that bioscience was a key strategic area, although there was discussion as to what niche activity the BIPM should start. With the increasing number of NMIs active in the biosciences it was clear that there would be an upcoming need for comparisons. Dr May believed that the question was not "whether" but

"when" the BIPM should begin a programme in this area. He added that NIST has been carrying out a strategic plan for growth of their bioprogramme and they have identified the areas that Dr Wielgosz mentioned. In particular amongst the emerging needs in diagnostics, NIST are focusing both on protein-based biomarkers and genetic testing (nucleic acids), medical imaging, biopharmaceutical area with particular interest in biologics. He agreed to share the available NIST reports with the other CIPM members.

The CIPM asked when the report of the consultancy study would be ready. Dr Wielgosz explained that the final report would be submitted at the end of 2010, but that an initial report on existing roadmaps would be ready in February, and a second report including interviews with industry and NMIs would be ready in time for the CCQM meeting in April. A first draft report would be available in August 2010. It was agreed that these reports should be circulated to the CIPM as soon as they became available.

Prof. Göbel confirmed that the bureau of the CIPM would carefully monitor the progress of the study, and it was expected that some activity in the field of bioscience would be included in the work programme unless the results of the study indicated otherwise.

12.2 Potential resolutions

Prof. Göbel invited comments on the various Resolutions that might be put to the CGPM at its next meeting. Prof. Wallard commented that it was not yet clear whether one would be needed on relations with the WTO. The BIPM continued to work with the WTO to find a way forward, and he would report back to the CIPM when the draft Convocation was being produced.

It was agreed that it was best not to propose another Resolution on the decimal marker. Prof. Göbel spoke in favour of a Resolution on the CIPM MRA, which he believed would support the budget request. Prof. Issaev again raised the issue of terminology, and it was agreed that the BIPM would use the following terminology "Member State of the BIPM" and "States Parties to the Metre Convention".

Mrs Perent introduced a proposition to put in place an international convention on Privileges and Immunities to facilitate the work of BIPM staff or persons on secondment to the BIPM when they travel abroad on an official mission, and facilitate the transport of equipment and standards for taking part of international comparisons. She pointed out that the BIPM's

staff do not have diplomatic status, and such a convention, if ratified by Member States, would be of help in the many comparisons in which the BIPM is involved. The CIPM agreed that such a proposal should be made to the CGPM at its next meeting.

There was also support for a Resolution related to climate change and carbon trade. Dr Tanaka suggested that the Resolution should also mention energy saving, as many scientific proposals could be hung from that, and that the CGPM should also be asked to support the BIPM in the pursuit of "grand challenges".

12.3 Proposed dates for the meeting of the CGPM

Prof. Göbel reminded the CIPM that the 24th meeting of the CGPM will take place from 17-21 October 2011, at a location yet to be announced. The CIPM will meet during the preceding week.

Prof. Wallard drew attention to the timelines presented in document CIPM/2009-12, pointing out that the plan was to issue the President's Report in April 2011, rather than as usual at the time of the CGPM. This will provide Member States with a report on the achievements of the 2009−2012 programme of work together with the proposed programme for the next quadrennium (2013−2016).

13. WORK OF THE BIPM

13.1 Director's Report for 2008-2009

The draft Director's Report on the activity and management of the BIPM for 2008−2009 (CIPM2009-01) had been circulated to the CIPM in advance of the meeting. There were no comments and it was approved unanimously.

Prof. Wallard noted that in addition a Short Annual Report had been sent to Member State governments this year, to attract the attention of policy makers; the aim was to produce such a Short Report annually, to supplement the full Director's Report.

13.2 Quality System

The Director presented document CIPM/2009-43, noting that since the last meeting of the CIPM, there have been a number of quality-related developments.

He reported that the CIPM's decision to publish uncertainties for the BIPM's calibration and measurement services has been implemented (on the BIPM website and KCDB) and appears to have been well received. Where it has not already been done, the Consultative Committees will be presented with reports on the current uncertainty calculations.

An external audit of the BIPM's Quality System was carried out in September 2008, with the final report received in December 2008. No no-conformities were found, though a number of suggestions were made for redrafting the key policy documents. The next external audit will take place in September 2011.

Other helpful remarks were made when the BIPM presented its Quality System to a meeting of RMO quality experts in March 2009.

Following the death of Dr Rainer Köhler, BIPM Quality Manager, in October 2008, the BIPM was able to take advantage of the quality background and expertise of Mr M. Streak, then on secondment from NMISA (South Africa). Mr Streak left the BIPM in April 2009, after resigning from NMISA, and a new full-time Quality, Health and Safety Manager, Mr B. Coelho, has recently been recruited for a two-year fixed-term appointment. Mr Coelho has already carried out several internal audits and has helped manage a number of external audits. The regular programme of internal and external audits has therefore been resumed.

The annual management review was held on 1 October 2009, and various actions were agreed for the coming period.

Mr Érard asked if the BIPM intended to have a periodic review of its Quality System by international experts. Prof. Wallard confirmed that the Quality System would be reviewed regularly.

Prof. Göbel recalled a question raised at the meeting of NMI Directors, in which it was suggested that Prof. Wallard's report was too optimistic in relation to the positive views given on the BIPM's QS during the review by QS experts. Prof. Wallard countered that the BIPM has remained open to the international community, its uncertainties were now published on the website, its Quality System was presented to RMO experts in March 2009, external audit reports would be made available on request, and all comments

received would be taken into account when the BIPM redrafted its quality documentation. He recognized, however, that the CIPM's authority over the BIPM Quality System caused some discontent within the RMOs.

13.3 Safety report

Prof. Wallard drew attention to document CIPM/2009-08, reporting that there have been no Health and Safety problems over the last year.

13.4 BIPM's role after a redefinition of the kilogram

Dr Davis briefly presented document CIPM/2009-39, which had been prepared in collaboration with Prof. Wallard, Prof. Kühne and Mr Picard. After the redefinition of the kilogram, the BIPM will continue to disseminate the unit of mass to Member States. It will also: establish and maintain an ensemble of standard masses maintained under special conditions in order to maintain the unit of mass; establish a watt balance at the BIPM in order to provide a primary realization of the unit; and pilot comparisons of other primary realizations in order to have the lowest possible uncertainty of 1 kg based on the redefinition.

There was consensus that the report presented the appropriate direction for the BIPM to take, both in preparing for the new definition of the kilogram, and in approaching its work after the redefinition. Maintaining a Watt Balance at the BIPM was considered essential and dissemination of the realization of the standard of mass would continue to be made by the BIPM through comparison of artefacts.

Prof. Kühne noted that as the future redefinition of the kilogram drew closer, it would be important to make a comparison of the International Prototype of the Kilogram and the standards the BIPM uses to disseminate the kilogram to the NMIs. The CIPM agreed that the three keys giving access to the depositary of the international prototypes would be reunited so as to have access to the International Prototype when required for this purpose.

13.5 Depository of the metric prototypes

The visit to the depository of the metric prototypes at the Pavillon de Breteuil took place at 17:15 on 14 October 2009, 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	19.5 °C
maximum temperature:	20 °C
minimum temperature:	19 °C
relative humidity:	48 %

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

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

14. *METROLOGIA*

Dr Miles presented a brief summary of her report CIPM/2009-20 on *Metrologia*, highlighting the increased number of submissions now being received by the journal and the higher impact factor (1.780) published for 2008 (achieved under the editorship of her predecessor, Dr J.H. Williams). She asked the CIPM to encourage the submission of high-quality scientific and review articles to the journal. Dr Göbel congratulated Dr Miles on her promotion and wished her and the journal continued success.

15. ADMINISTRATIVE AND FINANCIAL AFFAIRS

15.1 *Rapport aux Gouvernements* for 2008

Mrs Perent presented the *Rapport aux Gouvernements des Hautes parties contractantes sur la situation administrative et financière du Bureau international des poids et mesures en 2008*, which was distributed to the Member States and to the CIPM during the second quarter of 2009.

15.2 Quietus for 2008

Mrs Perent drew the attention of the CIPM to the first page of the auditors' report 2008, confirming the accounts presented in the *Rapport annuel*, and the CIPM unanimously gave quietus to the Director and the Administrator for the 2008 accounts.

Dr Carneiro asked if the auditors provided a supplementary manuscript report to inform the BIPM Direction of additional issues to monitor. Mrs Perent replied that they did not.

15.3 Member States and Associates in arrears

Mrs Perent presented a report on the contributions and subscriptions in arrears, noting that as of 7 October 2009 the contributions unpaid for up to 3 years amount to 1 538 785 euros. She explained that this sum relates to unpaid contributions from Argentina, Canada, Greece, Indonesia, Ireland, Republic of Korea, Pakistan, South Africa, Slovakia, Sweden, United States of America, and Uruguay. Apart from the case of Pakistan, which also has arrears for 2008, these unpaid contributions relate to the year 2009. The NPSL, which is in charge of the payment of the contribution of Pakistan, has indicated that the payment will be made in the near future. The United States of America have only settled 30 % of their 2009 contribution, leaving an unpaid sum at present of 721 131 euros. There has been no indication whether or not this sum will be settled in 2009.

Mrs Perent commented that in fact this situation regarding short-term arrears was relatively favourable compared to the past.

On contributions in arrears for more than 3 years, she noted that there remained four Member States for which the contributions were distributed among the other Member States. The arrears of these four States (Cameroon, Dominican Republic, Islamic Republic of Iran, and the Democratic People's Republic of Korea) are related to contributions distributed and not distributed among the other Member States and total nearly 3.8 million euros.

She reminded the CIPM of the procedure outlined in Resolution 8 adopted by the CGPM at its 23rd meeting (2007), and gave details about the situation of the BIPM's contact with each of the four States concerned. The next step will be to inform the governments of these four Member States of the possible decision of the CGPM with regard to their exclusion at its next meeting.

As of 7 October 2009, the unsettled subscriptions of Associates amount to 62 951 euros, corresponding to unsettled subscriptions from 11 out of the 28 Associates. Among them, Cuba and Ecuador have not settled their subscriptions for 2008, representing financial arrears of 13 717 euros.

Prof. Wallard added that, according to Resolution 3 adopted by the CGPM at its 21st meeting (1999), an Associate that is three years in arrears with its subscription would cease to be an Associate, and any CMCs would of course be removed from the KCDB. This warning would be included in the reminder letters to be addressed to the directors of the NMIs of Cuba and Ecuador.

Prof. Göbel thanked Mrs Perent for her report. After very brief discussion he concluded that the BIPM would proceed according to the above-mentioned Resolution 8 (2007).

15.4 Responses from Member States to the additional discretionary contribution and from NMIs to additional voluntary contributions for 2009−2012

Mrs Perent provided an update on responses from Member States concerning the additional discretionary contribution. She reported that five Member States (United States of America, Czech Republic, Hungary, Malaysia, and Spain) have said that they will not pay the discretionary contribution. This represents 14.98 % of the total discretionary contribution. In addition, Switzerland has not yet paid the discretionary contribution for 2009, but has not said that it will not pay. Taking into account the non-payment of the

discretionary contributions of the debtor States for more than 3 years, overall it appeared that 18.52 % of the additional discretionary contribution would not be paid. This situation is somewhat better than was forecast last year.

She informed the CIPM that a number of additional voluntary contributions have been confirmed, as follows:

- the PTB (Germany) has provided an annual grant of 24 000 euros for the living allowance of the JCRB Executive Secretary in 2008 and 2009. This has been extended for a further year, for 2010;
- the NMIA (Australia) agreed to provide 7 000 euros per year over the four-year period, and has already settled the total sum in 2009;
- the NIST (United States of America) has provided the secondment of Dr Pedro Espina until 31 December 2009;
- the LATU (Uruguay) has extended the secondment of Prof. Mussio until March 2011;
- the NPL (United Kingdom of Great Britain and Northern Ireland) has offered to provide the equivalent of one man-year during the four-year period in support of the BIPM mass programme;
- the NMIJ (Japan) provided 10 000 euros in support of the symposium to celebrate the ten-year anniversary of the CIPM MRA.

In addition the NIST would award a competitive grant of some 150 000 US dollars to support the BIPM Chemistry programme.

Dr Schwitz suggested that this information about additional forms of support for particular projects (including grants and secondments) should be made more widely available.

In response to a request from Dr Nava-Jaimes, Mrs Perent agreed to send him more information about how the contributions of each Member State are calculated.

15.5 Progress report on 2009

Prof. Wallard presented the estimated out-turn for 2009 (document CIPM/2009-53, which had been distributed that morning). The size of the planned transfer from the Ordinary Funds Account no. 1 will be adjusted in the light of any further contributions received before the end of the year.

Prof. Göbel commended the book-keeping and there were no questions from the CIPM.

15.6 Budget for 2010

Prof. Wallard presented the budget for 2010 (document CIPM/2009-54, which had been presented that morning). After brief discussion about the level of the reserves, the CIPM unanimously approved the budget.

Budget for 2010

Income		
		euros
Budgetary income:		
1. Contributions from Member States		11 244 080
2. Interest		288 000
3. Miscellaneous income		190 400
4. Subscriptions from Associates		234 495
5. *Metrologia*		86 400
6. Transfer from Account I. — Ordinary Funds		999 025
Total		**13 042 400**
Expenditure		
A. *Staff expenditure:*		
1. Salaries	4 980 000	
2. Family and social allowances	1 091 400	6 564 100
3. Social contributions	492 700	
B. *Contribution to the Pension Fund:*		2 291 000
C. *Operating expenses:*		
1. Heating, water, electricity	258 700	
2. Insurances	41 900	
3. Publications	63 300	
4. Office furniture	158 000	1 236 600
5. Costs of meetings	118 800	
6. Travels and transport of material	396 700	
7. Library	154 000	
8. Bureau of the CIPM	45 200	
D. *Laboratory expenditure:*		2 233 700
E. *Buildings (maintenance and renovation):*		637 000
F. *Miscellaneous:*		80 000
Total		**13 042 400**

15.7 BIPM staff: promotions, departures, recruitment

Mrs Perent reminded the CIPM that information about the staffing changes up to 30 June 2009 were included in the draft Director's Report 2008/9. She summarized the changes since 1 July 2009, noting that three staff members had retired: Mr Felder (Principal Physicist), Mr Labot (Principal Technician), and Mrs Le Coz (Librarian, Drafting Officer). Four staff members had been recruited: Mr Coelho (Quality, Health and Safety Manager for a two-year appointment), Miss Planche (Librarian/Drafting Officer), Dr Bradley (Research Fellow for the watt balance), and Miss Mesquida (a short-term replacement for a Technician in the Chemistry Section, who is on maternity leave). In addition, recruitment was under way for the three positions agreed by the CIPM in July 2009: an International Liaison Officer, an Accountancy Administrator, and a two-year fixed-term Secretary/Publications Secretary. The Technician post vacated by the retirement of Mr Labot will be transferred to the Electricity Section and advertised shortly.

15.8 BIPM Staff Rules

Mrs Perent summarized document CIPM/2009-42 on the BIPM Regulations, Rules and Instructions applicable to staff members. She recalled that during the year the CIPM had approved two amendments on 17 March 2009 by correspondence. The first amendment addressed the composition of the Applications Review Board and the second created a therapeutic part-time arrangement aimed at encouraging staff members on long-term sick leave to resume work. These amendments both came into force on 10 April 2009. In addition, as a result of recent restructuring and recruitment, two new positions have been created and included in the ranking table: Quality, Health and Safety Manager, and Receptionist.

As it may be in the interest of the BIPM, in some cases, to keep the experience and/or skills of a staff member having reached the age limit of serving staff, it is proposed to amend the Staff Regulations to allow the Director, after approval by the CIPM, to extend the appointment of a staff member beyond the maximum age of serving staff, presently 65, for a maximum of two years.

After brief discussion the CIPM approved a proposal to amend Rule 4.2, concerning the age limit of serving staff.

15.9 BIPM Pension Fund

Mrs Perent presented a summary of CIPM/2009-15 concerning the BIPM Pension Scheme and Pension Regulations. An actuarial study of the BIPM Pension Fund, carried out in 2008, concluded that − in the absence of any planned corrective action − the assets of the BIPM's Pension Fund would start to decrease significantly as of 2015, and the Fund would fall insolvent in 2041.

This actuarial review shows that:

- the number of pensioners will rise from 55 in 2008 to 74 in 2016, with a peak of 79 retirees in 2033, i.e. more retirees than current active staff (71);
- the capital of the Pension Fund will increase until 2015 and will then start to decrease;
- as from 2041, the assets will not be sufficient to pay the current plus future pensions;
- the actuarial value of the assets is less than the actuarial liabilities of the Pension Fund.

Based on the above, there is therefore an actuarial deficiency. The actuarial liabilities, i.e. the pensions to be served to the current retirees and the accrued rights of the current active staff members on the basis of the years of service accomplished at the time of the actuarial study, amount to 57.6 million euros (34.1 million euros for pensions of current retirees taking in account their life expectancy – the last pension of the current retirees should be served in 2041 – and 23.5 million of euros for accrued rights of active staff). Under the current conditions, the estimated capital that would be necessary to have a solvent scheme at present is 43.5 million euros, to be compared to the current capital of the Pension Fund of 12.8 million euros at the time of the actuarial study.

A review of the BIPM's Pensions Regulations was carried out in 2007 by a consultant and in 2008 by the Direction of the BIPM, and the broad conclusion of those surveys was positive, but that some amendments were needed to ensure the financial health of the BIPM Pension Scheme and bring a few regulations up to date. The proposed amendments have been carefully

reviewed by the Direction against the results of the actuarial study, and in particular considering the importance of the BIPM offering a pension scheme in order to attract and retain highly qualified staff. Document CIPM/2009-15 presents the results of the actuarial study, the various proposed amendments to the Pension Regulations, and the financial impact of these amendments on the Scheme.

The proposed amendments were listed in section 2.1.2 of CIPM/2009-15. In particular:

- the contributions of all staff members would be increased from 9 % to 10 % of salary,
- the normal retirement age would be increased from 60 up to 63 for serving staff below 55 years of age with some transition measures for staff over 45 years old, and to 65 for staff recruited after the entry into force of the amendments.

Some of the proposed amendments would apply to staff recruited after the entry into force of the amendments but not to existing staff members:

- the rate of accumulation would be reduced from 2 % per year of service to 1.9 % for staff recruited after the entry into force of the amendments;
- the salary taken into consideration for the calculation of the pension would be the average annual gross salary of the last 36 months of service for the staff recruited after the entry into force of the amendments rather than the last salary for serving staff;
- the minimum age to qualify for an anticipated pension, i.e. before the normal retirement age would be set at 55 for staff recruited after the entry into force of the amendments rather than at 50 for serving staff;
- the reduction rates applicable to pension rights when the staff member is receiving an anticipated pension would be reviewed and increased for staff recruited after the entry into force of the amendments. For serving staff, the reduction rates would only be modified for a retirement at 60 or 61;
- the retirement indemnity, which is a small additional indemnity for staff over 50 when they retire and if they have a minimum of 10 years of service (irrespective of the amount of retirement pension itself), would be suppressed for staff recruited after the entry into force of the amendments;
- the leaving allowance paid to staff members whose service with the BIPM terminates and who are not entitled to a retirement pension would

be reduced for staff recruited after the entry into force of the amendments to 2.25 times the amount deducted from their gross salary in respect of their contribution to the Pension Fund throughout their years of service rather than 3 times at present for serving staff and the indexation rate would be suppressed.

As a result, the financial sustainability of the BIPM Pension Fund should be assured until at least the middle of this century.

Dr Tanaka commented that such changes would normally require consultation with the staff, and asked how this would be dealt with at the BIPM. Mrs Perent confirmed that the proposed amendments had been discussed with the Commission for Conditions of Employment (CCE) and their opinion had been considered on a number of points. She drew attention to the comments from the CCE presented in documents CIPM/2009-18 (in English) and -19 (in French). In response to a question from Dr May, Prof. Wallard said he believed the pensions package remained competitive, and the discussions with the CCE indicated that it would be acceptable to the existing staff.

Dr McLaren asked if an actuarial study had been carried out on the additional amendments proposed by the CCE. Mrs Perent replied that the option to raise the maximum number of years of service from 35 to 37 years for the calculation of the retirement pension for staff recruited after the entry into force of the amendments had been considered but not retained for financial reasons.

The CIPM voiced no opposition to the proposed changes and the draft Regulations and Rules of the BIPM Pension and Provident Fund as proposed in documents CIPM/2009-16 (in English) and -17 (in French) were approved. They will enter into force on 1 January 2010.

15.10 BIPM salary review

Prof. Wallard gave a brief summary of his document CIPM/2009-14 on the BIPM's remuneration packages and salary structure based on a review of the BIPM's salaries and allowances carried out by the Inter-Organisations Study Section on Salary and Prices of the Co-ordinated Organisations (SIO) in 2008. He concluded that the salary scale was a workable structure, well adapted to the BIPM's needs, and there was no case for a general change to the basic remuneration package (and in particular no need for an increase in the salary scale). However he recommended three changes as follows: that

the range of grades for Principal Physicist be extended to include grade 12 (currently 10 and 11), that the range of grade of Principal IT Officer be extended to grade 11 (currently 8 to 10), and that the Heads of the Science Sections and Finance and Administration be renamed Directors to reflect their level of responsibility. These recommendations had been discussed extensively by the bureau of the CIPM. The financial implications would be modest as only a few staff would be affected.

Prof. Göbel supported in particular the proposed change in title to "Director of Department", noting that the new title would be useful when the Heads of Sections were attending meetings outside the BIPM, and negotiating with other international organizations.

All the proposed changes were accepted unanimously.

15.11 Draft revised financial regulations and changes to the BIPM's accounting system

Mrs Perent presented a review of the BIPM's financial provisions (CIPM/2009-37). The BIPM's existing Financial Regulations (*Règlement administratif et financier*) were adopted by the CIPM in 1981, based on the provisions in the Metre Convention, and on decisions and resolutions adopted by the CGPM since 1921. Since 1981 the CGPM has made a number of additional decisions that need to be incorporated into the Regulations, and it is important also to increase the effectiveness and efficiency of the financial management, to reinforce accountability and transparency, and to ensure the most effective use of resources in the achievement of the programme of work. She outlined in detail the draft revised Financial Regulations (CIPM/2009-35 (in English), and CIPM/2009-36 (in French)), which brought the existing Regulations up to date and completed them as necessary.

The Draft Financial Regulations had been carefully considered by the bureau of the CIPM and Mrs Perent drew attention to a rewording of Article 16 recommended by the bureau on 12 October 2009: the Special Working Capital Fund would be renamed "Capital Investment Fund". She noted that the purpose of the Reserve Fund was to cover the fluctuations in payments of annual contributions from Member States and any unexpected expenses. The Capital Investment Fund would be aimed at supporting the infrastructure of the BIPM. It would be financed through the entry contributions of States acceding to the BIPM, plus any sums the CIPM

decided to transfer from the Reserve Fund. Prof. Göbel pointed out that there would be just one Reserve Fund, and the maximum level of this Reserve Fund would be determined by the CIPM when approving the Budget.

The Draft Financial Regulations had been agreed by the bureau of the CIPM and Mrs Perent submitted them to the CIPM for approval.

The BIPM's accounting system would move from a cash to an accrual accounting system. The new accounting rules and policies will be implemented starting with the financial statements for 2010 but in order to assist Member States in comparing the accounts for all the four years of the current programme of work (2009 - 2012), the 2009 accounts will be recalculated on the new rules.

In answer to a question from Prof. Issaev, Mrs Perent confirmed that the discretionary contributions were not treated separately in the draft Financial Regulations. They are considered as other income. She explained the meaning of Supplementary Dotation in Article 5.

Prof. Göbel noted that the proposed documents represented a considerable amount of work by Mrs Perent and as well as by the bureau of the CIPM. The CIPM unanimously approved the draft Financial Regulations (see Annex 1), which will come into force on 1 January 2010.

16. OTHER BUSINESS

The CIPM noted the documents CIPM/2009-09, reporting the successful celebrations of World Metrology Day 2009; CIPM/2009-21 on the planned Workshop on Metrology at the Nanoscale to be held at the BIPM headquarters on 18-19 February 2010; CIPM/2009-44 on the BIPM/WMO workshop on climate change to be held at the WMO headquarters on 30 March and 1 April 2010; and CIPM/2009-05 on the forthcoming Workshop on Physiological Quantities and SI Units, to be held at the BIPM headquarters on 16-17 November 2009.

There were no questions, and no other matters were raised.

17. DATE OF NEXT MEETING

The President closed the meeting, thanking all present for their attention and support. The next meeting will take place at the BIPM headquarters from 12-15 October 2010.

RECOMMENDATIONS ADOPTED BY THE INTERNATIONAL COMMITTEE FOR WEIGHTS AND MEASURES

RECOMMENDATION 1 (CI-2009): Concerning adoption of a common terrestrial reference system by the CGPM

The International Committee for Weights and Measures (CIPM),

considering that

- there already exist a number of global satellite navigation systems (GNSS), that new ones are being created and in the future there may be many more;
- the proliferation of time and geodesy reference systems in use in these navigation systems creates ambiguities for users with regard to the interpretation of navigation and timing solutions and renders interoperability between the systems more difficult;
- although the International Terrestrial Reference System (ITRS) is recommended by relevant scientific unions, it has not yet been adopted by an intergovernmental organization;
- the adoption of a common reference system by the appropriate intergovernmental organization would be beneficial to users regarding unification of navigation and timing solutions and systems interoperability;

noting that

one of the key factors that led to the creation of the Metre Convention and the BIPM was the recommendation of the Second International Conference on Geodesy for the Measurement of Degrees in Europe, held in Berlin in 1867, that a European International Bureau of Weights and Measures be set up in order to unify European geodesy standards;

recommends that

the necessary steps be taken such that the ITRS, as defined by the International Union of Geodesy and Geophysics (IUGG) and realized by the International Earth Rotation and Reference Systems Service (IERS) and International GNSS Service (IGS), be adopted by the General Conference on Weights and Measures as the international standard for terrestrial reference frames used for all metrological applications.

RECOMMENDATION 2 (CI-2009): Updates to the list of standard frequencies

The International Committee for Weights and Measures (CIPM),

considering that

- a common list of "Recommended values of standard frequencies for applications including the practical realization of the metre and secondary representations of the second" has been established;
- the CCL-CCTF Frequency Standards Working Group (FSWG) has reviewed several promising candidates for inclusion in the list;

recommends

that the following transition frequencies shall be included or updated in the list of recommended standard frequencies:

- the unperturbed optical transition $5s^2\ {}^1S_0 - 5s\ 5p\ {}^3P_0$ of the ^{87}Sr neutral atom with a frequency of $f = 429\ 228\ 004\ 229\ 873.7$ Hz and a relative standard uncertainty of 1×10^{-15} (this radiation is already endorsed by the CIPM as a secondary representation of the second);
- the unperturbed optical transition $5s^2\ {}^1S_0 - 5s\ 5p\ {}^3P_0$ of the ^{88}Sr neutral atom with a frequency of $f = 429\ 228\ 066\ 418\ 012$ Hz and a relative standard uncertainty of 1×10^{-14};
- the unperturbed optical transition $4s\ {}^2S_{1/2} - 3d\ {}^2D_{5/2}$ of the $^{40}Ca^+$ ion with a frequency of $f = 411\ 042\ 129\ 776\ 393$ Hz and a relative standard uncertainty of 4×10^{-14};
- the unperturbed optical transition ${}^2S_{1/2}$ ($F = 0$) – ${}^2F_{7/2}$ ($F = 3$, $m_F = 0$) of the $^{171}Yb^+$ ion with a frequency of $f = 642\ 121\ 496\ 772\ 657$ Hz and a relative standard uncertainty of 6×10^{-14};
- the unperturbed optical transition $6s^2\ {}^1S_0$ ($F = 1/2$) – $6s\ 6p\ {}^3P_0$ ($F = 1/2$) of the ^{171}Yb neutral atom with a frequency of $f = 518\ 295\ 836\ 590\ 864$ Hz and a relative standard uncertainty of 1.6×10^{-13}.

RECOMMENDATION 3 (CI-2009):
Alignment of geodetic references and synchronization of time references to international standards

The International Committee for Weights and Measures (CIPM),

considering that

- the International Terrestrial Reference System (ITRS) has been recommended by the International Astronomical Union (IAU) and the International Union of Geodesy and Geophysics (IUGG) for applications in space and Earth sciences;
- primary access to the ITRS is achieved through the International Terrestrial Reference Frame (ITRF), and access with an uncertainty ranging between 3 cm and 40 cm is also possible through the global geodetic systems WGS84, PZ-90, the Galileo Terrestrial Reference Frame (GTRF), the China Geodetic System 2000 (CGS'2000), and through regional densifications;
- the time scale endorsed by the 15th General Conference of Weights and Measures (1975) for world-wide time coordination and dissemination is Coordinated Universal Time (UTC);
- the BIPM provides coordination for the maintenance and dissemination of UTC;
- GPS time is steered to the real-time realization of UTC maintained at the United States Naval Observatory (USNO), UTC(USNO) (modulo 1 s), GLONASS time is steered to the real-time realization of UTC maintained at the Institute for Physical-Technical and Radiotechnical Measurements (VNIIFTRI), UTC(SU), and Galileo time will be steered to an ensemble of European realizations of UTC, keeping the seconds of GPS time;
- the BIPM participates in the International Committee on GNSS (ICG);

and aware that

- new global navigation satellite systems (GNSS) are being designed and developed;
- interoperability of the various GNSS would be facilitated by the adoption of international time and geodetic references;
- common internationally recognized time and geodetic references are necessary for civil and scientific activities world-wide;

recognizes that

- the ICG is a unique structure enabling GNSS Service Providers to align their time and geodetic and references to UTC and the ITRS for the operation of their systems;

recommends that

- the geodetic references used by the GNSS be aligned as closely as possible to the ITRS;
- the internal System Times (ST) of the GNSS be synchronized as closely as possible to UTC (modulo 1 s);
- the GNSS broadcast, in addition to their own ST:
  - the time difference between the ST and a real-time realization of UTC,
  - the time differences between various STs;

and requests that

- the BIPM coordinate the necessary actions within the ICG.

RECOMMENDATION 4 (CI-2009):
On the weakness of the present definition of UTC

The International Committee for Weights and Measures (CIPM),

considering that

- the use of Coordinated Universal Time (UTC) as defined in 1972 is negatively affected by steps caused by the unpredictable insertion of an unpredictable number of leap seconds;
- this definition of UTC can not meet the requirements of many existing and future navigation systems needing uniform time;
- alternate time scales, not affected by leap seconds, are being developed and have started to proliferate;
- the need to represent the Earth's rotation angle in celestial reference systems for use in maritime celestial navigation is either no longer required or can easily be met through values of [$UT1 - UTC$] as published by the International Earth Rotation and Reference Systems Service (IERS);
- UT1 can fully satisfy needs related to the determination of the Earth rotation angle;
- there must be sufficient lead time allowed for developers of satellite- and land-based navigation system software to accommodate any change in the definition of UTC;
- over the last ten years a number of national and international technical organizations have expressed increasing concerns about the present definition of UTC and the concomitant proliferation of alternate time scales;

recommends that

national and international agencies and relevant scientific unions concerned with the definition of international time scales urgently consider decisions regarding the future definition of UTC so that international agreement can be reached as soon as possible.

RECOMMENDATION Q 1 (2009) :
On the possible redefinition of the mole and the kilogram

The Consultative Committee for Amount of Substance – Metrology in Chemistry (CCQM),

considering

- its previous recommendation to the CIPM on the possible redefinition of the mole and the kilogram, CCQM Q1 (2007),
- that the present definition of the mole refers to the kilogram,
- the importance of both the kilogram and the mole to the chemical measurement community,

noting

- the progress with experimental efforts to resolve the discrepancy of about 1 part in 10^6 between the value of the Planck constant arising from the watt balance and the X-ray crystal density/molar mass measurements,
- the development of independent mass spectrometric methods for the determination of the isotope amount ratios of silicon both at natural and enriched isotopic abundances as part of the IAC programme,
- that the level of awareness of the proposal to redefine the mole is low in the relevant communities,
- that support for the proposal to redefine the mole is not yet unanimous,

recommends that

- any decision on redefining the mole and kilogram be deferred until:
  - the discrepancy between results from the watt balance and the X-ray crystal density/molar mass measurements has been resolved; and
  - agreement is demonstrated between values for the Avogadro constant derived from independent measurements of the isotope amount ratios of silicon on samples at both natural and enriched isotopic composition,
- full consideration be given to the interests of the chemical measurement community,

- the BIPM, the National Metrology Institutes, and the other official representatives in the Consultative Committees increase their efforts to spread awareness of the proposals to the various scientific, industrial, and professional organizations, and seek their views at an early stage

states its preference for a redefinition of the mole, the SI unit of amount of substance, based on a fixed value of the Avogadro constant.

ANNEX 1

FINANCIAL REGULATIONS

The present Financial Regulations were approved by the International Committee for Weights and Measures (CIPM) at its 98th meeting, in October 2009. They entered into force on 1 January 2010, and cancel and replace the previous Financial Regulations.

— Part 1 —
Scope, application and definitions

Article 1 — General principles

1.1 These Financial Regulations follow from and are in accordance with Articles 9, 10 and 11 of the Metre Convention and Articles 6, 7, 15, 19 and 20 of the Annexed Regulations to the Metre Convention and shall govern the financial administration of the *Bureau International des Poids et Mesures* (hereinafter *the BIPM*).

1.2 The Director shall adopt Financial Rules as needs occur. The Director shall ensure effective implementation of the present Financial Regulations and of the Financial Rules.

Article 2 — Financial period and quadrennium

2.1 The financial period of the BIPM shall extend from 1 January to 31 December.

2.2 A quadrennium is made of 4 financial periods.

Article 3 — Definitions

3.1 The Dotation is the annual total sum voted by the General Conference on Weights and Measures (CGPM) providing the necessary appropriations for the functioning of the BIPM and the carrying out of its activities, at least for each of the 4 financial periods of the quadrennium. The Dotation is re-evaluated as necessary at meetings of the CGPM.

3.2 The Budget is the document whereby the International Committee for Weights and Measures (CIPM) accords the necessary commitment authorization for the functioning of the BIPM and the carrying out of its activities for one financial period.

3.3 The term "*commitment authorization*" means the authority conferred upon the Director to enter into obligations in the name of the BIPM during the financial period in question. The term "*appropriation*" means the sum of money which the Director is authorized to

disburse in the course of the financial period in respect of the expenses to which such appropriation relates.

— Part 2 —
Dotation

Article 4 — Dotation process

Establishment of the Draft re-evaluated Dotation

4.1 The CIPM shall establish a draft for re-evaluation of the Dotation for the implementation of the Programme of Work.

4.2 The Draft re-evaluated Dotation shall follow the format set forth below.

4.2.1 The Dotation shall be in Euros.

4.2.2 The Dotation shall comprise the fixed and complementary parts mentioned in Article 6 of the Annexed Regulations to the Metre Convention.

The Dotation shall cover general expenses related to the BIPM's mission and core activities of common interest to all Member States, including all operating, scientific equipment, maintenance and renovation of buildings and human resources expenditure.

The source of finance of the Dotation shall be the assessed contributions of Member States.

Approval of the Dotation

4.3 The CIPM shall submit the Draft re-evaluated Dotation to the CGPM in the Convocation to the next meeting of the CGPM and no later than 9 months before this next meeting, and the corresponding *Programme of Work and Budget* no later than 6 months before this said meeting, in order to give Member States time to instruct their

delegates to the meeting.

4.4 Before the opening of each quadrennium, the CGPM shall approve the re-evaluated Dotation for the 4 financial periods of the quadrennium.

4.5 The re-evaluated Dotation shall be approved only if no Member State votes against.

Absence of approval of the re-evaluated Dotation

4.6 If it has not been possible to approve the re-evaluated Dotation for the next quadrennium, the CGPM may decide not to close its meeting until the re-evaluated Dotation is approved and the Member States shall be convened to a meeting held no later than 9 months later, aimed at approving the Draft re-revaluated Dotation. On the day the re-evaluated Dotation is finally approved, the meeting of the CGPM will be considered as closed.

4.7 Until the approval of the re-evaluated Dotation, the Dotation previously approved for the 4th financial period of the preceding quadrennium continues unchanged into the next quadrennium and until such time as the CGPM approves a re-evaluated Dotation. The Director is authorized to commit expenditure and make payments within the limit of the appropriations approved under the 4th financial period of the preceding quadrennium Dotation.

Article 5 — Supplementary Dotation

Should circumstances so require, the CIPM may prepare one or more Draft supplementary Dotations, to be approved by the CGPM.

— Part 3 —
Budget

Article 6 — Approval of the Budget

6.1 The CIPM approves the annual Budget, on the proposal of the

Director and based on the Dotation, before the opening of the ensuing financial period.

6.2 The Budget shall be in Euros.

6.3 The CIPM approves the Budget by majority vote. In the case of a tie, the President of the CIPM has a casting vote.

6.4 Approval of the Budget by the CIPM shall empower the Director to receive, in addition to the contributions related to the Dotation, any other income included in the Budget.

6.5 The approval of the Budget by the CIPM shall also empower the Director to enter into obligations in the name of the BIPM during the financial period in question.

Article 7 — Commitments to be made in a future financial period

The Director is authorized to undertake commitments in a financial period for expenditure to be made after the end of that period in the following cases:

- Employment of staff;
- Contracts for the preservation and maintenance of the assets as well as for utilities provided that the contract duration does not exceed a firm period of 36 months; and
- Contracts for the procurement of goods and services provided that the contract duration does not exceed a firm period of 36 months and that the expenditure at stake is covered by the appropriation available in the financial period in which the commitment is made.

— Part 4 —
Appropriations and closing of accounts

Article 8 — Carry forward of non-committed appropriations to the ensuing quadrennium

Appropriations corresponding to non-committed expenditure and for which no payment has been made by the end of the current quadrennium may be carried forward to the ensuing quadrennium. Appropriations so carried forward shall be used either for the realization of the expenditure that justified their carry forward or transferred to the Reserve Fund in accordance with Article 16 below.

Article 9 — Carry forward of non-committed appropriations to the Budget of the ensuing financial period

Appropriations corresponding to non-committed expenditure and for which no payment has been made by the end of the current financial period may be carried forward to the Budget of the ensuing financial period. Appropriations so carried forward shall be used either for the realization of the expenditure that justified their carry forward or transferred to the Reserve Fund in accordance with Article 16 below.

Article 10 — Carry forward of committed appropriations to the Budget of the ensuing financial period

Appropriations corresponding to expenditure committed but for which no payment has been made by the end of the current financial period, shall be carried forward automatically to the Budget of the ensuing financial period. Appropriations so carried forward shall be used only for the realization of the commitments that justified their carry forward.

Article 11 — Transfer of appropriations

11.1 Appropriations may be transferred between Chapters of the Budget.

11.2 Transfers from one Chapter to another are:

- decided by the Director up to an amount not exceeding 100 000 euros per year;

- approved by the CIPM for an amount above 100 000 euros and not exceeding 500 000 euros per year.

A summary of the transfers of appropriations shall be submitted to the CIPM at the closing of accounts.

Article 12 — Closing of accounts

At the beginning of each financial period, the Director shall have until 15 February inclusive to close the accounts of the previous financial period. During this complementary period, the Director may authorize commitments and may make payments out of the Budget of the previous financial period in respect of expenditure related to vested rights and services rendered or goods delivered before the end of this previous financial period, and take the necessary regularization measures.

— Part 5 —
Income authorizations

Article 13 — Member States Contributions

13.1 The Dotation is distributed among Member States according to Article 20 of the Annexed Regulations to the Metre Convention and the decisions adopted by the CGPM at its 11th, 16th and 18th meetings.

13.2 At the end of a financial period, the bureau of the CIPM shall present to Member States the Table of the contributive parts for the ensuing financial period in a document entitled "*NOTIFICATION DES PARTS CONTRIBUTIVES DUES PAR LES GOUVERNEMENTS DES HAUTES PARTIES CONTRACTANTES POUR L'ENTRETIEN DU BUREAU INTERNATIONAL DES POIDS ET MESURES ET DES SOUSCRIPTIONS DUES PAR LES ÉTATS ET ENTITÉS ÉCONOMIQUES ASSOCIÉS À LA CONFÉRENCE GÉNÉRALE*", giving the table of repartition of the Dotation for the ensuing financial period, the method of calculation, the percentages of repartition for each Member State and the terms of payment.

13.3 The contributive part of each Member State for the financial period shall be determined following the method approved by the CGPM, based upon the *Scale of Assessments* for *the apportionment of the expenses of the United Nations* adopted by the United Nations Organization in force at the time of the calculation of the Table of the contributive parts and for the period mentioned in the *Scale of Assessment* of the United Nations Organization. If such a *Scale of Assessments* is not yet available from the United Nations Organization for the period in question, the previous *Scale of Assessments* is maintained until such time that the new *Scale of Assessments* is available when the contribution will be re-calculated using the new *Scale of Assessments* and appropriate adjustments made in the next *NOTIFICATION*.

The contribution of each State cannot be less than a minimum nor higher than a maximum. The maximum and minimum amounts were set by the CGPM at its 11th meeting at 10 % and 0.5 % of the total Dotation. Since the 16th meeting of the CGPM, these maximum and minimum have been re-evaluated at the beginning of each quadrennium by multiplying them by a factor of 100/(100 + x), where "x" is equal to the sum of percentages of repartition corresponding to Member States having acceded to the Metre Convention during the previous quadrennium.

The calculation of the Table of contributive parts shall also take into account the Member States obligation to pay supplementary sums to make up the Dotation due to the default of Member States which advantages and prerogatives are suspended in accordance with Article 6 of the Annexed Regulations to the Metre Convention.

13.4 If a Member State previously in arrears by more than three years pays its arrears of contributions, then the advances made by the other Member States are returned to them.

13.5 Contributions shall be payable in Euros, or in a Euro convertible currency, at the beginning of each year.

13.6 The contributions in arrears shall be recovered in accordance with Article 6 of the Annexed Regulations to the Metre Convention and

Resolution 8 adopted by the CGPM at its 23rd meeting (*cf.* Annex 1).

Article 14 — Contributions of new Member States

14.1 In accordance with Article 11 of the Metre Convention and the decision made by the CIPM at its 49th session, a State which becomes a Member State during the financial period shall be required to make an entry contribution equal to its first annual contribution and shall be required to make a contribution for the financial period in accordance with Article 13.3 above.

14.2 When an Associate State accedes to the Metre Convention, the entry contribution will be reduced by an amount equals to its subscriptions paid as an Associate up to a maximum of 5 years subscription (*cf.* Annex 2).

Article 15 — Subscriptions of Associates

15.1 In accordance with Resolution 3 adopted by the CGPM at its 21st meeting (*cf.* Annex 3), the Associate States and Economies of the CGPM shall pay an annual subscription to the BIPM to meet the cost of providing the services that the CIPM made available to them.

15.2 The assessed subscription of each Associate State shall be determined from its UN contribution, as for Member States, but with a minimum equal to 0.05 % of the annual Dotation of the BIPM.

15.3 At the end of a financial period, the bureau of the CIPM shall present to Associates the amount of their assessed subscriptions for the ensuing financial period.

15.4 Assessed subscriptions shall be payable in Euros, or in a Euro convertible currency, at the beginning of each year.

15.5 The subscriptions in arrears shall be recovered in accordance with Resolution 3 adopted by the CGPM at its 21st meeting.

Article 16 — Reserve Fund and Capital Investment Fund

16.1 A Reserve Fund exists aimed at covering the fluctuations in payments of annual contributions from Member States.

16.2 The Reserve Fund shall be financed by appropriations corresponding to expenditures that have not been committed, for which no payment has been made by the end of the current financial period, and that are not carried forward to the Budget of the ensuing financial period. The maximum amount of the Reserve Fund shall be determined by the CIPM when approving the Budget in accordance with Article 6 above.

16.3 A Capital Investment Fund exists aimed at supporting the infrastructure of the BIPM and includes depreciation of equipment, any other additional capital investment needed, and any unexpected expenses.

The source of finance of this Fund shall be whatever sums the CIPM may decide to transfer from the Reserve Fund and the entry contribution paid by States acceding to the BIPM representing their support to the infrastructure of the BIPM.

Article 17 — Grants, bequests and other income

17.1 The BIPM is authorized to accept any grant or bequest or any income (hereinafter collectively referred to as “grant”), e.g. under partnership agreements with other intergovernmental organizations or the public authorities of Member States, Associate States or Economies, or non-associated Economies.

The Director is authorized to accept any grant in an amount not exceeding 200 000 euros. Other grants are subject to acceptance by the CIPM.

The Director shall report on all acceptances to the bureau of the CIPM on a quarterly basis and to the CIPM annually.

17.2 Grants properly accepted shall be the object of an appropriation under the chapters corresponding to their purpose. Appropriations

which have not been committed before the end of the current financial period shall be automatically carried forward for the ensuing financial period until the termination of the activity(ies) for which the amount was intended.

17.3 The BIPM may only receive grants to carry out activities included in the Programme of Work.

17.4 The Director shall ensure that the activity, for which the grant is proposed, is included in the Programme of Work or in support of an activity or objective approved by the CGPM, that the BIPM is capable of complying in full with the proposed terms of the grant agreement and that the cost of obtaining and managing the grant should be significantly outweighed by the benefits to the BIPM.

17.5 The Director shall establish a system of preliminary control of the legal and financial acceptability of the terms and conditions of a proposed grant, as well as of the financial risk that would be associated with such a grant.

17.6 The BIPM shall encourage donors to make their grants available to the BIPM in Euros, or in a Euro convertible currency.

17.7 In the absence of any provision regarding surpluses in a grant agreement funding a specific activity, such surpluses shall be reassigned to another activity with the donor's prior written approval.

17.8 A system shall be established with donors to administer charges for directly attributable variable costs plus appropriate associated overhead costs to grants.

— Part 6 —
Pension and Provident Fund

Article 18 — Pension and Provident Fund

18.1 The Pension and Provident Fund was established by the CGPM at its 3rd meeting for the staff of the BIPM; the CGPM, at its 10th meeting, transferred to the CIPM responsibility for its administration, which, since then, adopts the *Regulations and Rules of the BIPM Pension and Provident Fund*.

18.2 The purpose of the Pension and Provident Fund shall be the payment to BIPM staff members of pensions, allowances, indemnities or any other benefits payable under the *Regulations of the BIPM Pension and Provident Fund*, to the exclusion of any other payment.

18.3 To service these pensions, allowances, indemnities and other benefit, a Pension and Provident Fund is maintained from the financial resources specified in the above regulations.

18.4 The Pension and Provident Fund shall be the subject of separated accounts in the financial statements.

— Part 7 —
Reserve Fund for Health Insurance

Article 19 — Reserve Fund for Health Insurance

19.1 As decided by the CIPM at its 80th session, a Reserve Fund for Health Insurance provides a guarantee in the event of failure of the private insurance company in charge of insuring the risks related to sickness, death and incapacity, work accidents and funerals expenditures for staff and retired staff members in accordance with the *Regulations, Rules and Instructions applicable to staff members*. In such a situation, medical cover for staff and retired staff members will be provided out of from the Reserve Fund for Health Insurance until such time as a contract with a new insurer can be arranged.

19.2 The Reserve Fund for Health Insurance shall be the subject of separated accounts in the financial statements.

— Part 8 —
Commitment authorizations

Article 20 – Commitment authorization

The Director is authorized to undertake commitments in a financial period.

Article 21 – Delegation

The Director may delegate to staff members of the BIPM his/her authority in writing as he or she considers necessary. Except if authorized in writing by the Director, the staff member to whom a power has been so delegated may not sub-delegate it.

— Part 9 —
Control system

Article 22— Control System

The internal financial and budgetary control system comprises all of the procedures and processes designed to ensure efficient, effective and proper application of the principles of sound financial management and the protection of assets. The detail of application of these principles is contained in the Financial Rules adopted by the Director, in the Regulations and Rules applicable to staff members of the BIPM and the Regulations and Rules of the BIPM Pension and Provident Fund which are approved by the CIPM.

Article 23 — Responsibility of the Director

The Director shall be responsible for implementing the internal financial and budgetary control system.

Article 24 — Accounting principles and reports

24.1 The accounting records of the BIPM shall be kept in Euros.

24.2 The financial statements of the BIPM shall be prepared by the Director on the basis of accounting principles. The principles adopted and the manner of their application shall be set forth in a note on accounting policies accompanying each financial period's financial statements.
The financial statements presented for each financial period shall include a Statement of financial position, a Statement of financial performance, the budget out-turn, and Notes to these financial statements.

24.3 After the closing of accounts (see article 12 above), an External Auditor shall report annually and directly to the CIPM on the financial statements and the out-turn of the Budget no later than the 31 May of the year following the close of the financial period in question

24.4 The Director shall submit the financial statements and the report on the out-turn of the budget to the bureau of the CIPM no later than the 31 March of the year following the close of the financial period in question.

24.5 Reports shall be prepared by the Director for each financial period and submitted to the CIPM at its next session in accordance with Article 19 of the Metre Convention. They include a report on the out-turn of the budget of the preceding financial period, financial statements of the preceding financial period together with the report of the External Auditor, a report on the work accomplished since the last session of the CIPM, and a report on the out-turn of the budget of the current financial period.

Article 25 —Discharge and annual report to Member States

25.1 On the basis of the financial statements, the report of the Director on the out-turn of the Budget and the report of the External Auditor, the CIPM shall discharge the Director of the BIPM from all liability in

respect of his or her administration for the previous financial period according to Article 19 of the Metre Convention.

25.2 According to Article 19 of the Metre Convention, the bureau of the CIPM shall address an annual report to the Member States on the administrative and financial situation of the BIPM for the previous financial period. This report shall include:

- the financial statements;
- a report on the implementation of the Budget;
- the Budget for the ensuing financial period;
- a summary on the activity of the CIPM and its Consultative Committees mentioning departure of CIPM members and nomination of new CIPM members;
- a summary of the work carried out during the financial period;
- a table detailing the contributions received from each Member State during the financial period and the situation of the unsettled contributions at the end of the financial period for each Member State;
- a table detailing the subscriptions received from each Associate during the financial period and the situation of the unsettled subscriptions at the end of the financial period for each Associate;
- the table of the contributive parts of Member States for the ensuing financial period;
- the table of the subscriptions of Associates for the ensuing financial period; and
- a list of the CIPM members.

Article 26 — Procurement of goods and services

“Procurement” is the acquisition by the BIPM from third parties of all goods and services necessary for its functioning or for the implementation of the Programme of Work. The procurement of goods and services shall maximize both value for money and transparency in selection of suppliers. The competitive procurement process is the procedure by which the BIPM selects the most economically and technically advantageous offer for the

supply of goods and services. This competitive procurement process shall be set out in the Financial Rules adopted by the Director.

— Part 10 —
Cash management

Article 27 — Cash management operations

The Director is authorized to carry out cash management operations which are necessary in the interests of the BIPM and, in particular, to invest funds not immediately required. For this purpose, the Director may perform any administrative act or disposal and, in particular, may purchase and transfer securities. The Director shall inform the CIPM of the investments made and shall take account of any proposals made on such occasions.

— Part 11 —
Miscellaneous provisions

Article 28 — Writing off of loss of assets

The Director may authorize the writing off of loss of assets, except for contributions of Member States and subscriptions of Associates in arrears. The Director shall seek the prior opinion of the bureau of the CIPM before writing off any loss of assets in an amount in excess of 10 000 euros. A full statement of all such amounts written off shall be attached as an annex to the financial statements.

Article 29 — Review of Financial Regulations

These Financial Regulations shall be subject to review by the CIPM no later than 5 years after their adoption.

— Annex 1 —

Resolution 8 of the 23rd meeting of the CGPM (2007)

The 23rd General Conference,

recalling that

Article 6 al. 6 to 8 of the Rules annexed to the Metre Convention reads:

> *«6. Si un État est demeuré trois années sans effectuer le versement de sa contribution, celle ci est répartie entre les autres États, au prorata de leurs propres contributions. Les sommes supplémentaires, versées ainsi par les États pour parfaire le montant de la dotation du Bureau, sont considérées comme une avance faite à l'État retardataire, et leur sont remboursées si celui-ci vient à acquitter ses contributions arriérées.*
> *7. Les avantages et prérogatives conférés par l'adhésion à la Convention du Mètre sont suspendus à l'égard des États déficitaires de trois années.*
> *8. Après trois nouvelles années, l'État déficitaire est exclu de la Convention, et le calcul des contributions est rétabli conformément aux dispositions de l'article 20 du présent Règlement.»*

and Article 11 of the Metre Convention reads:

> *«11. Les Gouvernements qui useraient de la faculté, réservée à tout État, d'accéder à la présente Convention, seront tenus d'acquitter une contribution dont le montant sera déterminé par le Comité sur les bases établies à l'article 9, et qui sera affectée à l'amélioration du matériel scientifique du Bureau.»*

considering

• the importance of the work carried out by the International Bureau of Weights and Measures (BIPM) and the services delivered to Member States,
• the absolute necessity that contributions of Member States be paid timely and consistently to allow the BIPM to fulfil its mission and to avoid financial problems in the day-to-day operation of the BIPM,

• the need to define the decision-making process and a procedure governing the recovery of arrears and exclusion,

invites Member States which have failed to fulfil their financial obligations to pay their outstanding arrears,

decides that

• when a Member State has not paid its contributions for six years, the International Committee for Weights and Measures (CIPM) shall send to the defaulting Member State a formal notification inviting it to fulfil its financial obligations and reminding it of the procedure governing the recovery of arrears and exclusion. Such a notification shall be sent no later than nine months before the next meeting of the General Conference on Weights and Measures (CGPM),
• the CIPM may enter into a rescheduling agreement with that defaulting Member State for the payment of its arrears,
• if, further to the above-mentioned notification, a Member State persists in its failure to fulfil its financial obligations or does not perform its obligations under an agreement with the CIPM, the latter shall recommend to the CGPM to take a decision with regard to the exclusion of that State in accordance with Article 6 al. 8 of the Rules annexed to the Metre Convention,
• the exclusion shall be notified by the CGPM to that Member State through the French Ministry of Foreign Affairs, which shall accordingly inform all Member States,
• an excluded Member State may only again accede to the Metre Convention if its remaining arrears have been paid. Pursuant to Article 11 of the Metre Convention, that Member State shall pay an entrance contribution equal to its first annual contribution,
• a Member State which withdraws may only again accede to the Metre Convention if its remaining arrears have been paid. Pursuant to Article 11 of the Metre Convention, that Member State shall pay an entrance contribution equal to its first annual contribution.

— Annex 2 —

Resolution 5 of the 23rd meeting of the CGPM (2007)

The 23rd General Conference,

considering

• Resolution 3 of the 21st General Conference,
• that the status of Associate State should be a possible first step to accede to the Metre Convention,
• the technical and economic benefits gained by Associates,
• the level of the financial subscription of the Associates in relation to these activities and benefits,
• the increasing costs to Member States of the participation of Associates in the CIPM MRA and in some elements of the work of Consultative Committees,

invites the International Committee to draw up criteria which would enable it to review whether it would be appropriate for an Associate to become a Member State and to report to the 24th General Conference on any changes to the conditions regarding the status of Associate,

decides

• that the International Committee will review the situation of each Associate State five years after its admission as an Associate with a view to encouraging it to accede to the Metre Convention,
• 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, and
• that an Associate State which accedes to the Metre Convention will pay an entrance fee from which its subscriptions paid as Associate of the CGPM, will be deducted, up to a maximum of five years subscription.

— Annex 3 —

Resolution 3 of the 21st meeting of the CGPM (1999)

The 21st Conférence Générale des Poids et Mesures,

considering that

• the worldwide measurement infrastructure, based on the International System of Units (SI) used in almost every aspect of modern society, rests on the universal application of the decisions of the General Conference,
• all States, not only those that are Member States of the Metre Convention, engage in measurements which are related to trade and need to be traceable to the SI,
• States which are not Member States of the Metre Convention are at present excluded from the activities of the Convention,
• Member States of the Metre Convention support the world's measurement system by devoting considerable financial resources to the BIPM and to their own national measurement systems,
• many smaller States would have difficulty in allocating funds sufficient to meet the cost of membership of the Metre Convention,

decides

• to assume a responsibility for providing those States and Economies not yet members of the Metre Convention with the means to establish links to the world's measurement system so as to provide recognition of the traceability of their measurements to the SI,
• that an important link can be through participation in the mutual recognition arrangement related to national measurement standards now operated by the International Committee,
• that participation in the arrangement for such a State or Economy should be by the association of their national metrology institutes with a regional metrology organization that is a member of the Joint Committee of the Regional Metrology Organizations and the BIPM,

and consequently **decides**

• to invite such States and Economies to take part in the General Conference as Associates, thereby establishing the connection with the Member States of the Metre Convention necessary for them to participate in the mutual recognition arrangement,
• that Associate States and Economies of the General Conference participate in the Conference through the appointment of non-voting observers,
• that Associate States and Economies shall pay an annual subscription to the BIPM to meet the cost of providing the services that the International Committee may make available to them; the annual subscription of each Associate State or Economy will be determined from its UN contribution, as for Member States but with a minimum equal to 0.05 % of the annual dotation of the BIPM,
• that a State or Economy wishing to become an Associate may do so by application to the Director of the BIPM, either directly or through its Embassy in Paris, and by the payment of the first annual subscription,
• that an Associate State or Economy three years in arrears with its subscription cease to be an Associate; it may be reinstated on payment of these arrears.

LIST OF ACRONYMS AND INITIALISMS USED IN THE PRESENT VOLUME

AFRIMETS	Inter-Africa Metrology System
AIC	ILAC Accreditation Issues Committee
APMP	Asia Pacific Metrology Programme
BAWG	CCQM Bioanalysis Working Group
BIPM	International Bureau of Weights and Measures/ *Bureau International des Poids et Mesures*
CARICOM	Caribbean community
CC	Consultative Committee of the CIPM
CCAUV	Consultative Committee for Acoustics, Ultrasound and Vibration/*Comité Consultatif de l'Acoustique, des Ultrasons et des Vibrations*
CCEM	Consultative Committee for Electricity and Magnetism/ *Comité Consultatif d'Électricité et Magnétisme*
CCEMRI	Comité consultatif pour les étalons de mesure des rayonnements ionisants
CCL	Consultative Committee for Length/ *Comité Consultatif des Longueurs*
CCM	Consultative Committee for Mass and Related Quantities/ *Comité Consultatif pour la Masse et les Grandeurs Apparentées*
CCPR	Consultative Committee for Photometry and Radiometry/ *Comité Consultatif de Photométrie et Radiométrie*
CCQM	Consultative Committee for Amount of Substance: Metrology in Chemistry/*Comité Consultatif pour la Quantité de Matière : Métrologie en Chimie*
CCRI	Consultative Committee for Ionizing Radiation/ *Comité Consultatif des Rayonnements Ionisants*
CCRI(I)	CCRI Section I: x- and gamma rays, charged particles
CCT	Consultative Committee for Thermometry/ *Comité Consultatif de Thermométrie*
CCTF	Consultative Committee for Time and Frequency/ *Comité Consultatif du Temps et des Fréquences*
CCU	Consultative Committee for Units/ *Comité Consultatif des Unités*
CEM	Centro Español de Metrología, Madrid (Spain)

CGPM	General Conference on Weights and Measures/ *Conférence Générale des Poids et Mesures*
CIE	International Commission on Illumination/*Commission internationale de l'éclairage*
CIML	International Committee of Legal Metrology/ *Comité International de Métrologie Legale*
CIPM	International Committee for Weights and Measures/ *Comité International des Poids et Mesures*
CIPM MRA	CIPM Mutual Recognition Arrangement
CITAC	Cooperation on International Traceability in Analytical Chemistry, Trappes (France)
CMC	Calibration and Measurement Capability
CODATA	Committee on Data for Science and Technology
Codex Alimentarius:	Commission under the Joint FAO/WHO Food Standards Programme
CRM	Certified reference material
DFM	Danish Fundamental Metrology Ltd., Lyngby (Denmark)
DPRK	Democratic People's Republic of Korea
DI	Designated institute
EA	European co-operation for Accreditation
EM	Electricity and Magnetism
EURAMET	(the former EUROMET) European Association of National Metrology Institutes
GNSS	Global Navigation Satellite System
GUM	Guide to the Expression of Uncertainty in Measurement
IAC	International Avogadro Coordination
IAEA	International Atomic Energy Agency
IAG	International Association of Geodesy
IAU	International Astronomical Union
ICAG	International Comparison of Absolute Gravimeters
ICRU	International Commission on Radiation Units and Measurements
ICTNS	Interdivisional Committee on Terminology, Nomenclature and Symbols
IEC	International Electrotechnical Commission
IFCC	International Federation of Clinical Chemistry and Laboratory Medicine
ILAC	International Laboratory Accreditation Cooperation

INMETRO	Instituto Nacional de Metrologia, Normalizaçao e Qualidade Industrial, Rio de Janeiro (Brazil)
INRIM	Istituto Nazionale di Ricerca Metrologica, Turin (Italy)
IPK	International prototype of the kilogram
IPQ	Instituto Português de Qualidade, Caparica (Portugal)
IRMM	Institute for Reference Materials and Measurements, European Commission, Geel (Belgium)
ISO	International Organization for Standardization
ISO CASCO	ISO Committee on Conformity Assessments
ISO REMCO	ISO Committee on Reference Materials
IUPAC	International Union of Pure and Applied Chemistry
IUPAP	International Union of Pure and Applied Physics
ITS	International Temperature Scale
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
JVS	Josephson voltage standard
KCDB	BIPM Key Comparison Database
KCRV	Key Comparison Reference Value
LATU	Laboratorio Tecnológico del Uruguay, Montevideo (Uruguay)
LGC	LGC (formerly Laboratory of the Government Chemist), Teddington (UK)
LNE	Laboratoire National de Métrologie et d'Essais, Paris (France)
MoU	Memorandum of Understanding
NATA	National Association of Testing Authorities, Sydney (Australia)
NBS	National Bureau of Standards (USA)
NEWMET	North-East and West Africa Metrology Programme (region of AFRIMETS)
NIM	National Institute of Metrology, Beijing (P.R. China)
NIS	National Institute for Standards, Cairo (Egypt)
NIST	National Institute of Standards and Technology, Gaithersburg, Md. (USA)

NMI	National Metrology Institute
NMIA	National Measurement Institute, Australia, Lindfield (Australia)
NMIJ AIST	National Metrology Institute of Japan, National Institute of Advanced Industrial Science and Technology, Tsukuba (Japan)
NMISA	National Metrology Institute of South Africa, Pretoria and Cape Town (South Africa)
NPL	National Physical Laboratory, Teddington (UK)
NPSL	National Physical and Standards Laboratory, Islamabad (Pakistan)
OAWG	CCQM Organic Analysis Working Group
OIML	International Organization of Legal Metrology/ *Organisation Internationale de Métrologie Légale*
PTB	Physikalisch-Technische Bundesanstalt, Braunschweig and Berlin (Germany)
QS	Quality System
RMO	Regional Metrology Organization
SI	International System of Units/*Système International d'Unités*
SIM	Inter-American Metrology System/*Sistema Interamericano de Metrología*
SSDL	Secondary Standard Dosimetry Laboratory
TAI	International Atomic Time/*Temps atomique universel*
TC	Technical Committee
TCQ	Technical Committee for Quality
TCQS	Technical Committee on Quality Systems
TT	Terrestrial Time
T2L2	Time Transfer by Laser Link
TWSTFT	Two-Way Satellite Time and Frequency Transfer
UK	United Kingdom of Great Britain and Northern Ireland
UNIDO	United Nations Industrial Development Organization
VAMAS	Versailles Project on Advanced Materials and Standards
VIM	International Vocabulary of Metrology, Basic and General Concepts and Associated Terms (3rd edition)
VNIIM	D.I. Mendeleyev Institute for Metrology, Rostekhregulirovaniye of Russia, St Petersburg (Russian Fed.)
WADA	World Anti-Doping Agency

WG	Working Group
WGACQHR	CCEM Working Group on Measurements of the Quantized Hall Resistance with Alternating Current and Related Measurements
WGFF	CCM Working Group on Fluid Flow
WGSP	CCEM Working Group on Strategic Planning
WHO	World Health Organization
WMD	World Metrology Day
WMO	World Meteorological Organization
WTO	World Trade Organization