

Bureau International des Poids et Mesures

Comité International des Poids et Mesures

93rd meeting (October 2004)

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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**MEMBER STATES OF THE METRE CONVENTION AND
ASSOCIATES OF THE GENERAL CONFERENCE**

as of 5 October 2004

Member States of the Metre Convention

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

Associates of the General Conference

Belarus	Latvia
Chinese Taipei	Lithuania
Costa Rica	Malta
Cuba	Panama
Ecuador	Philippines
Hong Kong, China	Slovenia
Jamaica	Ukraine
Kenya	Viet Nam

THE BIPM AND THE METRE CONVENTION

The International Bureau of Weights and Measures (BIPM) was set up 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 m²) 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 of the Metre Convention.

The task of the BIPM is to ensure worldwide unification of physical measurements; its function is thus to:

- establish fundamental standards and scales for the measurement of the principal physical quantities and maintain the international prototypes
- carry out comparisons of national and international standards;
- ensure the coordination of corresponding measurement techniques;
- carry out and coordinate measurements of the fundamental physical constants relevant to these activities.

The BIPM operates under the exclusive 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.

Delegates from all Member States of the Metre Convention attend the General Conference which, at present, meets every four years. The function of these meetings 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 CIPM has eighteen members each from a different State: at present, it meets every year. The officers of this committee present an annual report on the administrative and financial position of the BIPM to the Governments of

the Member States of the Metre Convention. The principal task of the CIPM is to ensure worldwide uniformity in units of measurement. It does this by direct action or by submitting proposals to the CGPM.

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 metrological research, international comparisons of realizations of units and calibrations of standards. 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 (*BIPM Proc.-Verb. Com. Int. Poids et Mesures*, 1963, **31**, 97). They meet at irregular intervals. The president of each Consultative Committee is designated by the CIPM and is normally a member of the CIPM. The members of the Consultative Committees are metrology laboratories and specialized institutes, agreed by the CIPM, which send delegates of their choice. In addition, there are individual members appointed by the CIPM, and a representative of the BIPM (Criteria for membership of Consultative Committees, *BIPM Proc.-Verb. Com. Int. Poids et Mesures*, 1996, **64**, 124). At present, there are ten such committees:

1. The Consultative Committee for Electricity and Magnetism (CEEM), new name given in 1997 to the Consultative Committee for Electricity (CCE) set up in 1927;

2. The Consultative Committee for Photometry and Radiometry (CCPR), new name given in 1971 to the Consultative Committee for Photometry (CCP) set up in 1933 (between 1930 and 1933 the CCE dealt with matters concerning photometry);
3. The Consultative Committee for Thermometry (CCT), set up in 1937;
4. The Consultative Committee for Length (CCL), new name given in 1997 to the Consultative Committee for the Definition of the Metre (CCDM), set up in 1952;
5. The Consultative Committee for Time and Frequency (CCTF), new name given in 1997 to the Consultative Committee for the Definition of the Second (CCDS) set up in 1956;
6. The Consultative Committee for Ionizing Radiation (CCRI), new name given in 1997 to the Consultative Committee for Standards of Ionizing Radiation (CCEMRI) set up in 1958 (in 1969 this committee established four sections: Section I (X- and γ -rays, electrons), 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 General Conference and the CIPM are published by the BIPM in the following series:

- *Report of the meeting of the General Conference on Weights and Measures;*
- *Report of the meeting of the International Committee for Weights and Measures.*

The CIPM decided in 2003 that the reports of meetings of the Consultative Committees should no longer be printed, but would be placed 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 various bodies created under the Metre Convention.

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on 1 January 2005

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1 Senior Research Fellow.

2 Research Fellow.

3 Head of special projects.

4 Also Publications.

5 Also site maintenance.

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**International Committee
for Weights and Measures**

**Proceedings of the sessions
of the 93rd meeting
(5–8 October 2004)**

Agenda

1. Opening of the meeting; quorum; agenda.
2. Report of the Secretary and activities of the bureau of the CIPM (October 2003 – September 2004).
3. Membership of the CIPM.
4. Report and papers from the Director on the follow-up of the 22nd CGPM.
5. The CIPM Mutual Recognition Arrangement.
6. SI Brochure.
7. Consultative Committees.
8. Rights of Associates of the CGPM.
9. Joint Committee for Traceability in Laboratory Medicine.
10. Metre Convention/ILAC Joint Working Group.
11. Contacts with other international organizations.
12. Joint Committee for Guides in Metrology.
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 93rd meeting from Tuesday 5 October to Friday 8 October 2004 at the Pavillon de Breteuil, Sèvres.

Present: S. Bennett, K. Carneiro, Myung Sai Chung, L. Énard, Gao Jie, E.O. Göbel, F. Hengstberger, B. Inglis, L.K. Issaev, R. Kaarls, S. Leschiutta, J. Lusztyk, G. Moscati, H. Semerjian, M. Tanaka, H. Ugur, J. Valdés, A.J. Wallard (Director of the BIPM).

Also attending: P. Giacomo and T.J. Quinn (Emeritus Directors of the BIPM); I.M. Mills (President of the CCU, present for part of the meeting); F. Joly, D. Le Coz and J.R. Miles (secretariat); also in attendance for parts of the meeting, the following Executive Secretaries of the Consultative Committees and JCGM contact persons: P.J. Allisy-Roberts, E.F. Arias, R.S. Davis, F. Delahaye, R. Felder, C. Michotte, M. Stock, C. Thomas, R.I. Wielgosz, T.J. Witt.

Prof. Göbel, President of the CIPM, opened the 93rd meeting by welcoming all present, particularly the two new members, Dr Carneiro and Mr Énard, Dr Semerjian (present for the first time), and the two Emeritus Directors, Prof. Giacomo and Dr Quinn. He noted that it was Dr Quinn's first session as Emeritus Director, as well as his own first session as President. He presented the apologies of Dr Schwitz. With seventeen members present, the quorum was satisfied according to Article 12 of the Rules annexed to the Metre Convention.

The agenda for the meeting was adopted, and the President invited the Secretary of the Committee, Dr Kaarls, to present his report.

2 REPORT OF THE SECRETARY AND ACTIVITIES OF THE BUREAU OF THE CIPM (October 2003 – September 2004)

All the important matters arising in the report of the Secretary are taken up later in the meeting. References are made in this section to the point in the subsequent discussion at which this occurs.

2.1 Meetings of the bureau of the CIPM

The bureau met three times during the year. The 2004 meetings in March and October were at the Pavillon de Breteuil in Sèvres, and the July meeting during the CPEM in London.

2.2 Member States of the Metre Convention

The number of Member States remains static at 51.

At present, the six following States have financial arrears for more than three years: Cameroon, Dominican Republic, Iran, the People's Democratic Republic of Korea, Uruguay, and Venezuela.

During the last year there have been several contacts at the technical level with the national metrology institute (NMI) in Iran. Since then, there have been further contacts with the Iranian authorities over their participation in the activities of the Convention du Mètre and the payment of their overdue contributions.

The bureau agreed to make a proposal to the Iranian Government for repayment of their arrears over a period of ten years. This was modelled on a similar arrangement with Cameroon in 1998-1999. This proposal is at present under consideration by the Iranian Government.

There has been a positive reply by the Government of Uruguay to a formal proposal for a rescheduled repayment of the contributions for the years 2000 to 2003.

Recent contacts with the Venezuelan embassy in Paris indicate that they are considering the repayment of their overdue contributions.

2.3 Associates of the CGPM

There are now 16 Associates of the CGPM, and discussions are underway with several potential Associates of the CGPM and with the economic entity CARICOM. The new Associates since the last CIPM meeting are Costa Rica and Viet Nam. The directors of the NMIs of all the Associates have signed the CIPM MRA.

2.4 Membership and officers of the International Committee

Since the last meeting, we have received and implemented the resignations of Professor Raj Gopal (India) and Professor Jean Kovalevsky (France).

Two new Members have been elected, Dr Kim Carneiro (Denmark), and Mr Luc Énard (France). The bureau urges Members to encourage new candidates for CIPM membership, the criteria for which are on the BIPM website.

2.5 The CIPM Mutual Recognition Arrangement

The bureau received regular reports on the position of the Mutual Recognition Arrangement (MRA). The formal transition period ended on 31 December 2003. The Joint Committee of the Regional Metrology Organizations and the BIPM (JCRB), at its 12th meeting in May 2004 in Mexico, confirmed a deadline of 31 December 2004 for the full implementation of the Quality Systems by the NMIs and other designated institutes in conformity with the CIPM MRA criteria and for final posting of the Quality Manuals for review by their regional metrology organizations (RMOs). Final approval by the relevant RMOs has to be obtained before 1 April 2005. After that date, any calibration and measurement capabilities (CMC) from laboratories that has not obtained a positive review of its Quality System will be withdrawn from the BIPM key comparison database (KCDB).

The 13th JCRB held in September 2004 at the BIPM urged signatories to use the JCRB statement of conformity on calibration certificates and encouraged discussion on the use of a simple CIPM MRA logo. The CIPM will be requested to examine a number of points (the position of international and intergovernmental organizations, arrangements for economic entities, resolving inconsistencies, subcontracting, designation of

other institutes, etc) which relate to the CIPM MRA through the agenda item 5.

The JCRB held a workshop in September 2004 at which RMOs explained the details of their review processes for Quality Systems and at which the BIPM presented its own Quality System.

The bureau considered potential dangers to the CIPM MRA as a consequence of the possible development of regional MRAs. The bureau is of the opinion that the Metre Convention should be as inclusive as possible. This may also be reflected in the rights of, and the services to, Associates of the CGPM. All these issues will be discussed further under separate points of the agenda during the meeting.

The bureau considered the special situation of the Joint Research Centres of the European Commission and the International Atomic Energy Agency. Both are signatories to the CIPM MRA. Neither body contributes financially, but there are substantial two-way technical links and benefits. The bureau took the view that these were well balanced so that there would be no need for payments to be made by such bodies. This also follows the general practice that international and intergovernmental bodies do not charge each other for the costs of their collaboration.

As the CIPM MRA and the KCDB are now, we hope, being promoted by NMIs to regulators and to industrial users, the bureau considered whether the current KCDB met the needs of these users. It is clear, however, that the vast majority of users are still in NMIs, although the number of industries visiting the KCDB is slowly growing. It is likely that many third parties will approach their own NMI for questions with respect to the capabilities of other NMIs. In these cases, the NMIs will consult the KCDB for help in finding answers. Some NMIs are establishing links with regulators and will provide advice to them based on data in the KCDB. The BIPM Director made some informal surveys with industrial companies to see whether, and how, they used the KCDB. Some of the more "metrology aware" companies use the data in Appendix C to see what the national capabilities are or whether they can find NMIs which provide a particular service. These few users can cope with the arrangement of the data as currently presented. Those NMIs that have now contacts with regulators, which like to make use of the KCDB, should ask these regulators whether the KCDB fulfils their needs. However at the moment, the BIPM Director proposed, and the bureau accepted, that there is no need for any modifications to the search engines in the KCDB. But we will keep the subject of modifications

to the search engine of the KCDB under review and if regulators or others provide feedback that they would like an alternative way of accessing data, then we will make the necessary investments in new software.

2.6 Rights of Associates

The bureau discussed the rights of Associates. This is a difficult issue to resolve but CIPM members may remember several approaches from Associates during the CGPM. Agenda item 9 addresses this issue and makes the proposal to the CIPM that Associates, for a fee, may benefit from calibrations of their Pt-Ir prototypes by the BIPM. The agenda item also deals with a clarification of the arrangements for their involvement in Consultative Committee activities.

The bureau also felt it was again time to promote the benefits of Metre Convention membership and Associate status, and the Director will send copies of his report as well as other CIPM MRA promotion documents to non-members later this year. The help of the RMOs will be important in this marketing exercise.

2.7 BIPM affairs

The Director of the BIPM has reported to the bureau on the state of the BIPM's Quality System and the Secretary of the CIPM has attended the first two quality management reviews. The BIPM Director's intention is to extend the Quality System from measurement services to include other BIPM services such as TAI, the KCDB, and the manufacture and sale of iodine cells. Various administrative procedures are being brought within the scope of the Quality System as time and resources permit.

2.8 Relations with other bodies

2.8.1 CIPM/ILAC/OIML discussions

The annual tripartite meeting was held last March and provided the usual helpful review of activities. Bureau members contributed ideas to the International Organization of Legal Metrology (OIML) "draft metrology law" and offered help, if needed, on the implementation of the OIML Mutual Acceptance Arrangement. With OIML, Dr Williams of the BIPM developed a short text explaining the significance of metrology. This was

put on the BIPM website for “World Metrology Day” 2004 and will be published in the *OIML Bulletin*. There are several other initiatives planned with the International Laboratory Accreditation Cooperation (ILAC) and the OIML and these will be reported under agenda item 11.

2.8.2 International Laboratory Accreditation Cooperation

There have been a number of interactions with ILAC over the year. It is recognized that the CIPM MRA and the ILAC Arrangement are fully complementary. The formulation of a joint position and strategy is in preparation. As the relationship with ILAC is an important one, it is addressed at several points in the agenda.

2.8.3 International Organization for Standardization

The bureau has kept in close touch with events concerning the Metre Convention and the International Organization for Standardization (ISO), especially those which emerged around the time of the last CGPM. As a result, we have taken a number of initiatives starting with an intervention by the Secretary of the CIPM during the meeting of ISO CASCO in November 2004 in Geneva and a follow-up approach to ISO by the previous Director, Dr T.J. Quinn, concerning the issues of impartiality and the relation between calibration and conformity assessment. NMI directors and the CIPM have been kept in touch through the BIPM website areas dedicated to such communications. As a result of these approaches and the efforts of NMI directors, there have been a number of important changes to various draft standards concerned with terminology, impartiality and conformity assessment.

The definition of conformity assessment in ISO 17000 does not include anymore “calibration”.

With the input given by the Secretary of the CIPM and some NMIs (a.o. of the PTB) the draft ISO 17001 on impartiality has been completely redrafted on the basis of a case by case risk analysis in the judgement whether a conformity assessment body is able to act sufficiently impartial. The approach via “related bodies” as taken in ISO 17011 has been abandoned. It is however to be expected that the new approach may lead to some further debates during the next plenary meeting of ISO CASCO.

Unfortunately, ISO 17011 had already been agreed by the members of the ISO CASCO WG 18, responsible for the drafting of this ISO standard,

before our intervention. A compromise reached in November last year between the Secretary of the CIPM and the Chairman of ISO CASCO WG 18 was, for unclear reasons, not taken on board in the printed version which went out for voting in January 2004. In July 2004, the BIPM attended a meeting of WG 18 and again negotiated the issue on calibration versus conformity assessment. The outcome is close to the position negotiated earlier on by the Secretary of the CIPM and ISO CASCO officials and is an acceptable situation. The issue of calibration and conformity assessment may, however, again be raised at the next ISO CASCO plenary in November 2004 and the CIPM and the BIPM may need to work closely with the NMI community to clarify matters.

It has been suggested by some NMI directors that there may be a need for an interpretation document of ISO 17011 to address the special situation of the NMIs. Neither ISO nor ILAC intended that the previous draft of the standard ISO 17011 stop the traditional advisory role of NMIs, nor any wish some of them may have to become accredited.

The Secretary of the CIPM and the Director of the BIPM visited the ISO Secretary General for a liaison meeting last February and this may well be repeated annually. It was productive in the sense that we made it clear that we felt that ISO had ignored the interests of the metrology community somewhat – in particular in the recent revisions of ISO 17011 and the writing of ISO 17000 and ISO 17001. The Secretary General also accepted an invitation to speak at the NMI directors' meeting on 1 October 2004.

The Director has asked Dr Rainer Köhler to take on day-to-day monitoring and liaison with ISO (and ILAC) and to use the Directors and NMI websites as an effective way of dealing with the information flow concerning ISO and other matters.

The Secretary of the CIPM and the Director of the BIPM also discussed the publication rights of the joint guides on metrology, the *Guide to the Expression of Uncertainty in Measurement* (GUM) and the *International Vocabulary of Basic and General Terms in Metrology* (VIM). We have expressed our wish that these publications become freely accessible via the internet. The ISO Secretary General expressed the necessity for ISO to cover the costs by selling the printed copies.

2.8.4 Codex Alimentarius Commission

There have been a number of initiatives to deal with the issue of metrology in food. Following a meeting in November last year, several discussions have taken place with representatives of the United Nation's Food and Agriculture Organization (FAO) and in particular with the Codex Alimentarius Commission, a joint activity of the FAO and the World Health Organization (WHO). The outcome is that the BIPM has been accepted as an observer to the Codex Alimentarius Commission and is now a member of the Inter Agency Meeting. The subject was also again discussed at a special meeting with several interested parties in food testing on 14 September 2004 which had the aim of identifying priorities for work within the existing CCQM mechanisms.

2.8.5 World Trade Organization

The Director of the BIPM has given a presentation to the Technical Barriers to Trade committee under its new Secretary Mr Erik Wikstrom. It seemed to be well received and the BIPM Director made it clear that the BIPM application for observer status had been on the table for a long time and that he hoped for greater collaboration in the future.

2.8.6 World Health Organization

The Secretary of the CIPM and the Director of the BIPM visited WHO in March 2004, and had received a very positive response from Dr Groth, the new Director of the WHO Department of Essential Health Technologies. He had previously held a post in the International Atomic Energy Agency (IAEA) in which he was responsible for the secondary dosimetry network; so he knew the BIPM quite well. He appreciated the need for traceability and measurement uncertainty. When asked about the previous reluctance of the WHO to be associated formally with the Joint Committee on Traceability in Laboratory Medicine (JCTLM) or to write to Member States on the matter on national responsibilities for laboratory medicine and their interaction with metrologists, he was open to a further approach.

The BIPM Director followed this up with a request for him to reconsider the issue, but no response has been received, despite a reminder.

2.9 Joint Committees

2.9.1 Joint Committee for Guides in Metrology: the VIM and the GUM

The members of the Joint Committee for Guides in Metrology (JCGM) are considering the current drafts of the VIM and the supplements to the GUM. The end of the formal consultation period was set for 31 August 2004 but replies are likely to be delayed. It is very likely that there will be a number of changes to the draft VIM to take account of remarks and responses and also to deal with the issue of calibration and conformity assessment.

2.9.2 Joint Committee on Coordination of Assistance to Developing Countries in Metrology, Accreditation and Standardization

We are still involved with the work of the Joint Committee on Coordination of Assistance to Developing Countries in Metrology, Accreditation and Standardization (JCDCMAS) but with a relatively low level of commitment. We initially encountered problems over the terms of reference but these are now resolved. We have developed a common position with OIML and ILAC and have met with UNIDO at Director General level to urge him to promote the “MAS” package to aid agencies and development banks. This seems to be bearing fruit and he committed himself to put work on the reduction of technical barriers to trade at the top of his priorities.

2.9.3 Joint Committee on Traceability in Laboratory Medicine

The activities of the Joint Committee on Traceability in Laboratory Medicine (JCTLM) are gaining momentum and lists of reference materials of “higher order” are now published in a special database. The work has also attracted greater interest from the European Commission and the IFCC is discussing the provision of financial support for the secretariat held at BIPM. There is some concern about whether questions of legal liability may arise if there is any dispute over the entry of some commercial companies rather than others in the list of competent national reference laboratories in the field of clinical chemistry and laboratory medicine. The issue is being discussed with IFCC and ILAC in order to find a solution which protects the three organizations. The matter will be raised in agenda item 9 and the JCTLM Executive will discuss it in December 2004.

2.10 Materials metrology

Proposals for work in the field of materials metrology (metrological properties of materials) may be revived by the KRISS, NMIJ and NPL. A meeting was held at NPL on 14 September 2004 and the Director attended as an observer. Agenda item 16 provides the opportunity for a report and a CIPM discussion on this topic.

2.11 Directors' meeting

A Directors' meeting was held on 30 September and 1 October 2004, just after the JCRB and before the CIPM. Associates were invited, as the subject was to be the state of the CIPM MRA. A report will be made orally.

2.12 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	2001	2002	2003	2004
I. Ordinary funds	6 197 805.86	6 849 066.09	6 796 242.47	6 716 177.48
II. Pension fund	8 679 664.82	10 547 903.46	10 895 038.83	11 240 366.44
III. Special fund for the improvement of scientific equipment	0.00	0.00	0.00	0.00
IV. Staff loan fund	185 723.29	194 983.92	202 427.33	209 624.60
V. Building reserve fund	1 216 406.49	0.00	0.00	0.00
VI. <i>Metrologia</i>	0.00	0.00	0.00	0.00
VII. Medical insurance reserve fund	625 077.75	653 741.11	630 883.82	609 069.49
Totals	16 904 678.21	18 245 694.58	18 524 592.45	18 775 238.01

Prof. Göbel thanked Dr Kaarls and invited discussion on the report.

Dr Semerjian commented on the CIPM's relationship with ILAC, pointing out that as metrology is fundamental to ILAC's work, they are reliant on the work of the Metre Convention. Prof. Göbel welcomed further comments, commenting that the objective was an appropriate and effective working relationship. Dr Lusztyk pointed out that accreditation had a higher profile at the national level. Prof. Issaev urged the BIPM to continue discussions with OIML, as an intergovernmental organization.

Dr Carneiro said he considered metrologists and accreditors to be equal partners.

Dr Hengstberger commented that in his experience, the ILAC leadership were well aware of the need for metrology, and he welcomed the mutual trust being established through the two organizations through the basis of the Memorandum of Understanding signed in 2001, and called for an effective interaction with the ILAC as both shared the common goal of a worldwide system of measurement and traceability.

Dr Semerjian asked if members could identify any concerns related to potential regional MRAs. He mentioned that SIM have gone no further with discussions to create a regional arrangement, but the idea was to facilitate trade within the region, and to include SIM members who are not Members of the Metre Convention or Associates of the General Conference. He saw a regional MRA as a precursor to joining the CIPM MRA, not a threat to it, and said he believed it would encourage other countries to participate.

Prof. Göbel explained that the main concern of the CIPM bureau was that two databases would exist, and this would lead to confusion for regulators. Instead, he urged promotion of Membership of the Metre Convention or Associateship of the CGPM.

Dr Kaarls agreed, adding that if non-Members/Associates were able to sign up to a regional MRA it would be with similar criteria as for those joining the CIPM MRA. If these criteria were fulfilled, why should these countries not sign up directly to the CIPM MRA?

Dr Semerjian responded that the main difficulty for many smaller States was financial, pointing out that many of SIM's 34 Members are islands with small populations. He called for the CIPM to be more accommodating to these very small economies, and to welcome regional "feeder" activities.

Prof. Wallard said that he has been told that the barriers to such economies signing up as Associates were finance and experience. However, the subscription level for Associates was modest and, in general, RMOs were helping them prepare to become signatories to the CIPM MRA through

training involving regional comparisons. Also, discussions were under way with CARICOM concerning Associateship as a regional economy, and if this went ahead then only six SIM States would neither be Members nor Associates.

Dr Inglis recognized the commitment amongst RMOs towards accommodating all States, but wondered what would be the advantage of a multiplicity of databases. He cited the example of APMP, which had abandoned its own plans for a regional MRA in favour of the worldwide CIPM Arrangement. Although RMO MRAs might initially be considered stepping stones, he cautioned that they risked becoming alternative systems. Prof. Göbel agreed, adding that an RMO MRA would not give international traceability.

Mr Énard asked if North African countries could also join as a regional body. Dr Kaarls said that the countries could of course apply for membership individually, and Prof. Wallard clarified that the question of group membership concerned recognized economic entities and that the BIPM took advice on this status from the French government. It was unlikely that any existing North African group would qualify.

Prof. Göbel then closed the discussion, thanking Dr Kaarls for his report.

3 MEMBERSHIP OF THE CIPM

Prof. Göbel noted that there were currently no vacancies on the CIPM, but reminded members that possible candidates could be suggested at any time. Dr Semerjian inquired about the procedure for nominating candidates, and Prof. Göbel said that the criteria were available from the BIPM website. The CIPM then proceeded to a confidential discussion on possible candidates.

4 REPORT AND PAPERS FROM THE DIRECTOR ON THE FOLLOW-UP TO THE 22nd CGPM

4.1 Resolution 6 (on the importance of the CIPM MRA)

Prof. Wallard presented, for discussion, a document on the importance of the CIPM MRA, reminding the CIPM that, following a discussion led by Dr Schwitz, Resolution 6 of the 22nd CGPM asked, *inter alia*:

“the International Committee to prepare a declaration on the importance and application of the CIPM MRA in trade, commerce and regulatory affairs, and to bring it to the attention of the Governments of the Metre Convention with the recommendation that the principles of the CIPM MRA be included in intergovernmental agreements as appropriate.”

Since the CGPM, the bureau had held a high-level meeting with the ILAC Chair and Secretariat. One outcome of this meeting was a decision to draft a common statement on how NMIs and national accreditation bodies (NABs) could work together and share responsibility for national measurement systems (see agenda item 10). The bureau believes that Resolution 6 of the 22nd CGPM would have a more powerful global impact if it could be turned into a statement which encouraged governments, regulators and international bodies to rely always on organizations and structures which are part of the CIPM MRA **and** the ILAC Arrangement. They also felt that there is a good argument for collaborating on this work with the OIML and subsequently to invite ISO to endorse the outcome.

In an informal exchange with the Director, the Chair of ILAC indicated a strong interest in collaborating in this way. Likewise, the bureau asked Prof. Wallard to make an informal approach to OIML, who also expressed interest in collaborating.

Prof. Wallard pointed out that ISO has good relations with the World Trade Organization (WTO) and promotion of a common statement would have a direct impact on the Metre Convention and would reinforce the impact which metrology makes on trade – precisely the target area which the CGPM had in mind. He reminded the CIPM that the desired recipients of the Declaration include: Trade/Economies Ministries of Member States, the WTO, the European Commission (noting that the CIPM MRA is already

cited in US/EU agreements), UN agencies, and other international and intergovernmental bodies.

Tripartite BIPM/OIML/ILAC meetings are already being held, and Prof. Wallard suggested that there would be some merit in formalizing them into what is, in essence, a meeting of the three most important and influential bodies concerned with international metrology and its application in an increasing number of areas. This intent is brought into sharper focus because of the joint BIPM/ILAC statement on roles and responsibilities and the proposed tripartite reaction to Resolution 6 of the 22nd CGPM. All three bodies are increasing their bilateral collaboration on specific rather than general issues.

Dr Semerjian remarked that this was a very important discussion, and asked if there was any formal meeting between the organizations concerned. He commented that the PTB workshop in 1999 had been an important event, and called for such events to be carefully planned. Prof. Wallard replied that the bureau of the CIPM met with the CIML and the ILAC leadership on an annual basis. Prof. Göbel added that members of the bureau of the CIPM also attend the General Assemblies of the other organizations. He said that the bureau would consider the suggestion of a larger conference, perhaps a two-day meeting with more participants, to promote the concept of metrology and accreditation and standardization, and which would involve the key intergovernmental and international organizations.

Dr Hengstberger drew attention to the need to help NMIs in developing countries, pointing out that it was unlikely that those countries currently without an established MAS system would be able to attend an international event such as that held at the PTB. In SADC MET, about 70 % of the NMIs are part of, and controlled by, an NSB. He informed the Committee that SADC MET often hosts introductory seminars on MAS.

Dr Inglis commented that the Metre Convention was also represented at the NCSLI Conference. Dr Bennett, who has inherited Prof. Wallard's responsibilities in the NCSLI agreed, adding that a specific session on legal metrology was organized by the Director of the BIML at the 2004 NCSLI Conference. However, he said that the NCSLI addressed mainly US accreditation bodies, rather than the wider audience sought by Dr Semerjian.

Prof. Issaev commented that it was important also to involve manufacturers, saying that a global measurement system was essential.

Prof. Göbel returned the discussion to the draft Declaration. The CIPM agreed that work on the text should continue in collaboration with ILAC and OIML. Dr Kaarls called for the ISO TAG 4 to be revived, and suggested that the Declaration should be addressed to ISO when it was distributed.

Prof. Göbel noted that whenever ISO was mentioned, ISO/IEC was meant. He asked for the Committee's views as to whether or not they should be invited to contribute to the Declaration.

Prof. Issaev recommended that contact be made with metrologists within the IEC, pointing out that the IEC was also a member of ISO TAG 4. Dr Henstberger supported the proposal that ISO should be invited to endorse the Declaration once it was prepared.

Prof. Ugur commented that it was essential that ISO standards included mention of the CIPM MRA, and recommended that traceability be made the most important message of the Declaration. He hoped that once ILAC is convinced of that, they would support promotion of the CIPM MRA.

Prof. Wallard noted that ILAC considers the CIPM MRA as the higher authority and as the only peer-reviewed route to traceability to the SI. He also welcomed the opportunity to develop (informally) bilateral relations with ISO, extolling the positive reaction of the ISO Secretary General.

Prof. Ugur queried the wording of the recent ISO/IEC Standard 17011, asking how including "calibration" as a conformity assessment activity in the context of the standard affected the NABs. Prof. Wallard commented that ISO seemed to be happy with the outcome. It was clear that the wording about calibration and conformity assessment was a compromise, but there was room for development. Prof. Göbel added that it had been important to avoid mandatory total separation of NMIs and NABs, which would have been the consequence if calibration had been considered part of conformity assessment.

Dr Tanaka suggested that it would be helpful to define what is meant by an NMI. This would also facilitate explaining the different roles of the CIPM, ILAC and ISO.

Dr Valdés agreed with the comments of Dr Kaarls, saying that the original authority for metrology was with the CIPM, not ILAC, but that there was now an important collaboration to be made between the two bodies. He agreed that it would be beneficial for ISO standards to refer to the CIPM MRA as the route to traceability, and pointed out that this went further than the initial goal of the MRA, which was to demonstrate equivalence. He

pointed out that everyone needed to demonstrate traceability, and asked if non-members should also follow the route through the CIPM MRA.

Dr Semerjian renewed his call for promotion of MAS as a whole, perhaps through a conference. He recommended that NMI concerns on standardization be expressed through the national standardization bodies which had the leverage with ISO. He also welcomed Dr Tanaka's suggestion for a clear definition of NMI.

Dr Inglis agreed that a two-pronged approach would be most effective, and that it should be initiated by the organizations at the top level and carried forward between the various bodies at the national level. He then renewed Prof. Issaev's query about contact with the IEC.

Dr Kaarls replied that he and Dr Quinn had held a meeting with the Secretary Generals of ISO and the IEC in 2003. He noted that ISO produced most of the written standards, pointing out that the BIPM was represented in ISO CASCO and REMCO, but he accepted that the IEC should also be approached. Dr Inglis agreed that the IEC was an important organization, and noted that it already interacted with various committees of the OIML.

Dr Kaarls supported the call for NMIs to interact more closely with the NABs and NSBs, and supported the need for interactions at the regional level.

Prof. Göbel concluded by confirming the CIPM's mandate to Prof. Wallard to continue preparing the Declaration in collaboration with OIML and ILAC. He said it was important to include a summary, explaining the roles of the different organizations, and in particular the CIPM MRA. He said that the bureau of the CIPM would produce a schematic representation and circulate it to the Committee.

4.2 Resolution 9 (cross-border transport)

Prof. Wallard reported that the most appropriate contact appeared to be the International Customs Union (ICU). He had intended to write to the Secretary General proposing a solution under which there would be a special category of customs documents and arrangements for metrological samples, based on a similar arrangement for reference materials negotiated with help from ISO REMCO. However, he had been informed that the latter arrangements are not working very well and that ISO REMCO is gathering evidence of problems encountered by users to present to the ICU.

Following discussions with ISO, it seemed best to wait until REMCO produces this evidence and works with the ICU to find a solution. At that time, he would work with REMCO on a coordinated approach so as to seek a solution that works for all.

The BIPM would continue to look for other appropriate organizations with which to work on this issue.

4.3 Resolution 10 (symbol for the decimal marker)

Immediately after the 22nd CGPM, Dr Quinn wrote to ISO and other bodies about the decimal marker Resolution. Prof. Wallard has also discussed the matter with the ISO Secretary General. ISO TC12 is the key committee which would change ISO's current policy, as set out in ISO 31-0, which states that the decimal marker is the comma.

At the request of Barry Taylor (NIST) and Anders Thor (Chair of ISO TC12), Prof. Göbel and Prof. Wallard co-signed a letter to NMI directors in July, asking them to request that their national members of the committee vote in support of a proposed amendment to ISO 31-0. They have not yet heard back about reaction to this letter.

5 THE CIPM MUTUAL RECOGNITION ARRANGEMENT

Dr Ismael Castelazo, Executive Secretary of the JCRB, and Dr Claudine Thomas, Coordinator of the KCDB, joined the CIPM for discussion of items 5.1 and 5.2.

5.1 Report of the Chairman of the JCRB

Prof. Wallard presented a report prepared by Dr Castelazo.

5.1.1 Report on present status

The CMC review process continues smoothly and all nine technical areas covered by the Consultative Committees are now participating in the CIPM

MRA. The JCRB procedures have been revised with the objectives of improving the efficiency of the process and assuring that CMC declarations are uniform and technically correct.

The KCDB presently contains over 15 000 approved CMCs in Appendix C and 580 key and supplementary comparisons in Appendix B.

5.1.2 End of the transition period

Paragraph 11.3 of the CIPM MRA defined a transition period extending from the signature of the MRA in October 1999 until such time as the first round of key comparisons had been completed and the Quality Systems referred to in Paragraph 7.3 had been put in place. The JCRB initially interpreted the end of this period as 31 December 2003 but have subsequently relaxed this to 31 December 2004. RMOs will report on this to the BIPM by 31 March 2005. The CIPM noted that any CMCs that are not covered by an approved Quality System after such time will be deleted from Appendix C.

5.1.3 CIPM MRA statement and logo

The importance of using the “CIPM MRA statement” and a proposed logo in certificates issued by participating NMIs was discussed at the 12th meeting of the JCRB so as to help recognition of certificates. The NMI Director’s meeting had indicated that almost half of NMIs now included the statement on their calibration certificates. This was encouraging progress, and the CIPM hoped the trend would continue.

Use of the statement was reported still to be low among regulators and accreditators, and the JCRB continues to discuss the design of the logo.

5.1.4 Quality System Workshop

A Workshop on Quality Systems (QS) was held at the BIPM on 30 September 2004, helping to increase the mutual confidence amongst the RMOs. The BIPM presented its own QS.

Dr Inglis congratulated the BIPM Quality Manager for his excellent presentation of the BIPM’s Quality System during the JCRB Workshop, and extended his compliments to all involved. He also commended the presentation given by Dr Claudine Thomas during the Directors’ meeting, suggesting that it would be useful for her to give similar presentations of

the KCDB to the accreditation community. He argued that a live demonstration was a convincing way of communicating the power of the database. Dr Semerjian noted that other appropriate venues included the NCSLI Conference, PITTCON and other metrology-related meetings. He encouraged the BIPM's leadership in this area, agreeing that first-hand experience of searches was an effective means of advertising this important tool, and adding that indeed all exposure of the KCDB was beneficial. Prof. Göbel agreed and the Director and Dr Thomas noted the comments.

The CIPM was unanimous that published CMCs must be kept up to date and periodically reviewed. Dr Kaarls reminded the Committee that this was one of the tasks of the Consultative Committee working groups on CMCs, noting that progress was under way within the CCQM KCWG. Dr Luszyk suggested that a gentle letter of reminder from the BIPM Director to the NMI directors might also be appropriate.

Dr Luszyk asked what the procedure was for withdrawing CMCs, asking if it was likely that many would have to be withdrawn at the end of the transition period. Prof. Wallard confirmed that no NMI would have to have all of its results excluded, though some CMCs might need to be removed pending approval by the relevant RMO of that area of their Quality System. Mr Énard and Dr Semerjian mentioned that a small number of CMCs will be withdrawn for the BNM (now the LNE) and the NIST, pending completion of technical documentation. In response to a question from Prof. Göbel, Dr Thomas confirmed that if CMCs are withdrawn it is at the initiative of an NMI, and that on at least one occasion this had been the case following the results of a key comparison. She added that the KCDB receives on average one or two requests per week for withdrawal of CMCs. New CMCs are also added regularly and she receives regular updates of CMCs already published. Two thousand or so new CMCs are expected in the near future in the fields of ionizing radiation, time and frequency, and chemistry.

Dr Carneiro urged management action to speed up and simplify the process of adding CMCs. He cautioned that there might be some reluctance to re-submit CMCs because of the work involved. Prof. Göbel said that again the CC working groups on CMCs had an important role, but agreed that the CIPM should also be involved. Dr Tanaka noted that discussions within the CCM had not converged on the periodicity required for key comparisons, and welcomed guidelines from the CIPM. Again, Prof. Göbel replied that

this was an essential part of the work of the Consultative Committee working groups.

Dr Semerjian called for this optimization process to be borne in mind when CCs were discussing the number of key comparisons to be undertaken. He paid tribute to the enormous amount of work that has been accomplished to date within the framework of the CIPM MRA, congratulating not only the BIPM but also the Consultative Committees. He suggested that the end of the transition period would be an appropriate time for the Director of the BIPM to address a letter of thanks to all contributing parties. Dr Quinn commended Dr Thomas for the enormous amount of work she has done, and extended his thanks to the JCRB and all the NMIs for their enthusiasm. He supported the idea of marking the end of the transition period in some way, and Dr Inglis added that an appropriate expression of appreciation could be very positive in unifying NMIs, RMOs and the BIPM. Prof. Göbel agreed that the bureau of the CIPM would consider an appropriate way of marking the event and invited the CIPM to address suggestions to the bureau members.

5.2 The BIPM key comparison database: Situation as on 13 September 2004 and plans for the future

Prof. Wallard presented a report prepared by Dr Thomas.

He pointed out that Appendix B was now used mainly by the NMIs, who seemed to be happy with it. Appendix B now contains 580 CIPM and RMO key and supplementary comparisons, compared with 516 at the time of the last CIPM meeting. The results of some 150 comparisons have already been published.

There is also a steady increase in the quantity of data presented in Appendix C, which now contains over 15 000 CMCs. He welcomed the comments of Dr Inglis and Dr Semerjian concerning publicity, saying that Appendix C was also still mainly used by the NMI community. He called on NMIs to take an active role in promoting use of the KCDB to regulators.

Dr Hengstberger pointed out that the way uncertainties were expressed in the KCDB differed from that used by NABs. He noted that some accreditation laboratories have experienced difficulty with the uncertainties in the KCDB being expressed in formulae, particularly in the field of length. He suggested that it might help to add a clear link to a page of definitions from any pages quoting uncertainties. He reminded the

Committee that it was important to listen to other users if we wanted the KCDB to be used outside the NMI community.

Dr Thomas confirmed that a link to the definitions had already been added from the length area in Appendix B, and said she would do the same for Appendix C. She pointed out that the tables of uncertainties listed numbers, not formulae.

Mr Énard commented that the main objective of the CIPM MRA was to demonstrate the degree of equivalence between NMIs, and that the KCDB works very well within the NMI community. However, changes and simplifications must be considered if it is to be adapted for other communities such as regulators and larger companies. Prof. Göbel added that smaller companies tended to contact the NMIs, who would search the KCDB for them.

Dr Luszyk asked if it would be possible to consult industrialists on the subject, and suggested that Dr Thomas work with them to elucidate practical needs. He said that the NMIs could be asked to suggest companies to be contacted.

Prof. Wallard noted that this option had been considered as part of the proposal to develop a new search engine for the KCDB, but it was considered premature at present. He mentioned that at the NCSLI in 2004, industrialists had expressed very little interest in the database. He suggested that it was first necessary to raise the profile of the KCDB, particularly through promotion at the national level, and urged the NMIs to promote it to their communities.

Dr Luszyk agreed, but expressed concern that the problem of equivalence, which was important on the industrial level, was largely being treated from the NMI viewpoint through the CIPM MRA. He suggested that the NMIs be asked to provide information about the requests they received from industrialists for advice about the impact of the CIPM MRA, and supported the call for practical changes if industrial interest increases in the KCDB.

Prof. Göbel agreed that promotion of the KCDB would be most effective through national channels, and Dr Kaarls added that the recent Directors' meeting had reached the same conclusion. He noted that it was also important to consult with regulators and suggested that the NMIs should also be asked for feedback on this issue.

Dr Carneiro suggested that the clearest feedback could be obtained by developing a customer satisfaction questionnaire, in "popup" form on the KCDB, and in paper form distributed to the NMIs. He suggested that,

although the average NMI might be able to explain the tables in Appendix B, some of them were extremely complex. It might also be useful to provide a simpler, condensed form, giving typical examples and references of how the NMIs provided services which met the requirements of the CIPM MRA.

Prof. Göbel accepted that parts of the KCDB are very complicated, but reminded the Committee that the database had been developed following the demands of the NMIs. Dr Carneiro countered that it may be more important to provide information to the interested but uninitiated reader, than to provide exactly what the NMIs wanted. Prof. Göbel noted Dr Carneiro's comments, and concluded the discussion on this point.

5.3 Recruiting a new Executive Secretary of the JCRB

Prof. Wallard remarked that the BIPM had been delighted with the contributions of Dr Angela Samuel and Dr Ismael Castelazo, the first two Executive Secretaries of the JCRB. Both had been very energetic and effective in the role. He expressed his thanks to the former NML CSIRO (now NMIA) and the CENAM for these secondments.

He confirmed that he had written to NMIs inviting applications for the next Executive Secretary and had received half a dozen firm enquiries. Two candidates would be invited for interview in November 2004 and the changeover would take place in May 2005.

Dr Semerjian asked whether there was a reasonable geographical distribution of candidates. Prof. Wallard confirmed that he had received applications from candidates in the EUROMET, SADC MET and SIM regions, but none from APMP or COOMET.

Dr Semerjian suggested that lessons might be learnt from the success of applications for the post of JCRB Executive Secretary, to be applied to the secondments available in other areas. He suggested that the success of this position was in part due to it being a well-defined post, whereas in other areas the openings were less well-defined.

Prof. Wallard drew attention to the posts advertised on the restricted-access part of the BIPM website for directors of NMIs. Out of over ten posts available, he said that a firm offer had only been received for one: from the NMIJ for a chemist to join the BIPM Chemistry section. Dr Quinn added that, following the 22nd CGPM, a list of specific posts had been addressed to all the directors.

Dr Luszyk suggested that it might be more effective to advertise one or two posts at a time, preferably with an indication of the preferred time scale. Dr Semerjian agreed, adding that subject-specific posts could also be addressed to the appropriate sections directly, not just to the directors. They could also be advertised to the appropriate Consultative Committees.

Prof. Göbel commented that there might also be a reluctance on the part of the NMIs to liberate their best personnel on secondments.

5.4 Interpreting the CIPM MRA

Prof. Wallard presented a document on interpretations of the MRA text. He said that there was no intention of rewriting the Arrangement, but that this document identified areas in the current text that require clarification.

Concerning signatories, the CIPM agreed that:

- All laboratories, institutes or other bodies taking part in the CIPM MRA must be designated by a responsible body in one form or another; only one, however, is the signatory (coordinating institute).
- All designated institutes must consider it their own responsibility to demonstrate conformity with the requirements of the CIPM MRA.

Concerning the participants of CIPM key and supplementary comparisons, they agreed that the participation of NMIs or designated institutes (DIs) from Associates of the CGPM (in pilot studies or other activities) should be considered carefully on a case by case basis where this adds scientific or other value and efficiency and effectiveness to the relevant activity.

Concerning Appendix B:

- All reports of RMO comparisons in which NMIs and DIs from Associates take part should be included in the KCDB.
- The word “nominated” in the fourth line of paragraph 6.1 of the CIPM MRA is interpreted to mean “designated”.
- Results (numbers and graphs) from institutes that are not designated should not be included in Appendix B.

Although paragraph 1.6 states that international and intergovernmental bodies must be designated by the CIPM, Prof. Wallard pointed out that in fact the participation of the IAEA and IRMM had been officially considered and approved by the CIPM. The CIPM agreed that future applications from other similar bodies should be considered and approved by the CIPM.

Concerning the submission of “regular reports” as specified in paragraph 7.2, the CIPM agreed that:

- This condition is satisfied for CC members through their regular reports to the Committees.
- The clause is satisfied by the regular Technical Committee reviews of CMCs carried out in the RMOs.

The suggestion that NMIs and DIs from Associates should be reminded of their obligation to provide “regular reports” led to considerable discussion.

Dr Hengstberger asked if the well-structured mechanisms for submitting reports to RMOs would satisfy this obligation. Dr Kaarls pointed out that some reports sent to RMOs did not reach those responsible for reviewing CMCs at the inter-regional level.

Dr Semerjian asked what these reports were supposed to include. Prof. Ugur pointed out that reports on key comparisons were under the jurisdiction of the Consultative Committees. Reports on laboratory activities, on the other hand, were important for the sustainability of Appendix C.

Dr Carneiro suggested that the institutes could be requested to send a copy of their Annual Reports to the BIPM. Prof. Wallard said that he did not wish to impose an unnecessary burden, but the aim was to collect sufficient information to allow efficient and informed inter-regional CMC reviews.

Dr Kaarls commented that the majority of CMCs in amount of substance were not underpinned by key comparisons, and it would not be possible to do otherwise. Currently, reports from CCQM members were unfortunately not always available to others.

Prof. Göbel suggested that it could be left open to NMIs, whether to send their Annual Report or to send something more appropriate. Dr Semerjian cautioned that it was important to define carefully what was needed before asking the institutes (NMIs and DIs from Associates) to submit anything.

Dr Luszyk agreed that it would be premature to make a blanket request for reports without defining exactly what was wanted. He suggested that the most useful aspect of receiving such reports would be for the CCs to review their memberships, but Dr Kaarls reminded him that the present discussion concerned Associates, not Member States, and that Associates did not qualify for CC membership.

Dr Quinn commented that paragraph 7.2 had never been implemented, and Prof. Ugur suggested that the CIPM continue to ignore it. An exception

would be the case of an NMI not covered by an RMO, which might submit a supporting report to the BIPM directly. Dr Luszyk pointed out that it was the role of NMIs to make sure that designations were acceptable and current, and said it would be a mistake to burden the BIPM with this role. Instead of continuing to ignore the paragraph, Dr Semerjian suggested the following, which was approved by the CIPM:

“The CIPM reminds RMOs that they (the RMOs) need to receive reports from the NMIs and designated institutes of Associates as well as from Member States.”

5.5 NMIs and other designated institutes

Dr Kaarls presented guidelines to clarify what is meant by “NMI” or “DI” from the point of view of the Metre Convention and the CIPM MRA. In particular, it related to participation in key comparisons, the entry of CMCs into the KCDB, and the subsequent responsibilities and activities of designated institutes in the international metrology community.

The document provoked considerable discussion from the CIPM members, who accepted that they were not in a position to change the rules in individual countries. Dr Luszyk suggested that the only thing the CIPM MRA could specify was that communications to and from the BIPM should be with only one (signatory) body per country. In some cases, it is the NMI that designates further institutes; in others, the designations come from the government.

Dr Bennett remarked that the word “designated” also caused confusion. In the United Kingdom, for example, the DTI had designated the NPL to represent the LGC and NEL within the CIPM MRA. Thus NPL had signed the MRA on behalf of all three organizations, each of which was an NMI.

Prof. Moscati said that care should be taken to differentiate between “government-designated NMIs” and “designated institutes”. In fact there were three levels in this hierarchy and the word “designated” is currently used for each! He suggested that the government-designated coordinating institute should be referred to as the “coordinating” institute, perhaps with the abbreviation GCDI.

Dr Luszyk agreed that the confusion lay in the double use of the word “designated” and suggested that the signatory laboratory could be referred to as the national representative to the CIPM MRA.

Prof. Göbel suggested that the distinction was already clear in the wording “signatory institute” and “other designated institutes”, but Prof. Leschiutta pointed out that this led to difficulties in certain cases, as for Italy.

Prof. Issaev added that seven Russian NMIs participated in the CIPM MRA, and they had decided between them which would be the coordinator. Other NMIs exist, but are not designated. In fact in Russia there are three different levels: NMIs, designated institutes, and notified institutes.

Dr Carneiro remarked that the wording currently used led to complications in what was essentially a simple distinction. He suggested saying “signatory” and “other participating” institutes. Prof. Göbel agreed that this was consistent with the document presented by Dr Kaarls.

Dr Semerjian remarked that perhaps a note of “interpretation” should be added to the documents which were to be produced to clarify other terms used in the CIPM MRA. In his view the distinction between “signatory” and “participating” institutes only referred to NMIs, and the term “designated institute” was restricted to non-NMIs. Dr Luszyk suggested that the description “nominated” should be used.

Various minor rewordings were approved, and Prof. Göbel then turned the discussion to the next item in the Agenda.

5.6 Subcontracting of measurements under the CIPM MRA

Dr Kaarls presented criteria proposed for cases where a coordinating NMI or other participating institute subcontracts part of its activities under the CIPM MRA to another competent laboratory with which it collaborates (i.e. acts as a subcontractor), either for unexpected reasons or on a continuing basis. He pointed out that “collaboration” with another expert laboratory, as described in ISO Guide 34, is considered a form of sub-contracting. In particular, he noted that subcontracting often occurred in the CRM certification process.

Dr Luszyk questioned the need for accreditation of subcontracting institutes. Dr Kaarls remarked that all participating NMIs had already declared that they had implemented ISO/IEC 17025 and ISO 34. They would therefore only collaborate with competent institutes. The current document only reiterated the need for the NMIs to comply with the requirements for subcontracting which were incorporated into their Quality Systems.

Dr Luszyk welcomed the inclusion of the words “or equivalent” when specifying that the collaborating laboratory must have a Quality System in place in compliance with ISO/IEC 17025 or equivalent. Prof. Ugur commented that the document was a useful addition, which would help reduce inhomogeneities. He noted that the Quality System of EUROMET was forcing even small companies of three or four people to set up Quality Systems.

Dr Semerjian agreed that the document would help avoid the situation where a laboratory made a claim to measurements that were not its own. Rather than hiding the capability of a third party, it would be clear that certain functions were subcontracted. He added that there was confusion in the field between CMCs in chemistry and the CRMs to disseminate them.

Dr Bennett commented that the present discussion mirrored that which had taken place at WELMEC on the WELMEC Type Approval Agreement (available from www.welmec.org). This specifies that the signatory of the final certificate takes full responsibility. He noted that one very good reason for subcontracting particular measurements is where the laboratory does not itself have the necessary competence. Dr Kaarls noted that if the NMI did not have the competence for that field, then it or another appropriate body should officially designate the other institute.

Prof. Göbel remarked that the NMI would at least need the necessary competence to judge whether or not the results of the subcontracted measurements were reasonable. Dr Inglis agreed, pointing out that this would be part of the NMI’s Quality System.

Dr Luszyk asked what would be the status if an NMI developed the fabrication procedure and method of analysis for a particular chemical, and subcontracted the fabrication to another laboratory. The CIPM agreed that the NMI could bottle and sell the chemical as a CRM, so long as it had the technical capabilities to undertake the analysis to check the product. It would not be acceptable for the NMI to sell it as a CRM under the CIPM MRA if it did not undertake the analysis.

Prof. Göbel concluded that there was general consensus on the document. The criteria for subcontracting are listed below:

- The NMI or other designated institute subcontracting work to another competent and collaborating laboratory shall have its process of subcontracting described in its Quality System.
- The collaborating laboratory to which work will be subcontracted shall have a Quality System in place in compliance with ISO/IEC 17025

(and in the case of a CRM certification process in compliance with ISO Guide 34) or equivalent. The Quality System must cover, as a minimum, the part of the work subcontracted to it.

- The NMI or other designated institute, which subcontracts work to another laboratory, shall assure itself about the capability and competence of the subcontracted laboratory. It shall also keep records of evidence of the capabilities and competences of this laboratory and its compliance with ISO/IEC 17025 (and/or ISO Guide 34) or equivalent.
- In its internal and external reports to clients, the subcontracting NMI or other designated institute shall clearly state which part of the work has been carried out by a subcontracted laboratory.
- If possible, the subcontracting NMI or other designated institute shall inform its clients in advance when subcontracting is considered.
- The subcontracting NMI or other designated institute is responsible for the use of the results obtained by the collaborating laboratory.
- Collaborating laboratories may only be used in addition to in-house capabilities and competences in the field concerned.
- The name of a subcontracted, collaborating laboratory, is not to be published in the Appendix C of the CIPM MRA because this laboratory is not designated to act as a national metrology institute for measurements of those quantities, measurands and measurement ranges which are subcontracted to it. However, the contribution of the subcontracted laboratory should be mentioned in the calibration, measurement or certification report.
- The calibration certificate, measurement report or CRM certificate issued by a NMI or other designated institute, and which includes results of subcontracted work, shall be issued in the usual way on the NMI's (or designated institute's) certificate paper and be signed by the responsible person in the NMI or other designated institute. If an important or significant part of the work has been subcontracted, it is possible for the certificate to be co-signed by the subcontractor.
- The designated NMI or other designated institute shall keep a register of subcontracted and collaborating laboratories used.
- A collaborating laboratory carrying out work subcontracted to it as part of a CMC claim of a NMI or other designated institute cannot claim the same CMC if it subsequently becomes a designated institute.

- The criteria also apply in cases where staff from the coordinating NMI or other designated institute are on the spot taking part in, or observing, the measurements carried out in the subcontracted laboratory.

5.7 Guidelines for the acceptance of Certified Reference Materials in Appendix C of the CIPM MRA

Dr Kaarls presented a proposed amendment to document CCQM/01-08, on Guidelines for the acceptance of Certified Reference Materials in Appendix C of the CIPM MRA.

The document was approved after a brief discussion. Prof. Wallard remarked that criterion 6, concerning participation in relevant CC and/or RMO activities, was also pertinent to the CCM and CCPR. The CIPM agreed that the document should be circulated to these Consultative Committees.

6 SI BROCHURE

On behalf of the CCU, Prof. Mills presented the draft version of the 8th edition of the SI Brochure for discussion. This draft manuscript has been prepared over the past 18 months by the CCU, in meetings held in April 2003 and May 2004, through correspondence between members, and additional *ad hoc* meetings between some members of the CCU.

Prof. Mills reported that in addition to the printed copy, it is planned to make the new edition available on the web with full search facilities. The CCU has made efforts to make the Brochure more useful to a wider audience. The CCU has also tried to make it a more “user friendly” and didactic document, in so far as possible without sacrificing its authoritative character as the official publication on the International System of Units (SI).

There are a number of relatively minor revisions and extensions from the previous edition. The most important of these are listed below.

Chapter 1 has been developed into a general introduction and tutorial on how the International System of Units was established. The concepts of

coherent units, and of dimensions are discussed carefully. Units for biological quantities are introduced. The historical review of the SI has been moved to the end of the chapter, which the CCU believe is more appropriate than having it as the opening section.

Chapter 2 gives the definitions of the base and derived units of the SI. A new discussion has been introduced on the distinction between *defining a base unit* and *realising the definition*. Otherwise this chapter is largely unchanged, apart from minor revisions and corrections.

Chapter 3 describes the SI prefixes and their use, as before.

Chapter 4 concerns non-SI units that are still in use, and their relation to the SI; it is a substantially revised version of what was Chapter 4 in the last edition.

Prof. Mills briefly explained the opinions of the CCU on units outside the SI, and in summary said that the CCU recommended the following changes from previous editions:

There are now no units whose use is positively deprecated in Tables 6 through 9.

Table 6 contains non-SI units whose use should be accepted owing to their widespread every-day use (such as the units of time, the minute, hour and day).

Tables 7, 8 and 9 contain non-SI units whose use is not encouraged, but which the CCU believes will – and should – be used only in the special circumstances described in the introductory text for each table.

Table 10 remains a table of units whose use is deprecated, but it is planned to make this table available on the BIPM website and remove it from the printed version.

Chapter 5 is a revised and expanded version of what was Chapter 5 in the last edition. It is concerned with the subject of how to write and format the values of quantities using the SI clearly and unambiguously. Much of the material in this chapter is not readily available elsewhere, and the CCU believes that it will be welcomed.

An entirely new chapter was proposed, on units for biological quantities, many of which cannot be measured with the traditional SI units. (Note: this new chapter was abandoned in February 2005.)

Appendix 1 contains the most important extracts from the records of the CGPM and CIPM meetings over the years. It has been updated and also returned to its original chronological order. In addition, the CCU have

introduced a subject index to facilitate the location of decisions concerning particular subjects.

Appendix 2 from the last edition, which gave detailed instructions for realizing the definitions of some of the most important units, will now be made available on the BIPM website and will not be included in the printed version of the Brochure.

The CCU is planning to include a new **Appendix 3** on the relations between the CGS-Gaussian systems of units and the SI, to facilitate translations between the values of quantities expressed in these different unit systems. This is still being developed.

Prof. Mills concluded by thanking all his colleagues on the CCU who have put so much effort into preparing this draft, and also Dr Claudine Thomas, Executive Secretary of the CCU at the BIPM. He commended the draft for the new edition of the SI Brochure to the CIPM for their consideration.

Prof. Göbel thanked Prof. Mills for his presentation, and the CCU for all their work in preparing the new draft. He then invited comments from the CIPM.

Various minor issues of wording were raised before discussion turned to more general principles. Dr Hengstberger raised a problem with the wording of the last sentence in section 2.1.1.7, referring to an email from Dr Bastie dated 23 September 2004. He said he would forward to Prof. Mills the CCPR's suggested revised wording. He also suggested inclusion of the words "actinic and..." in the sentence "...the biological effects of *actinic and* ionizing radiation..." in the introduction to the proposed new chapter on biological units.

Dr Kaarls suggested rewording the first paragraph in this section to make it clear that WHO International Units are not calibrated, and said he would send Prof. Mills a revised version of the text.

Dr Valdés made three personal comments, and another on behalf of the CCAUV. Firstly, he queried the wording of the last sentence of the first paragraph in section 1.4 concerning coherent units. He pointed out that giving special names to dimensionless quantities might lead to a need for conversion factors. Prof. Mills agreed to revise the wording.

Secondly, Dr Valdés turned to the end of the introductory text to section 2.1.1, suggesting that the phrase "the unit ohm can be realized with..." should be corrected to "the unit ohm can be reproduced with...". Dr Quinn said he believed the current wording to be correct, saying that any SI unit

can be realized according to its definition, from an equation and a constant. Prof. Göbel added that it was perhaps a question of definition, saying that the new version of section 2.1.1 was consistent with this wording. Mr Énard pointed out that the uncertainty in the von Klitzing constant is currently 1 or 2 parts in 10^7 , but Dr Quinn reminded him that the conventional value for the SI ohm was set in 1990. If we took the CODATA value for R_K now, it might be possible to reduce the uncertainty in the unit ohm. Dr Kaarls disagreed, asking, if this were the case, why would one need to build a calculable capacitor. Dr Quinn replied that the calculable capacitor was part of the proof, and Prof. Mills suggested that Drs Valdés and Quinn continue their discussion bilaterally and come to agreement with Dr Barry Taylor as the representative of CODATA.

Dr Valdés then turned to section 2.2.3, asking if the number of molecules was not simply the unit mole. Prof. Mills explained that counts have always been considered a dimensionless quantity in the SI. For example, the Avogadro constant is usually expressed as $6.022\,1415 \times 10^{23} \text{ mol}^{-1}$, not molecules/mol. Dr Kaarls added that number of molecules has nothing to do with moles.

Dr Carneiro then drew attention to the final example of draft section 5.3.2, which explicitly states that molecular concentration should be written as, for example, $C = 2.6 \times 10^{12} \text{ cm}^{-3}$ and not $C = 2.6 \times 10^{12} \text{ molecules cm}^{-3}$. Prof. Mills noted that it is often useful to include the word molecule, but this is not strictly a unit. The Committee agreed that although the example was strictly correct, it would be better not to include it in the Brochure. Dr Semerjian commented that it was important to keep the broadest possible audience in mind.

Dr Valdés then turned to a meeting of the CCAUV on 27-28 September 2004, at which a draft chapter in units for acoustical quantities describing biological effects was discussed in detail. The CCAUV concluded that the dB was not the most appropriate unit for assessing these effects, which could be more usefully described by acoustical quantities such as acoustic power, intensity and pressure, as is currently the practice within the area of medical ultrasound. The CCAUV proposed that the new chapter:

- should refer to peak values as well as rms values of acoustic pressure both of which are important for damage risk criteria for human hearing;
- should encourage the use of the SI in preference to the decibel;
- should include the quantities power and pressure with the SI units watt and pascal as used in medical ultrasound applications.

Dr Valdés also said that the CCAUV supports:

- the proposal to remove the bel and the neper from Table 6 to Table 8 for “non SI units”;
- the statement that the reference value of the quantity should always be stated in SI units when using the decibel.

He suggested modifying the text just before Table 8, to make it clear that the neper, bel and decibel are not SI units. Prof. Mills suggested “The units neper, bel, and decibel have been accepted by the CIPM for use with the International System, but are not at present considered SI units”. Since the CIPM had previously agreed to conclude discussions on the neper, Prof. Göbel suggested this should rather be simplified to “... but are not considered SI units”.

On more general aspects, Prof. Moscati praised the great effort of the CCU in producing the revised draft, but commented that the document was made difficult to read by its attention to too many different communities. He said that the main purpose of the Brochure was to make clear the CIPM position on the SI, explaining how it was established and how it is maintained.

He suggested that a hierarchy should be introduced in the presentation of the information, some of which is of interest to only a small part of the community. At present the reader is sometimes presented with the justification of answers to questions of which the reader was not even aware, and this makes the document rather complicated.

He suggested that it might be more appropriate to keep the main text as simple as possible, and provide the supplementary related texts as associated notes, appendices or web supplements. He called for the Brochure to be considered from the point of view of educators and communicators, saying that ideally teachers should be able to use it to introduce the SI at the beginning of their courses.

On the subject of Chapter 4, Prof. Moscati said he appreciated giving space to the normal use of non-SI units in various specialist areas, but wondered if the draft text was now too liberal. He called for authors choosing to use non-SI units to also state the values in SI units.

Prof. Mills thanked Prof. Moscati for his comments and said he welcomed the idea of an SI publication for widespread distribution. Indeed, he has already discussed with the BIPM Publications section the idea of a summary which could be produced fairly cheaply and in large numbers. This might go some way to meeting the needs of teachers and students.

Prof. Göbel welcomed this proposal, saying that such a summary could also usefully be included in the Brochure. Dr Inglis agreed, saying that he was concerned that in general the SI Brochure was too complicated. Although the Brochure is scientifically and academically complete, he urged the CCU to think about their target audience. He suggested that Appendix 1, like Appendix 2, be transferred to the web version and no longer included in the printed version. He also asked if the Brochure would contain an index and if the various acronyms would be defined? Prof. Mills confirmed that there would indeed be both an index and a list of acronyms.

Dr Carneiro called for the SI to be presented as a coherent system, and suggested that discussion of non-SI units should be left to Appendices. In this way, the Brochure would gain in pedagogic value and stringency. The target audience should be technical people who make measurements.

Dr Quinn reminded the Committee of the purpose of the Brochure, which he said was the authoritative source and which should contain all information pertaining to the SI. He agreed that the existing Appendix 2 could be omitted from the printed version, but argued that Appendix 1 contained essential information and should not be taken out. He concurred that perhaps two versions were needed: a complete authoritative “bible” of the SI, and a shorter, more user-friendly version for widespread circulation.

Prof. Leschiutta agreed that the SI Brochure should remain the authoritative guide and considered it no problem if the text remained strict.

Prof. Göbel asked Prof. Mills about the timescale for production of the new edition. Prof. Mills asked for any further comments on the draft 8th edition to be addressed to him or Dr Thomas at the BIPM before the end of 2004, and said that an editorial meeting was planned for February 2005. The resulting version would be placed on a restricted-access part of the website for final comments, and it was hoped that the new edition could be printed and published on the website during the second half of 2005.

The CIPM gave formal permission for the CCU to go-ahead but agreed that Prof. Mills should first produce the draft summary version, which will be posted on the CIPM site before January 2005, for approval prior to its inclusion in the Brochure. This short version should be produced in both English and French.

The file could be made available on the BIPM website and also sent to NMIs for further distribution and possible translation into other languages. On the subject of the widespread distribution of this summary version, it

was agreed that there should be no copyright restrictions. Prof. Wallard asked the NMIs to take on the costs of local printing.

Dr Inglis pointed out that it should be clearly marked as a BIPM document, and be “reproduced with permission from the BIPM”. He remarked that this was an ideal opportunity to raise the profile of the BIPM.

7 CONSULTATIVE COMMITTEES

Several BIPM staff attended for the part of the discussion concerning the Committee for which they are the Executive Secretary.

Consultative Committee for Units: There was no separate report from the CCU, as all items had been covered under section 6, on the SI Brochure.

7.1 Consultative Committee for Amount of Substance – Metrology in Chemistry

Dr Kaarls, President of the Consultative Committee for Amount of Substance – Metrology in Chemistry (CCQM), presented a report on the 10th meeting of the Committee, held at the BIPM in April 2004. As usual, ancillary meetings of all the CCQM working groups were held in the week before the full CCQM meeting. The BAWG, EAWG, GAWG, IAWG and OAWG had additionally organized separate meetings at other venues during the year, and joint sessions had been held between the EAWG and IAWG, the BAWG and OAWG, and the GAWG and OAWG.

The CCQM had welcomed the document on CCQM Rules and Policy which, under item 7.11, is presented to the CIPM as a possible model for other CCs. Dr Kaarls noted that CCQM priorities are determined on the basis of the most urgent needs of trade, regulators and society, and by the available resources in the NMIs and other designated and expert institutes.

Some 71 CCQM pilot studies and 44 key comparisons have been carried out, are in progress, or are planned for the near future. The activities already cover nearly all fields of chemical analysis, but still much work remains to be done.

The BAWG and SAWG presented provisional results of their work. The SAWG has made considerable progress in improving accuracy in surface analysis measurements. The BAWG is discussing various approaches for tackling the problems of measuring biological activity. Studies and discussions on traceability to the SI are under way.

The CCQM WG on KCs and CMC Quality also met in April 2004 to discuss the submitted CMCs. The WG has streamlined its review process and straightened out various differences of opinion between the RMO review teams. In particular, reports of on-site peer-review visits have proved to be valuable when making final decisions.

ISO Guide 34 has been accepted and is being implemented by all the NMIs and other designated institutes having activities in characterization and value assignment of CRMs. As a result of the introduction of this Guide, and developments with respect to the (restricted) possibilities for subcontracting and cooperation with collaborating laboratories, document CCQM/01-08 was reviewed, simplified and transformed to "Guidelines for the acceptance of Certified Materials in Appendix C of the CIPM MRA", presented separately to the CIPM under item 5.7. Another CCQM document, "Subcontracting of measurements under the CIPM MRA", is presented under item 5.6.

The RMO TC chairs for metrology in chemistry reported on their activities in the different regions. For reasons of efficiency, cost and effectiveness, there is a clear need for carrying out as many studies and comparisons as possible directly on the global scale under the CCQM.

Dr Wielgosz presented to the CCQM the BIPM programme of metrology in chemistry, which focuses on ozone and nitrogen oxide reference standards and primary calibrators for clinical and organic chemistry, supported by the CCQM and in particular its working groups on Gas Analysis and Organic Analysis.

Contact between the CCQM and other organizations continues to be very productive. Cooperation with ISO REMCO, of which the BIPM is a contributing member, is developing well. It is expected that in the near future contacts will be established with the pharmaceutical sector and the various *Pharmacopoeia*.

Presentations were also given by representatives of the IAEA, the WMO and WHO.

The IAEA is in the process of changing their old system of assigning values to reference materials based on inter-laboratory comparisons (consensus

values) into a system where assigned values are based on metrological traceability to the SI.

Dr Padilla explained the WHO activities in the field of *in vitro* diagnostics, in which about 70 % of WHO reference materials for biological activity are used. These materials are largely lyophilised and value-assigned by WHO collaborative studies; the results are approved by the WHO Expert Committee on Biological Standardization. It is clear that much can be learned through further collaboration between the WHO, WHO laboratories and the CCQM.

Formal cooperation has been established with the Codex Alimentarius Commission and the Inter-Agency Meeting. In November 2003 and September 2004, the BIPM and CCQM organized two successful workshops with the stakeholders in the area of food safety and testing. The September 2004 workshop established clear lists of measurands and matrix configurations to be addressed with high priority by the CCQM WGs on Inorganic, Organic and Bio-Analysis.

The JCTLM is discussed separately, under item 9 of the Agenda.

Prof. Göbel thanked Dr Kaarls for his report and commended the CCQM on the progress achieved.

Prof. Issaev remarked that the activities of the CCQM were very important, and covered an enormous field. He noted that they also had an area of overlap with the CCM, concerning the reference material used for the silicon sphere in the redetermination of the Avogadro constant N_A . He asked if the CCQM had discussed any proposals to redefine the mole. Dr Kaarls replied that this was not a priority at present. The CCQM was focussing its efforts on the needs of trade, industry and society, but would of course respond to any questions posed by the other CCs.

Dr Inglis asked if Dr Kaarls foresaw any need to split the CCQM, given its enormous field of activity. Dr Kaarls did not exclude this possibility in the future, but said he believed that the homogeneity of the CCQM was currently an advantage, adding that several joint meetings had been held between the CCQM working groups.

Dr Tanaka expressed the CCM's appreciation to the CCQM for their collaboration on the argon content in air. He noted that the CCM would also welcome a pilot study on the thickness of the oxide layer on silicon spheres. Dr Kaarls responded that the CCQM would be pleased to work on this.

Dr Semerjian added his personal congratulations to Dr Kaarls, who he said had shown strong leadership and done an extraordinary job. He asked if the CCQM had considered the field of materials metrology. Discussion on this topic was deferred to item 16.4 of the Agenda.

Prof. Göbel thanked Dr Kaarls again, and added his thanks to Dr Wielgosz, who has the busy role of Executive Secretary of the CCQM.

7.2 Consultative Committee for Time and Frequency

Prof. Leschiutta, President of the Consultative Committee for Time and Frequency (CCTF), presented a report on the 16th meeting of the Committee, held at the BIPM in April 2004. He also updated the CIPM on external events having an impact on time and frequency work.

Prof. Leschiutta reminded the CIPM that today the second is known with an uncertainty of 2×10^{-15} . In 1996 the CCTF formed a working group to establish rules for expressing the uncertainty of primary frequency standards; this working group has finished its task and a new, more general, working group on primary frequency standards is being formed.

Following discussions at the Symposium on Time Scale Algorithms held at the BIPM in March 2002, the CCTF made a Recommendation to revise the steering mechanism used to form International Atomic Time (TAI). A new procedure has been implemented since July 2004 and provides more flexibility. The TAI time scale, and consequently Coordinated Universal Time (UTC), are currently based on 260 clocks kept in 56 laboratories.

Discussion continues as to a possible modification of UTC. The BIPM participates in an International Telecommunication Union (ITU) working group on the subject. During the last CCTF meeting, the European Space Agency (ESA) engaged to follow the BIPM and international recommendations in this field.

The BIPM Time section has continued its important activities in the calibration of GPS equipment installed in participating laboratories, use of the “geodetic” receivers method, and routine use of two-way satellite time and frequency transfer. Uncertainties of all time links are now published in *Circular T*. This is an important step towards including CCTF activities in the CIPM MRA.

Declaration of CMCs in the domain of time and frequency measurements presents a peculiar case for CIPM MRA activities, for the following reasons:

- The only key comparison is CCTF-K2001.UTC, corresponding to the calculation of UTC. With the notable exception of navigation systems, which have stringent requirements, general users do not need this level of accuracy.
- The second is unique amongst the SI units, in that it can be widely disseminated using electromagnetic waves.
- There is a long-standing tradition of cooperation in this field, between the time laboratories and the coordinating international organization (formerly the Bureau International de l'Heure (BIH), now the BIPM), and between the laboratories themselves.

A CCTF working group was formed to study the problems connected with the introduction of time and frequency calibrations within the CIPM MRA. This group has met on several occasions, and will meet again in December 2004 to prepare a list of actions and agree on a list of terms of reference.

The BIPM Time section has been charged with evaluating the uncertainties of the values of $[UTC - UTC(k)]$ published in *Circular T* and to have this referenced in Appendix B of the KCDB.

The CCTF keeps abreast of the numerous technological applications, such as satellite navigation and digital communications, that require accurate frequency standards or time scales. It therefore remains aware of needs and evolving requirements, and can act to avoid the proliferation of time references and time scales for civil use. The BIPM and a number of European metrology institutes participated in the Galileo Satellite WG on the Galileo Time Interface, formed by the ESA.

The CCTF and the CCL have created a Joint Working Group to explore possible secondary representations of the second. This Joint Working Group CCL/CCTF has met twice and has recommended that a given transition of ^{87}Rb may be used as a secondary representation of the second, and is considering other optical frequency standards as potential candidates. The Joint Working Group will review the situation periodically and report back to the Presidents of the CCL and CCTF.

Prof. Göbel thanked Prof. Leschiutta for his presentation and asked if it might be appropriate to merge the CCL Working Group on the *Mise en Pratique* and the Joint Working Group CCL/CCTF. Prof. Wallard suggested that for the time being the situation should be left as it is. The priority, he said, was for the Joint WG to make the necessary evaluations of the optical frequencies. Dr Chung deferred his comments until his presentation on the CCL (see Section 7.7).

Dr Quinn drew attention to a forthcoming special issue of *Metrologia* on atomic time-keeping. This issue will be published in mid-2005, to commemorate the 50th anniversary of the first caesium device going into operation as a clock, in June 1955. It will include manuscripts on clocks and time scale development.

Dr Bennett remarked that the NPL was also contributing to various activities to celebrate this anniversary, including a special exhibition to be hosted at the Royal Greenwich Observatory.

Dr Luszyk asked when the caesium fountains currently being developed might be able to contribute to TAI. Prof. Leschiutta replied that several already did contribute and the BIPM was ready to receive new results as soon as other fountains were operational.

Prof. Göbel asked whether there had been any further discussion at the ITU about the future of the leap second. Prof. Leschiutta informed him that at a meeting at the end of September 2004 there had been a proposal to abandon the leap second in 2007. It had been important 30 years ago, he said, but seemed no longer relevant. One option now would be to drop the leap second and adopt a leap hour.

Dr Arias added that the decision was one for the ITU and it had not yet been made. The CCTF is a member of the relevant ITU working group and will keep the CIPM informed of progress. It might be another three or four years before any final decision is taken.

7.3 Consultative Committee for Acoustics, Ultrasound and Vibration

Dr Valdés, President of the Consultative Committee for Acoustics, Ultrasound and Vibration (CCAUV), presented a brief report on the 4th meeting of the Committee, held at the BIPM in September 2004.

Two draft B Reports were approved, on the key comparisons CCAUV.W-K1 and CCAUV.U-K2, and the protocols for two further key comparisons were presented (CCAUV.A-K2 and CCAUV.A-K4).

Good progress is being made with regional comparisons. A draft B report and links to the relevant CCAUV comparisons were approved for the key comparison EUROMET.AUV.A-K1. Links were also established for the older comparison APMP.AUV.V-K1, covering vibration.

The importance of members supplying and updating bibliographies of peer-reviewed publications was emphasized, as this is one of the principal means of complying with the research criteria for CCAUV membership. Several laboratories (CSIR-NML, DPLA, NRC, NMIJ, NPL, PTB, VNIIFTRI) gave detailed presentations on their national standards and areas of research interest, which demonstrated the vitality of work in acoustics, ultrasound and vibration.

The CCAUV Working Group on CMCs, attended by RMO TC Chairs and their advisers, met on 29 September 2004. Currently, some 750 CMCs have been published in the field of AUV. The WG review all CMCs to ensure that the newly revised guidelines are applied correctly. A report was submitted to the JCRB.

A number of new CMCs, particularly from COOMET and the new countries in EUROMET, are now within the review process. The simplified electronic procedure recently approved by the JCRB for posting CMC files was welcomed by the TC Chairs.

The current status of a potentially important document describing future metrological needs in the areas of acoustics, ultrasound and vibration, was discussed. It was agreed that it would be brought up to date and published by the BIPM/CCAUV within the next few months.

A chapter on units for acoustical quantities describing biological effects, proposed by the CCU for the draft 8th edition of the SI Brochure, was discussed. Detailed comments from the CCAUV on the draft 8th edition of the SI Brochure are reported under item 6 of the Agenda.

Prof. Göbel thanked Dr Valdés for his report, and Dr Allisy-Roberts for her work as Executive Secretary of the CCAUV.

7.4 Consultative Committee for Electricity and Magnetism

Dr Inglis, President of the Consultative Committee for Electricity and Magnetism (CCEM), presented a report on the activities of the CCEM since the last meeting of the CIPM. During this period, meetings were held of: the CCEM Working Group on Low-Frequency Quantities (WGLF); the CCEM Working Group on Radiofrequency Quantities (GT-RF); the CCEM Working Group on Monitoring the stability of the Kilogram by Electrical Methods; and the CCEM Working Group on Measurements of Quantized Hall Resistance with Alternating Current (WGACQHR). Members of the CCEM approved by correspondence a guideline document on comparisons

on electricity and magnetism and a number of comparison reports circulated by the Chairman of the WGLF. It was noted that the CCEM's revised technical guidelines for reliable dc measurements of the quantized Hall resistance were published in *Metrologia* in October 2003.

The main items discussed by the WGLF were the CCEM comparisons and the wording of the new CCEM *Guidelines for Planning, Organizing, Conducting and Reporting Key, Supplementary and Pilot Comparisons*. These *Guidelines* have subsequently been finalized and formally approved, and are now available on the BIPM website.

The GT-RF also concentrated its discussions on comparisons and the wording of the CCEM comparison guidelines which were then approved.

The Working Group on Monitoring the Stability of the Kilogram by Electrical Methods met informally to review progress on the experiments that have been in operation for a number of years, and to discuss several proposals for new experiments. The watt balances at METAS, NIST and NPL have reported results and descriptions of recent modifications were given. These modifications aim to reach an uncertainty of 1 part in 10^8 , and NIST hopes to approach this goal by the end of 2005. NPL is preparing new apparatus which should be in place by early 2006.

The work on the BNM watt balance has now moved to a new laboratory, and should be operational by the end of 2006. The design of the BIPM watt balance based on a permanent magnet at cryogenic temperature and a superconducting coil system is progressing. Several alternative measurement procedures will be tested in a room-temperature model of the apparatus.

A collaborative project between MIKES and VNIIM is developing a magnetic levitation apparatus to determine Planck's constant. NMIJ have slowed their work on magnetic levitation but may start work on a watt balance.

The PTB project to determine the Faraday constant has concentrated on increasing the ion beam current and reducing the losses due to sputtering. The aim is to produce a result at the level of parts in 10^6 within three years.

The WGACQHR reviewed results of the ac QHR measurements, particularly from the METAS-NRC-PTB collaboration. Although progress has been made with measuring techniques, it was too early to attempt to draft guidelines for these measurements.

Dr Inglis reported that the BIPM/NMIA calculable capacitor project was also progressing. The measuring instrument for assessing the geometry of the bars for the two calculable capacitors is nearing completion. Six bars to be used in model tests have been ground to size. The model tests will enable the geometry of the guard electrode of the calculable capacitor to be optimized. Four bars for the final capacitors have been machined to initial size and prepared for grinding. The NRC has expressed interest in obtaining bars and other critical components for a calculable capacitor that they plan to construct.

In reply to a question from Dr Valdés, Dr Inglis commented that the BIPM's approach to the watt balance was an exciting new approach. Prof. Göbel thanked Dr Inglis for his presentation and Dr Witt for his work as Executive Secretary of the CCEM.

7.5 Report on the International Avogadro Coordination

Dr Tanaka presented a detailed report of the coordinated work on the International Avogadro Coordination (IAC), which began in April 2004.

A brief summary of progress is given below:

The enrichment of SiF_4 gases at St Petersburg looks promising, indicating that an isotopic purity of over 0.9999 can be reached; this is sufficient to obtain the target uncertainty for molar mass.

In an absolute determination of the lattice parameter, a reproducibility of 1 part in 10^8 has been demonstrated. A fast scan of x-ray fringes has been developed.

The relative measurement uncertainty of the volume determination is now at the level of 1 part in 10^7 .

The highest priority of the IAC is to discover the cause of discrepancies in the volume determination (1 part in 10^6) and lattice parameter determination (1 part in 10^7).

The existing comparative methods in both quantities will be examined to see if a direct comparison can be made between naturally occurring and isotopically enriched silicon.

It is critical to be able to characterize the surface of the silicon spheres. An instrument will be developed to measure directly the surface of the sphere *in situ* by a variety of methods.

Redundancy is guaranteed in measurements of all quantities, apart from at present for molar mass.

In response to a question from Dr Carneiro, Dr Tanaka confirmed that six key comparisons in the field of fluid flow were planned or already under way. The CCM Working Group on Fluid Flow hopes that all six comparisons will be completed within the next two years.

7.6 Consultative Committee for Ionizing Radiation

Prof. Moscati, President of the Consultative Committee for Ionizing Radiation (CCRI), presented a report on the activities of the Committee and its three Sections, which continue to be very active. Most of the working documents are openly available on the BIPM website for the benefit of the whole Ionizing Radiation metrology community.

All three Sections are making good progress with their key comparisons. There has been an increase of 20 % in the number of CIPM and RMO dosimetry comparisons registered, and an increase of 10 % in the number of CIPM and RMO radionuclide activity comparisons registered in the last year. The results of many comparisons are already available in the KCDB. A CCRI Workshop on activity comparisons will be held in November 2004 at the BIPM, and a CCRI Workshop on key comparison uncertainties is planned for May 2005 at the BIPM, just before the next CCRI meeting.

The RMO CMC Working Group met in September 2004 and reviewed the guidelines for the review of CMCs. The new guidelines will be made available on the BIPM website, from the CCRI pages, the JCRB pages, and the KCDB.

The WG appreciated the new method of “posting” CMCs for review. Currently the ionizing radiation CMCs of 11 countries and the IAEA and IRMM have been published in Appendix C. Another 26 countries have submitted CMCs for review and approval. If these are all approved, there will be over 4000 CMCs published in IR.

Some progress has been made towards the idea of preparing special CCRI-related issues of *Metrologia*. Lists of contents have been established for special issues on dosimetry and activity, and authors have already been identified for the articles on dosimetry. The first of these special issues is provisionally scheduled for 2006.

The CCRI has recently published, in conjunction with the international Decay Data Evaluation Project, *Monographie BIPM-5*, on nuclear data.

This two-volume issue is available on the BIPM website and will be distributed in October 2004 to the 29 laboratories that have requested copies.

Monographie BIPM-6 on Source Preparation is expected to be published in 2005, and *Monographie BIPM-7* on the SIR will follow later in 2005.

The CCRI has an RMO Working Group to discuss CMCs, and each of the three Sections has a Key Comparisons Working Group (KCWG). The CCRI(II) has four other WGs:

- UCWG(II): The major project of the Uncertainties Working Group is to identify the state of the art uncertainties for different measurement methods used for activity determinations for over one hundred radionuclides.
- ESWG(II): The major project of Extended SIR Working Group is to determine which liquid scintillation cocktail will give consistent and stable results in the extension of the SIR to pure beta emitters.
- The Realization of the Becquerel Working Group is charged with specifying, and constructing from this specification, a reference ionization chamber that can be linked to the SIR to provide on-site determinations of equivalent activity particularly for NMIs that are unable to send ampoules to the SIR.
- The High Efficiency Detection Systems Working Group is writing a BIPM Monograph on such systems for the benefit of the NMI community.

The CCRI has made two proposals for changes in the next edition of the SI Brochure regarding the definition of dose equivalent and the derived quantity organ equivalent dose. It has also agreed with the statement that Monte Carlo calculations produce realistic values for correction factors for ionization chambers, which has enabled the publication of some key comparison results.

There were no questions, and Prof. Göbel thanked Prof. Moscati for his presentation and Dr Allisy-Roberts for her work as Executive Secretary.

7.7 Consultative Committee for Length

Dr Chung, President of the Consultative Committee for Length (CCL), presented a report on the activities of the two CCL working groups.

7.7.1 CCL Working Group on Dimensional Metrology

The 9th meeting of the CCL Working Group on Dimensional Metrology (WGDM), held at the NIM (Beijing, China) in September 2004, established the following rules for a new class of CCL RMO key comparisons in dimensional metrology:

- The WGDM will monitor the programme.
- The RMO Technical Committees for Length (TCLs) should send their key comparison technical protocol to the WGDM for comment before the start of the comparison.
- The RMO Technical Chairs for Length have the final decision on who participates in their comparisons.
- The RMO TCLs should send their key comparison schedule to the WGDM for distribution to the other RMO TCLs.
- Participants wishing to participate in a comparison run by another region must apply through their own RMO TCL.
- Final reports should be sent to the WGDM for comment.

7.7.2 CCL Working Group on the *Mise en Pratique*

Following the CCL meeting in September 2003, the following activities and outcomes have been taken forward within the framework of the CCL Working Group on the *Mise en Pratique* (MePWG):

- a follow-on meeting of the Joint Working Group CCL/CCTF;
- development of a protocol for the ongoing key comparison at the BIPM (BIPM.L-K11);
- a campaign of absolute frequency measurements of stabilized lasers at the BIPM (May 2004).

These are described in more detail below.

The second meeting of the Joint Working Group CCL/CCTF (JWG), co-chaired by Drs Riehle (PTB) and Gill (NPL), was held just prior to the CCTF meeting at the beginning of April 2004. The main item on the agenda was the evaluation of the status of the Rb microwave standard and its uncertainty budget, in order to consider its suitability as a secondary representation of the second. The JWG recommended to the CCTF that the unperturbed ground-state hyperfine transition of ^{87}Rb may be used as a

secondary representation of the second with an estimated relative standard uncertainty of 3×10^{-15} .

Various other cold atom and ion optical standards were also reviewed, but none was considered appropriate at that time as a secondary representation of the second. Given the rapid progress being made with these optical standards, however, the JWG recommended that they be reviewed again at the next JWG meeting, which will be held in 2005, just prior to the next CCL meeting.

The 11th CCL had noted that the BIPM.L-K10 key comparison of 633 nm laser standards was complete, and decided that a new key comparison, BIPM.L-K11, should be launched to cater for the wider range of laser standards now available to realize the metre, and the new methods by which these can be related to the primary frequency standard. A technical protocol to cover the various methods, including direct femtosecond comb measurements traceable to microwave standards, has been drafted, primarily by Dr Robertsson of the BIPM.

A campaign of absolute frequency measurements of 633 nm stabilized lasers was conducted at the BIPM during May 2004, involving the CSIR-NML (South Africa), IPQ (Portugal), NIS (Egypt) and VNIIM (Russia). The iodine-stabilized laser standards were measured using the BIPM femtosecond comb, in accordance with the draft protocol for BIPM.L-K11. The results are currently being analysed.

An APMP comparison of laser standards is under way at the NIM (China). A comparison may be made between the NIM and the BIPM standards towards the end of 2004, to establish a link to the regional results.

In response to a question from Prof. Wallard, Dr Chung confirmed that the RMOs had approved the rule that laboratories wishing to participate in a comparison run by another region should apply through the TCL of their own RMO. Dr Thomas added that increased participation in the comparisons of other RMOs would improve global linking.

Prof. Göbel thanked Dr Chung for his presentation and Mr Felder for his work as Executive Secretary.

7.8 Consultative Committee for Thermometry

Prof. Ugur, President of the Consultative Committee for Thermometry (CCT), presented a brief report on the activities of the CCT. He informed the Committee that the following six CCT working groups had met since

the last CIPM meeting: CCT-WG 1: Defining fixed points and interpolating instruments; CCT-WG 3: Uncertainties; CCT-WG 6: Humidity measurements; CCT-WG 7: Key Comparisons; CCT-WG 8: CMC Working Group; and CCT-WG 9: Thermophysical Properties.

The CCT also organized three workshops in 2004, at the occasion of the TempMeko conference in Cavtat-Dubrovnik, Croatia:

- Uncertainty in Humidity Measurements (21 June 2004);
- Common Problems in Radiometry and Thermometry (25 June 2004);
and
- Uncertainty in Temperature Fixed Points (26 June 2004).

He reported progress on MRA-related activities, commenting that the results of three key comparisons (CCT-K2 to -K4) had been published in the KCDB, and the draft A reports for CCT-K1, -K5 and -K7 were in preparation. CCT-K7 is the comparison of water triple point cells, piloted by the BIPM. Measurements are continuing on CCT-K6.

In response to a question from Dr Semerjian, Prof. Ugur commented that the inter-regional review process had taken a very long time for CMCs in the thermometry, as it was not always clear how to evaluate them. He added that the difficulty lay with the RMOs rather than the CCT.

Dr Inglis pointed out that such problems with the review process should be brought to the attention of the JCRB, and possibly to the directors of the NMIs involved, so that the issues can be resolved. Dr Kaarls added that, at the request of the JCRB, the CIPM in 2003 had decided that working groups on CMCs should be attached to the Consultative Committees, specifically to facilitate the inter-regional review process.

Dr Carneiro asked whether, in difficult cases, the chairman of the appropriate CC could be mandated to try to resolve the problem and report back to the CIPM the following year. Dr Luszyk commented that such a mandate would in fact originate from the JCRB, because the JCRB should alert the CIPM, who would refer to the CC. Prof. Wallard reminded the Committee of clause 8 of the CIPM MRA, which states:

“This arrangement is operated by the BIPM in close consultation with the Consultative Committees and the RMOs whose responsibility it is, under paragraphs 4 and 5 above, to carry out and evaluate the results of the key comparisons. Disagreements that arise in the operation of this arrangement are discussed first within the

appropriate Consultative Committee, the RMO or the Joint Committee and if not resolved there, are referred to the CIPM.”

Dr Inglis pointed out that this was effectively the case for the CCT at present, and the Committee agreed that Prof. Ugur had their support to resolve the problems as necessary. Prof. Göbel concluded the discussion by saying that the CIPM wanted to see progress and a rapid resolution of this long-running issue.

Dr Thomas subsequently confirmed that a total of 453 CMCs in thermometry, from 34 countries, had been published in the KCDB.

7.9 Consultative Committee for Photometry and Radiometry

There has been no recent meeting of the Consultative Committee for Photometry and Radiometry (CCPR), but its President, Dr Hengstberger, asked about the status of bilateral comparisons related to key comparisons. Dr Thomas explained that initially the letters “BK” had been used to indicate such comparisons, but this had led to some confusion between these bilaterals and ongoing BIPM key comparisons. The letters BK are therefore no longer used. Subsequent bilateral comparisons were usually held after a key comparison, between the pilot laboratory and one of the participants who wished to repeat its measurements; they may be represented in the KCDB by the letters “comp.1” or simply by a comment in the Final Report. All data points are kept, and any new ones are added in a different colour on the graph of equivalence. Subsequent bilaterals do not affect the initial key comparison reference value.

Dr Kaarls commented that it was for each CC to judge when a comparison should be renewed completely. Dr Hengstberger noted that supplementary guidelines are being prepared for key comparisons in photometry, and a strategy team was studying how to minimize the load on NMIs.

Prof. Ugur asked how the KCDB would deal with the results of laboratories participating in different comparisons if they were not consistent. Dr Quinn replied that linking between comparisons was based on the premise that the participants performed consistently. If this appeared not to be the case, then the uncertainties would have to be increased appropriately.

7.10 Members and Observers of the Consultative Committees

The CIPM approved the following changes to membership of the Consultative Committees.

Committee	New members	New observers
CCAUV	INRIM (previously IEN and IMGIC) GUM (previously Observer)	METAS (previously Member) NMi (previously Member) NPLI (previously Member) CEM
CCEM	MIKES (previously Dr Seppa, personal member)	INMETRO
CCL	CSIR-NML (previously Observer)	
CCM	CENAM (previously Observer)	
CCQM	CSIR-NML The NIM will no longer be a member of the CCQM.	INMETRO
CCRI(I)		STUK (in principle, pending receipt of their application)
CCRI(II)	IFIN LNMRI (previously Observer, approved in principle, pending receipt of their application)	IAEA BARC (in principle, pending receipt of their application) CNEA (in principle, pending receipt of their application)
CCRI(III)		NRC (previously Member) KRISS (in principle, pending receipt of their application)
CCU	Dr T.J. Quinn (personal member)	

No applications for membership had been received for the CCPR, CCT or CCTF.

7.11 CCQM rules and policy

Dr Kaarls presented CCQM rules and policy. This document had been welcomed by the 11th meeting of the CCQM, and was presented to the CIPM as a useful model for other CCs, although the current text was addressed primarily to the CCQM and its working groups.

Prof. Wallard invited questions, and Prof. Moscati asked whether the document was openly available and if he could show it to the CCRI. Dr Kaarls confirmed that it would be made available on the BIPM website if it was adopted.

In response to a query from Dr Hengstberger, Prof. Wallard confirmed that CC Presidents can create working groups within their Consultative Committee. He reminded members that the CIPM should be kept informed of new working groups.

In response to a question from Dr Semerjian, Dr Quinn confirmed that the CIPM could approve international organizations and individual persons as CC members.

Dr Hengstberger drew attention to draft terms of reference that had been established for the CCPR working groups, and distributed this document (dated May 2004) to the CIPM. Dr Inglis informed the Committee that terms of reference had also been drafted for the CCEM, but had not yet been circulated to the CCEM members. There were no conflicts, he said, with the CCQM rules.

Dr Bennett called for a single reference document to be produced, with any CC-specific details given in specific CC documents.

7.12 Future meetings

The following dates were confirmed for future meetings of the Consultative Committees, CIPM, and other meetings at the BIPM:

2005

CCEM and WGs	14-18 March
CCQM and WGs	7-15 April
CCM and WGs	25-29 April

CCRI	27 May
CCRI Section I	18-20 May
CCRI Section II	23-25 May
CCRI Section III	25-26 May
CCT and WGs	6-10 June
CCU	29 June – 1 July
CCL-CCTF Joint WG	14 September
CCL	15-16 September
JCRB	28 September
Directors' meeting	30 September
Bureau of the CIPM	3 October
CIPM	4-7 October
CCPR and WGs	24-28 October
	(to coincide with NEWRAD 2005)

2006

CCQM	April
CCU	April?
CCAUV	3 days (Monday-Wednesday) in September or October

2007

CCTF	(no dates fixed)
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8 RIGHTS OF ASSOCIATES OF THE CGPM

Prof. Wallard raised the question of additional benefits that could be offered to Associates of the General Conference (referred to hereafter as "Associates") to help make membership of the Metre Convention more

attractive to non-members. He presented a discussion paper, in which he made the following recommendations:

- that Associates be invited to send representatives to future meetings of directors;
- that the CIPM MRA be interpreted as discussed under item 5.4;
- that where Associates have Pt-Ir prototypes, they may have them calibrated by the BIPM at an appropriate charge; and
- that the CIPM endorse his proposal to contact non-members with appropriate publicity and information material, and that RMOs be invited to assist in this progress.

The CIPM noted, with approval, that directors of NMIs in Associate States and Economies should be invited to attend the Directors' meeting. However, they considered that CC membership should continue to be reserved for Members of the Metre Convention working at the highest level in the field. If appropriate, delegates from institutes in Associate States and Economies could be invited to attend as experts.

On the subject of how to attract new Member States of the Metre Convention and Associates of the CGPM, Prof. Wallard reminded the Committee that one of the key advantages gained by Members and Associates is that they are able to sign the CIPM MRA. He considered that now, at the end of the transition period of the MRA, it would be appropriate to remind all States and Economies of the advantages of participating in the Arrangement.

Dr Kaarls pointed out that for many States, participation in the MRA might still be a long way off. Dr Semerjian asked how the small economies in SIM could be encouraged to become more involved in the workings of the metrology system. He mentioned that SIM has adopted an educatory role, involving many of the members in pilot groups, and suggested that it also would be useful to organize workshops.

Dr Inglis suggested establishing a sub-class of Associates of the CGPM, which would be free of charge until they were able to participate in the CIPM MRA. Dr Hengstberger suggested that the CIPM consulted the lists of programmes for developing countries set up by the WTO and other organizations, to see if the Metre Convention featured in the relevant local workshops or events. Prof. Göbel cautioned that funding would have to be found for any new activities carried out by the BIPM in this regard.

Prof. Ugur cautioned that the problem was not just the attractiveness or even the cost of Associateship, but rather the administrative arrangements required to include the cost in governmental budgets.

Dr Inglis supported in general the idea of providing, for a fee, appropriate calibration services to Associates. He pointed out that some of the richer Associates had opted for this status – rather than Membership – not by choice but for political reasons. However, in order to accommodate other countries, he suggested that a revised minimum fee should also be established. He cautioned that if the BIPM did not cater for these countries, alternative systems would be set up.

Dr Lustzyk looked to the longer term, asking what the CIPM wanted to achieve. He wondered if one option would be a *per-capita* GDP limit, below which certain services would be free. He recommended that in any case the rules be clearly defined. He pointed out, however, that while the CIPM must clearly extend its services to the poorer parts of the world, it was important to reserve certain advantages for full Members, otherwise States would no longer apply for Membership.

Dr Valdés raised the problem of States which were ineligible for Associateship, citing the example of Peru, which was an initial signatory to the Metre Convention but which withdrew in 1956 with six years of debts. The problem of debtor States was also discussed under item 15.2.

Dr Hengstberger supported the suggestion to provide calibrations for Associates who held Pt-Ir prototypes.

Prof. Ugur pointed out that, for most Associates, a stainless steel prototype would be more appropriate than a Pt-Ir prototype, and Prof. Wallard confirmed that this was often his response when the BIPM receives an enquiry about Pt-Ir prototypes.

The CIPM agreed that the BIPM should provide a calibration service for States and Economies that already have a Pt-Ir prototype provided by the BIPM. This applies to Member States and Associates. In response to a question from Mr Énard, Prof. Wallard replied that the fee charged to Associates for such calibrations should at least cover costs.

9 JOINT COMMITTEE FOR TRACEABILITY IN LABORATORY MEDICINE

Prof. Wallard explained that the Joint Committee for Traceability in Laboratory Medicine, JCTLM, has two working groups, and he described the activities of each. The work of both groups tends to be particularly close to commercial concerns, which could raise difficulties for the BIPM and the CIPM.

It was clear that the JCTLM was leading the BIPM into new territory. It was therefore important to be clear about the criteria used to list reference materials and laboratories. The following issues were discussed:

- the consequences of publishing a list/database of reference measurement services of reference measurement laboratories;
- the criteria to be used for recommending the publication of a reference measurement service in the list; and
- whether the JCTLM have sufficient resources to review and maintain an endorsed list of reference measurement services of reference measurement laboratories.

Dr Wielgosz, Executive Secretary of the JCTLM, presented a brief report on the specific activities of the JCTLM.

Prof. Göbel concluded the discussion by asking Dr Kaarls and Dr Wielgosz to convey the CIPM's concerns to the JCTLM-WG 2 (on reference measurement laboratories).

10 METRE CONVENTION/ILAC JOINT WORKING GROUP

Prof. Wallard reported on the Joint Working Group of the Metre Convention and ILAC, remarking that links with ILAC were becoming increasingly important. They were also mutually beneficial, as accreditation activities have well-established reputations with many governments as well as with a number of bodies for whom the Metre Convention is of interest.

The Joint Working Group grew from the joint meetings held between the CIPM bureau and the ILAC secretariat, as well as from a number of discussions at JCRB meetings at which ILAC was represented. The subjects covered have been diverse and from time to time the “permanent” members of the group have invited the participation of colleagues from NMIs to help with particular tasks.

The draft terms of reference of the group are to:

- intensify the flow of information between the two organizations;
- review the BIPM-ILAC Memorandum of Understanding (MoU) when necessary;
- review issues concerning the coherence of the CIPM MRA and the ILAC Mutual Acceptance Arrangement;
- exchange information on current and planned comparisons under both organizations in view of identifying those of common interest;
- review the framework for traceability from NMIs to accredited laboratories; and
- review impacts of ISO standards on metrology.

The main issues of concern to the working group include:

- a) the JCRB’s concern about “special” calibrations which appeared to be offered from time to time by a number of NMIs. This caused confusion for some accreditors when they assessed laboratories which claimed traceability to standards held at an NMI, and where the uncertainties were smaller than those stated in the KCDB;
- b) ILAC’s knowledge of the way in which the Quality System review process used by RMOs for the CIPM MRA established technical competence;
- c) a common interest in the integrity of national metrology systems and how this relates to international metrology;
- d) the need for a common approach to the specification of “measurement scopes”, the treatment of uncertainty and the need to establish the CMCs stated in the KCDB as the route whereby traceability to the SI is established;
- e) a concern by ILAC and others that there should be clarity about the vital importance of traceability to the SI and how such measurements made by accredited laboratories and NMIs could be promoted to regulators and legislators;

- f) the qualities of assessors used for accreditation and third-party review, and experts used for self declaration;
- g) key comparisons and their linkage with ILAC proficiency testing activities, as evidence that the international metrology system works effectively in delivering SI-traceable measurement worldwide;
- h) a common position on calibration and conformity assessment in reaction to Resolution 11 of the 22nd CGPM and the activities of ISO CASCO; and
- i) terminology, especially the use of the terms BMC and CMC.

Some of these issues have already been resolved, as described below.

Item (f) was taken up by a working group of the JCRB chaired by Lam Kong Hong (Singapore), which will work with a EUROMET group to clarify the situations in which on-site peer-review visits would be required and the capabilities required of the peers. This matter was discussed further at the 13th meeting of the JCRB in September 2004.

The JCRB took up the issue of “special” calibrations (item (a)), finding that very few are actually done. A number of actions resulted, namely that NMIs which did do special calibrations should submit revised CMCs with lower uncertainty claims through the RMO review process. Other NMIs would stop the practice or make it clear that these certificates were not produced within the CIPM MRA framework. When accreditors encounter such a situation, they should take special care when considering uncertainty claims and should discuss the issues with an appropriate NMI. The BIPM/ILAC Working Group is also considering a clarification of what is meant by “normally offered to clients” – the term used in the CIPM MRA for CMCs. This is also a concern in accreditation circles, as accredited laboratories can sometimes offer smaller uncertainties than their “best measurement capabilities”. The working group considers that some harmonization of terms would be useful in order to avoid confusion.

For item (b), Michael Kuehne (PTB) attended the meeting of the Joint Working Group in March 2004 as a special NMI invitee to explain in detail the procedures EUROMET uses for acceptance of CMCs in the KCDB, and their review of Quality Systems within the RMOs. This was taken as typical of the approach used in other RMOs. As a result, ILAC was confident that the RMOs’ approach to the QS reviews was technically sound.

Item (h) was dealt with through consultation prior to a number of ISO CASCO meetings and the common position adopted by the Metre

Convention and ILAC has made it much easier to convince ISO working groups to accept a view that satisfied the interests of NMIs within the Metre Convention.

The remaining items led to common interest in establishing a joint BIPM/ILAC position on the roles and responsibilities of NMIs and NABs, and on how the various components of the Metre Convention and the world of accreditation complement and reinforce each other. This was given additional impetus by the concerns of NMIs over the consequences of current discussions in ISO CASCO. The overall intention of both parties, especially given the CIPM-ILAC MoU, is to strengthen the role of SI-traceable measurements, and the part to be played by both bodies. This is clearly important as the work of the Metre Convention is applied to new areas in which accreditation is, or is likely to be, used by regulatory or other authorities. The concept of a common statement has been discussed at the JCRB and by directors and was warmly welcomed by RMOs as providing a statement of how NMIs and NABs should work together. The intention was not to produce an instruction on how to behave, but rather to use the statement as a guide to best practice. Prof. Wallard presented a draft version of the statement being developed with ILAC on the role and responsibilities of NMIs and NABs, and invited the CIPM to comment on the general approach and to offer advice on aspects of the behaviour of NMIs that might be considered. He also welcomed comments on presentation and any perceived sensitivities. The core members of the working group are due to meet again in November 2004 to report back on the initial responses of their stakeholders. Another meeting will take place in March 2005 with RMOs and regional accreditation bodies to discuss the draft statement.

Prof. Göbel commented that the relationship between NMIs and NABs was not widely understood, and commented that areas of concern were often based on perceived, rather than actual, impartiality: NMIs must provide calibrations, but this might be in competition with the accredited laboratories. Dr Kaarls added that the problem mainly concerned eastern European countries.

Dr Semerjian pointed out that NIST was required by law to provide calibrations, and asked if accredited bodies could not also be governmental.

Dr Hengstberger noted that an accreditation body often started out as part of an NMI, then was separated into a distinct entity as the volume of work increased.

Dr Inglis agreed that the problem of perceived impartiality was largely European.

Dr Bennett commented that in the UK and elsewhere, the national metrology institute and the accreditation body had separated. He was conscious of the danger that UKAS and the NPL might drift apart, but noted that UKAS had recently sought the NPL's advice in a case concerning conflicts of interest.

Dr Valdés pointed out that NMIs were charged with establishing and disseminating traceability to the SI, which they do through established networks. He suggested that it was really for the NMIs to recognize the accreditors, not the other way round. Dr Kaarls agreed that this had apparently been forgotten in some ISO CASCO standards.

Prof. Ugur said that NMIs in developing countries might be able to cope with all the calibrations required, but pointed out that in more developed countries the workload of calibrations was such that the NMI could not undertake them all and other laboratories were needed. He agreed that this gave rise to a potential conflict of interest, and called for the CIPM to make a clear statement.

Dr Carneiro returned to an issue already raised at the Directors' meeting, concerning the difference between CMCs in the CIPM MRA, and BMCs in the ILAC Arrangement. He pointed out that NABs represent the largest consortium of clients, and recommended that priority be given to promoting relations with ILAC. This was likely to be raised at the proposed meeting of regional bodies.

Dr Semerjian suggested that accreditors needed to be reminded that it was not an issue of competition. He said this would be clear from a simple comparison between the number of calibrations undertaken by NMIs and the number undertaken by other bodies, and suggested that such data be collected.

He pointed out that calibration laboratories and test bodies acted on different levels. Prof. Göbel clarified that the present discussion concerned the accreditation of calibration bodies.

Prof. Wallard counselled the CIPM not to become defensive, saying that discussions with ILAC had been very clear, and confirmed that ILAC believed that a relationship was necessary between NMIs and NABs. He proposed that the RMO/RAB meeting should identify the tasks over which NABs and NMIs should collaborate.

Dr Luszyk said it was important to distinguish between the role of an international body and of national bodies. The CIPM cannot interfere with national systems; it can only suggest best practice within an idealized system.

Dr Valdés pointed out that in several countries, metrology and accreditation were dealt with by the same body. He pointed out that as metrology expanded to new fields, possible conflicts of interest would extend to the testing laboratories. He proposed that the CIPM should consider not only NABs, but measurement laboratories in general, including testing laboratories.

Prof. Göbel suggested that Dr Bennett and the bureau of the CIPM should draft a CIPM Recommendation on this issue.

After discussion and minor rewording, the proposed text was subsequently adopted as Recommendation 1 (CI-2004), on the relationship between national metrology institutes (NMIs) and nationally recognised accreditation bodies (NABs).

11 CONTACTS WITH OTHER INTERNATIONAL ORGANIZATIONS

Prof. Wallard noted that interactions with other international organizations were already discussed in the Secretary's report (item 2 of the agenda).

Prof. Wallard commented that he had been invited to give a presentation to the WTO Technical Barriers to Trade Committee (TBT), on the BIPM and the work of the CIPM MRA. This contact was encouraging, and subsequent correspondence with the WTO has been positive. Dr Luszyk asked if there was any news on the BIPM's application for Observer status on the TBT Committee, but Prof. Wallard replied that the application was still pending.

Dr Semerjian encouraged the interactions of the BIPM with these other international organizations, saying that coordinating, educating, and raising awareness of metrology was a very important part of the BIPM's role.

Dr Inglis agreed that these top-level contacts were very useful, remarking that the communication between the CIPM and WMO had led to contact at

the national level between the NMIA and the Australian meteorological body.

Prof. Göbel reminded the Committee that the main problem for the BIPM in such activities was its limited resources.

Dr Hengstberger informed the Committee that the International Commission on Illumination (the CIE) had expressed a wish to formalize its relationship with the CIPM through a MoU. Dr Kaarls remarked that MoUs should be signed only if there was a need to do so. Dr Hengstberger pointed out that the candela is defined at a particular frequency, and the field of photometry depends on measuring light of any frequency in such a way that the result of the measurement correlates closely with the visual sensation experienced by a human observer of the same radiation. At the moment, this is done through the CIE spectral luminous efficiency functions, which describe the relative spectral responsivity of the average human eye for photopic and scotopic vision. He suggested that the relationship could be formalized through an exchange of letters, and Prof. Göbel agreed that Prof. Wallard and Dr Hengstberger should coordinate this.

Prof. Issaev asked whether UNESCO had recognized World Metrology Day? Prof. Wallard replied that he is continuing the attempts of Dr Quinn to encourage this, but as yet there has been no response from UNESCO.

In response to a question from Prof. Issaev, Dr Quinn confirmed that he continues to be a member of the CODATA Task Group on Fundamental Physical Constants, which meets once a year. He has close contact with the other members, who come from NMIs. Prof. Göbel thanked him and asked him to continue this interaction.

Prof. Issaev commented that there is much work to be done to introduce SI units to the full range of WMO activities. Prof. Wallard confirmed that satisfactory relations with the WMO headquarters in Geneva have been established through Dr Wielgosz. However, he was unable to send a delegate from the BIPM to attend the whole of the WMO General Assembly, which lasts three weeks, as he had been unable to identify specific metrology-related items on their Agenda. Dr Quinn commented that there had been discussions about holding a meeting on “metrology in climate change”, although nothing has yet been organized. Dr Semerjian and Prof. Issaev agreed that this would be very useful, and Prof. Issaev suggested the title “Metrology and Meterology”. Prof. Göbel agreed that Prof. Issaev and Prof. Wallard should take note of the CIPM’s discussion.

12 JOINT COMMITTEE FOR GUIDES IN METROLOGY

The CIPM were joined by the contact persons of JCGM working groups 1 and 2: Dr Carine Michotte and Mr François Delahaye, respectively.

Prof. Wallard reported that JCGM WG 1, on the *Guide to the Expression of Uncertainty in Measurement* (the “GUM”), had produced a draft *Supplement* to the GUM, and JCGM WG 2, on the *International Vocabulary of Basic and General Terms in Metrology* (the “VIM”), had produced a draft new edition. Both documents were sent out in April 2004 for external review amongst the member organizations of the Joint Committee and the NMIs. Such a review is by nature a lengthy process, but it is hoped that reasonably consolidated responses will be received towards the end of the year.

Prof. Wallard reminded the Committee that both the GUM and the VIM were originally published by ISO, because the contributing organizations had wanted ISO’s endorsement of them, and wanted ISO to use the vocabulary in its standards. ISO thus holds the copyright for both of the original documents. Prof. Wallard remarked, however, that Working Group 1 of the JCGM considered the *Supplement* to the GUM as a new document, and agreed that the BIPM should make it available free of charge on the BIPM website. Negotiations continue with ISO for both publications.

On the subject of the VIM, Prof. Wallard commented that the new edition did not yet contain any MRA-related terminology, nor vocabulary concerning calibration and conformity assessment activities. It was likely that ISO CASCO would request a formal definition of conformity assessment in the VIM.

Prof. Göbel thanked Prof. Wallard for his report, and invited comments from the CIPM.

Several members expressed surprise that ISO, although it is only one of eight partners in the JCGM, had put the documents out for formal voting as if they were draft guides.

There was general agreement that the draft new edition of the VIM was not in general an improvement on the original edition. Dr Valdés called for the BIPM to produce its own version of the vocabulary, perhaps in collaboration with the OIML. Prof. Issaev pointed out that the OIML already have their own official vocabulary of legal metrology, generally

referred to as the VIML, but agreed he was unhappy with the new version of the VIM, which he believed would weaken the position of the BIPM.

Prof. Moscati pointed out that the discussion could have serious consequences. He warned that if it was decided that each community should use its own individual vocabulary, this might lead to problems with, for example, quality manuals and accreditors.

Dr Quinn and Prof. Giacomo agreed that it had been very difficult to get consensus, even in such a small group. Both agreed that, in general, the new draft was not an improvement on the existing edition, but Prof. Giacomo said that the work could not be redone. Dr Quinn proposed an alternative solution, which would be to ask the CIPM to make only the necessary changes to the initial edition. Prof. Wallard agreed, saying that the BIPM could conclude that no clear agreement had been reached and the CIPM could suggest minimal changes.

Dr Hengstberger commented that the CIE had experienced similar problems with its IEC/CIE International Lighting Vocabulary. Their *modus operandi* was to change a definition only if there was unanimous agreement. Prof. Göbel agreed that this was good advice, and similar to the suggestion of Dr Quinn and Prof. Wallard.

13 WORK OF THE BIPM

13.1 Director's Report

Prof. Wallard presented the draft Director's Report, which as per usual had been circulated to the CIPM members prior to the meeting. He pointed to new chapters covering the administration, secretariat and workshop, and commented that the annual report was an important means of communicating with the outside world. However, it was difficult to strike a balance between making a comprehensive statement about the work achieved and being able to use the Report as a more general document. Dr Lustzyk encouraged the production of a more digestible version, which could be diffused on the website.

In response to a question from Prof. Göbel, Prof. Wallard confirmed that the Director's Report would indeed be printed, and sent to Member Governments along with the financial report.

Prof. Göbel requested that other details, mentioned during the BIPM's staff presentations to the CIPM, would also be included in the official version; particularly, the number of calibrations undertaken.

Dr Semerjian recognized that the scientific staff had worked very hard to make their five-minute presentations to the CIPM, but said that such a short time did not do justice to their work. He suggested that perhaps the sections making presentations could be rotated from year to year, to allow more time for individual's talks. Prof. Göbel said that this was under discussion by the bureau. He added that some members of staff had expressed disappointment at the low number of visits during the open afternoon. This would also be discussed by the bureau, who would hope to revise the programme for 2005. Dr Lustzyk expressed strong support for the idea of having longer presentations.

Prof. Göbel thanked the Committee for their comments, saying they would all be considered by the bureau. Dr Luszyk asked Prof. Wallard to convey to the staff the CIPM's appreciation of the effort made and the quality of the work presented.

13.2 Criteria for BIPM technical programmes

Prof. Wallard presented criteria for selection of BIPM work programmes. This was in response to the request from the 22nd CGPM to develop objectives for the work programmes of the BIPM and to establish criteria for the projects within them.

Prof. Wallard reminded the Committee that the broad remit of the BIPM was defined in the Metre Convention as follows:

- Article 1 (1875) of the Metre Convention establishes the BIPM as “a scientific and permanent international bureau of weights and measures”.
- Article 6 (1875) sets out its duties in regard to “comparisons and verifications of the metre and the kilogram...” their “custody” ...and the “periodic comparison of national standards with the international prototypes” and “the comparison of standards and scales of precision, the verification of which may be requested by governments or by scientific societies, or even by constructors or men of science”.

- The 1921 additions (Article 7) to the Convention added the task of “coordinating the measures relative to electrical units” and the “duty of making determinations of the physical constants”.

Subsequent Resolutions of the CGPM and the CIPM enlarged the technical scope of the BIPM’s work to include photometry (1939), ionizing radiation (1964) and the absorption of the Bureau International de l’Heure in 1985. Chemistry started in 2000.

Up until the late 1980s, the BIPM’s activities generally followed a traditional pattern of establishment of primary or reference standards, their comparisons and their dissemination. Consultative Committees concerned themselves mainly with scientific matters, and it was not until the 1990s that the significance of collaboration with the work of major international organizations at a policy level began to play a major part. This work has accelerated enormously since then, and nearly half the time of many senior scientific staff at the BIPM is devoted to these objectives.

Prof. Wallard pointed out that a balance has to be struck between the original scientific orientations and commitments, and the vital importance of establishing international partnerships and collaborations. He emphasized that the success of the BIPM’s mission is entirely dependent on having the best possible staff with an appropriate mixture of skills, and pointed out that attracting and retaining people with a good scientific mind as well as an aptitude of the more administrative side of the BIPM’s work is made easier because of the laboratory work.

Prof. Wallard outlined the new priorities of the BIPM and set various criteria for judging its work programmes. He reminded the CIPM that the 22nd CGPM has emphasized the importance of:

- the BIPM’s role of coordination and international collaboration; and
- its agreed move to include additional areas of activity in chemistry with an emphasis on medicine, the environment and food.

He proposed the following criteria to help formulate, shape and define the work of the BIPM:

- Criterion A: Mandated activities under the Convention or CIPM Recommendations/CGPM Resolutions (including maintaining the kilogram prototype and TAI/UTC, and providing calibrations for NMIs in selected areas);
- Criterion B: Coordination of NMI work and Consultative Committees;

- Criterion C: Avoiding unnecessary duplication with NMIs in BIPM's technical and research work;
- Criterion D: Managing and dealing with comparisons;
- Criterion E: Interacting and collaborating with international and intergovernmental bodies on behalf of the Metre Convention; and
- Criterion F: Promoting the work of the Metre Convention and NMI metrology worldwide.

In order to establish the detailed content of the programme, the BIPM needed the specific advice and statements of need from stakeholders, which came from, amongst other things:

- the direct involvement and use of Consultative Committees which helped to set priorities, allocate tasks and who gave their overall endorsement to work programmes; and
- questionnaires sent to NMI directors.

Prof. Wallard commented that the work programme for 2005-2008 approved by the General Conference fell into these categories of criteria.

Dr Semerjian asked how the BIPM's calibration services were selected (criterion A). Prof. Göbel responded that this was a question for the CIPM, not Prof. Wallard, because it is the CIPM and CGPM that approve the BIPM work programme.

Dr Kaarls asked what other criteria should be added. He pointed out that the criteria stated in the current document were largely those already formulated in the "Kaarls report" and elsewhere.

Dr Luszyk encouraged the CIPM to follow these criteria, by applying a more formal approval process than before. Dr Kaarls commented that the Consultative Committees are the major stakeholders.

Dr Carneiro pointed out that it was not always possible to wait until the next CGPM for a new work programme to be approved, saying that it would be better to give the BIPM Director the power to direct. He suggested that a document should be written to outline the decision-making process.

Dr Semerjian commented that there was a conflict between not duplicating NMI activities and providing calibrations for smaller institutes. He suggested that there was no real need to continue to do this, asking what necessitated any duplication?

Prof. Wallard referred to the results of the questionnaires sent to NMI directors, which showed that small and medium-sized NMIs appreciate the calibration services offered by the BIPM, because it is independent. There is a strong demand for calibration services from these smaller countries.

He drew attention to various areas in which the BIPM services are unique, highlighting the SIR and the travelling Josephson junction. He said that the Consultative Committees provided important input, and the BIPM Executive Secretaries were always encouraged to present the BIPM work programme at CC meetings, and to receive feedback from the Committees. He mentioned, in particular, the CCQM Organic Analysis Working Group, which has been very important in defining the programme of the Chemistry section.

Dr Inglis returned discussion to the BIPM's calibration services, agreeing that work programmes were not usually set up in order to develop a calibration service, but rather that new calibration services sometimes became possible as a result of a scientific project.

Prof. Göbel pointed out that many smaller countries are willing to pay the membership fee for the Metre Convention, because it entitles them to free calibrations at the BIPM. He said that this free service could not easily be replaced by NMIs. Prof. Wallard added that such services also keep the BIPM in touch with the customer community, and provide opportunities for the transfer of technical knowledge.

The Committee agreed that the discussion on establishing work programmes was very important. Prof. Göbel encouraged members to submit their comments to Prof. Wallard, and agreed that the bureau would revise the document at their next meeting and present another version to the CIPM in 2005.

13.3 BIPM Quality System

Following the internal Management Review of the BIPM's Quality System, attended by Dr Kaarls, Prof. Wallard drew the CIPM's attention to the BIPM's policy on stating uncertainties, as used on the BIPM's calibration certificates. The following is taken from the relevant quality procedure:

BIPM policy on stating uncertainties

The BIPM offers calibrations for NMIs and designated institutes of Member States of the Metre Convention. In most cases, the instrument or artefact is a national standard. The uncertainty associated with BIPM calibrations is a combined standard uncertainty, without the application of a coverage factor k .

This long-standing practice of not applying a coverage factor is considered to facilitate the combination of the BIPM and NMI uncertainties, and thus simplify the subsequent dissemination of the standard to the customers of the NMI. It can be assumed that the BIPM's measurements fulfil the criteria of section G6.6 of the GUM. In particular, for the purpose of calculating the expanded uncertainty for their end result at a specified level of confidence, an NMI can assume that the number of effective degrees of freedom for a BIPM calibration is sufficient to be able to use a coverage factor $k = 2$ for a level of confidence of approximately 95 %. Any exceptions are noted in the calibration certificate.

The CIPM endorsed this policy.

13.4 Development of the BIPM website

Prof. Wallard said that use of the BIPM website continued to increase. It includes parts dedicated to the CIPM, the directors of NMIs, and members of the various Consultative Committees. It is an important means of communication with these communities.

Reaction to the new-look site, launched in October 2003, has been positive, and a recent redesign of the front page has increased the profile of the KCDB and the JCTLM database.

Dr Luszyk asked who the clientele (visitors to the website) were, and which parts of the website were most popular. Dr Miles (the BIPM webmaster) replied that the website received visitors from all round the world, including not only Member and Associate States, but also non-members. The user community includes, of course, metrologists at NMIs, but also other scientists, industrialists, teachers and students, historians and many others. About 10 % of visitors consult the SI section of the site, and the SI Brochure continues to be downloaded about 2000 times per month. Other much-used facilities include the BIPM's collection of useful links, and the *Metrologia* database.

Prof. Issaev suggested that the presentations made by the directors at the annual Directors' meeting could be published on the site. Prof. Wallard expressed doubts about the usefulness of this, pointing out that the presentations were not designed for the purpose.

Dr Valdés commended the BIPM website to teachers, pointing out that the sites of the BIPM and the NIST contained a wealth of information, and that the web pages were often more approachable than most text books. Prof. Moscati agreed that the BIPM website was a great resource, and provided a useful way of locating important documents.

Prof. Moscati suggested that, in addition to the main site hosting official documents, it might also be useful to have an unofficial site, which listed "unofficial" or other discussion documents. Prof. Göbel noted the suggestion but expressed doubt as to the practicality of the idea. Prof. Wallard added that some committees already make a selection of their documents openly available on the website following their meetings.

13.5 BIPM "image" and promotion

Prof. Wallard confirmed that promotion of the work of the BIPM and the Metre Convention was one of the priorities he had set for himself and the staff, and outlined various activities already undertaken. These include the launch of the re-vamped website in October 2003 (see Section 13.4), and the raised profile of the BIPM within other international and intergovernmental organizations; particularly IFCC, ISO, WHO and WMO. In addition to the continuing activities with the ILAC and OIML, there has been increased publicity for the KCDB, with particular sectors of application in mind. More generally, there has been some press coverage of the CGPM and scientific highlights of the BIPM's scientific work such as the BIPM/NIST/ECNU paper in *Science* on femtosecond combs, radio interviews on the work of the BIPM, and, at the request of Prof. Göbel, a project to film the opening of the kilogram vault, in collaboration with the German TV station ZDF. The general image of metrology was also promoted in celebration of World Metrology Day (20 May) by an article from Dr Jeffrey Williams on "What is metrology?", published on the BIPM website and also in the *OIML Bulletin* (see *OIML Bull.*, 2004, **XLV**, 4, 22-25).

Dr Luszyk remarked that the promotion of metrology was essential, not just for the BIPM but for the international metrology community as a

whole. It should be a common goal for all States linked to the Metre Convention.

Prof. Issaev welcomed Dr Williams' article on "What is metrology?" and suggested that if such an article could be distributed a week or so in advance, this would allow for local translation and even broader diffusion.

Dr Luszyk asked if "spam" mailing of information about the BIPM and metrology had been considered, and Prof. Wallard replied that it had been considered inappropriate. In response to a remark of Dr Luszyk, Prof. Wallard commented that the KCDB Newsletter is widely distributed by email, and readers can add their addresses to the distribution database via the KCDB website.

Prof. Göbel commented that the listed promotional activities varied greatly in their degree of impact.

Dr Inglis commented that ISO was very successful because they were supported and promoted by other organizations and by their publications. He was encouraged by the idea of producing an SI flyer for widespread distribution, and pointed out that this was an ideal opportunity to increase exposure of the BIPM. He noted that it was essential that the flyer be targeted to the user community, which he defined as schools and accreditation laboratories. He also pointed out that, in general, our audience is the world at large, not just NMIs, but the whole cross-section of the community.

Dr Kaarls expressed concern about the BIPM's limited resources, and Dr Inglis agreed that it was important to seek a multiplying factor in the distribution of publicity material. He suggested that interaction with ILAC might be appropriate.

Prof. Göbel expressed his support for the SI flyer.

13.6 Depository of the metric prototypes

The visit to the depository of the metric prototypes at the Pavillon de Breteuil took place at 16 h 15 on 6 October 2004, in the presence of the President of the CIPM, the Director of the BIPM, and the representatives 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 Mr Bruno Galland, 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 observed.

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

temperature:	22 °C
maximum temperature:	24 °C
minimum temperature:	21 °C
relative humidity:	64 %

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	B. Galland	E.O. Göbel

14 METROLOGIA

Dr Jeffrey Williams, Editor of *Metrologia*, presented a brief report on the journal.

Since the beginning of 2003, *Metrologia* has been produced in conjunction with the Institute of Physics Publishing (IOPP) Ltd. In addition to appearing in the printed journal, all submissions that have been accepted are made freely available for one month on the *Metrologia* section of the IOPP website (www.iop.org/EJ/journal/Met).

The technical details of the production of *Metrologia* are working well.

A recent project has been the digitization of the whole archive of *Metrologia*. This is being undertaken by IOPP, and will be completed by the end of 2004. IOPP has plans to market this *Metrologia* archive as part of the archive of papers published in their journals; in particular, in

conjunction with the archive of *Measurement Science and Technology* and related journals.

Prof. Göbel asked if the relation with the IOPP was generally working well. Dr Williams confirmed that it was, commenting that the journal appears on time and we benefit from the extensive marketing network of IOPP to assist in maintaining the subscriptions levels of the journal at a time when subscription levels are falling for the majority of scientific journals. In answer to another question from Prof. Göbel, he confirmed that subscription prices were fixed by the IOPP and said that the increase from 2004 to 2005 was 11 %.

Dr Kaarls asked what was causing the worrying trend in subscription levels. Dr Williams explained that subscriptions to all technical journals were falling, but pointed out that overall subscription levels to *Metrologia* had increased from 2003 to 2004, due to its inclusion in IOPP package deals. This was an impressive change, leading to greater exposure, albeit reduced revenue. Prof. Ugur volunteered to help analyse any available subscription statistics.

Dr Luszyk suggested that the journal should include more invited reviews, saying that reviews of current and future prospects in particular fields would be particularly valuable. Dr Williams replied that special issues of *Metrologia* are still organized by an invited specialist editor in cooperation with the editor at the BIPM. In 2004, there were two special issues: Electrical charge and Density; and in 2005 there will again be two special issue: Time-keeping (to coincide with the 50th anniversary of Essen's experiments) and Pressure (proceedings of the CCM Pressure and Vacuum Conference).

Prof. Moscati expressed surprise that the subscription level was so low, and remarked that the special issues were particularly interesting. He also encouraged the inclusion of more general review articles.

Dr Luszyk asked if there was any editorial policy limiting the subject to physics, and Dr Williams explained that there was not, but that there was stiff competition in chemistry from the many chemical journals already in existence. He added that a small number of manuscripts in chemistry are currently under review, and a special issue on chemistry is planned for 2006.

Dr Carneiro pointed out that the problem with publishing in *Metrologia* was its low impact factor. However, he encouraged the CIPM to see the positive evolution in subscriptions to *Metrologia* – combining both full

subscriptions and package deals – as an opportunity to give greater exposure to the journal and, as a consequence, to the BIPM and metrology, even if this resulted in a falling income for the BIPM.

Prof. Issaev asked if *Metrologia* interacted with any other journals; for example, the Russian-language metrology journal. Dr Williams replied that there were no interactions.

Dr Inglis commented that many journals were now accessed over the web and speculated that this would have an impact on sales. Dr Williams confirmed that all IOPP journals were produced electronically and available through their website.

In answer to a question from Prof. Göbel, Prof. Wallard said that the current level of annual income derived from the journal was about 73 000 euros.

Prof. Göbel concluded the discussion by thanking Dr Williams for his presentation.

15 ADMINISTRATIVE AND FINANCIAL AFFAIRS

15.1 *Rapport aux Gouvernements for 2003; quietus*

The CIPM invited Mrs Perent, Administrator of the BIPM, to join them and present the *Rapport annuel aux Gouvernements des hautes parties contractantes sur la situation administrative et financière du Bureau International des Poids et Mesures en 2003*, which had been distributed in March 2004.

Dr Luszyk asked if there was any formal requirement for the level of the retirement fund. Mrs Perent replied that the level was based on the actuarial study carried out in 2001, which indicated that BIPM pensions were assured for the next decade or so. All the accounts were fully audited.

The report of the auditors for 2003 was presented and the required formal discharge was given to the Director and Administrator of the BIPM for 2003.

15.2 Member States in arrears

Mrs Perent listed the Member States in arrears with their payments, mentioning, in particular, Iran, with whom negotiations are under way concerning a possible repayment, the Dominican Republic, with whom negotiations have started, Cameroon, with whom an arrangement had previously been negotiated but whose repayments have stopped, and Uruguay and Venezuela, with whom there has been recent contact. It is hoped that payments from both the latter might be received before the end of 2004, which would allow their CMCs to be entered into the KCDB.

Prof. Göbel said that the bureau of the CIPM had discussed the problem of Member States in arrears, and was considering applying a stricter rule in future so as to avoid such large debts being accrued. He commented that after three years, a debtor State is no longer eligible to participate in the CIPM MRA, and their CMCs are removed from the KCDB. After six years, membership would be suspended.

Dr Quinn reminded the Committee that the Metre Convention specified that all the advantages and prerogatives of Member States should be suspended after three years of non-payment, and the debtor State would be excluded from the Convention after three further years. What is more, the accrued debt is to all of the other Member States, between which the unpaid contributions are distributed. It was not clear who was in a position to write off these debts on behalf of all the other Member States.

Dr Semerjian asked how far back the current debts extended, pointing out that endlessly accruing debts could pose an overwhelming problem, preventing a State from ever returning to active membership. Prof. Göbel agreed, saying that this was why the bureau had been discussing a stricter interpretation of the six-year limit. Mrs Perent asked the Committee to also bear in mind that other States had repaid their full debts.

Prof. Wallard pointed out that the right to participate in the CIPM MRA was an important advantage of Membership, saying that the exclusion of CMCs of debtor States from the KCDB after three years of non-payment was an effective means of dissuading States from accumulating such a debt.

The CIPM asked the bureau to continue their discussions, and Prof. Göbel noted that the CIPM would reconsider the issue in 2005.

15.3 Progress report on the 2004 exercise; Budget for 2005

Prof. Wallard presented a summary of the BIPM's accounts for 2004 and a draft budget for 2005. Both were approved after a short discussion.

Dr Bennett queried the substantial shortfall in contributions received in 2004. Mrs Perent replied that the amount received each year varied from 80 % to 120 % of the expected contributions, depending on late payments.

Budget for 2005

Income		euros
<i>Budgetary income:</i>		
1. Contributions from the States		9 713 882
2. Interest on capital		249 000
3. Miscellaneous income		118 000
4. Subscriptions from the Associates		178 422
5. <i>Metrologia</i>		75 000
Total		10 334 304
Expenditure		
<i>A. Staff expenses:</i>		
1. Salaries	4 211 000	} 5 608 200
2. Family and social allowances	929 300	
3. Social expenses	467 900	
<i>B. Contribution to the pension fund:</i>		1 576 000
<i>C. Operating expenses:</i>		
1. Heating, water, electrical energy	187 900	} 1 103 300
2. Insurance	37 000	
3. Publications	150 400	
4. Office expenses	129 700	
5. Meeting expenses	65 000	
6. Travel expenses and freight charges	328 400	
7. Library	176 000	
8. Bureau of the CIPM	29 000	
<i>D. Laboratories:</i>		1 534 000
<i>E. Buildings (major maintenance and renovation):</i>		415 000
<i>F. Miscellaneous and unforeseen expenses:</i>		97 804
Total		10 334 304

Mrs Perent pointed out that the budgeted income for 2005 includes both fixed and discretionary parts of the contributions for all but two States (Turkey and Chile) which have already notified the BIPM of their refusal to pay the discretionary part. For all the others, it is assumed they will pay even though a significant fraction have not yet confirmed their intentions. Mrs Perent read out the names of the States that have confirmed that they will pay the discretionary contribution, and those that have not yet responded.

15.4 BIPM staff promotions

The CIPM approved the promotion to *physicien principal* of Dr David Burns of the Ionizing Radiation section, and confirmed the appointment of Dr Steven Westwood at the grade of *chimiste principal*.

Dr Luszyk requested that information be provided about the hierarchy of grades at the BIPM, the distribution of these grades amongst the personnel, and the typical timescale for promotion. Dr Semerjian commented that twenty years appeared a long time to wait for promotion between grades.

Mrs Perent said that of the 37 physicists/chemists currently at the BIPM, six had the highest grade, *physicien* (or *chimiste*) *chercheur principal*, and thirteen had the middle grade, *physicien* (or *chimiste*) *principal*. Prof. Wallard agreed that further information would be distributed in advance of the next meeting of the CIPM.

15.5 BIPM staff statute

The CIPM approved three modifications to the BIPM staff statute:

- The level of family allowance was increased to be in-line with that in coordinated international organizations (from 732 *points-or* to 765 *points-or* per year).
- A new clause was added concerning medical examinations, to confirm the current practice. All employees have a medical examination when they are taken on, and an annual medical check-up. A medical examination may also be requested at any time by the Director.
- The maximum loan available from the *Caisse des Prêts Sociaux* was increased from 10 500 to 13 000 euros, the interest rate increased to 2 %, and the minimum monthly reimbursement was reduced from 5 % to 4 % of the net salary.

16 OTHER BUSINESS

16.1 English translations of French names

Prof. Wallard circulated the following list of English translations of French names, and asked CIPM members to circulate them as appropriate, to try to standardize usage. He also requested that CIPM MRA be written thus, without a hyphen:

- General Conference on Weights and Measures;
- International Committee for Weights and Measures;
- International Bureau of Weights and Measures;
- Member States of the Metre Convention;
- Associates of the General Conference on Weights and Measures.

16.2 Costa Rica

Prof. Wallard announced that Dr B. Paniagua had signed the CIPM MRA on 6 October 2004, on behalf of LACOMET, Costa Rica. The NMIs of all 16 Associates of the General Conference now participate in the Arrangement.

16.3 Possible redefinition of the kilogram

Dr Davis, Head of the BIPM Mass section, and Dr Stock, Head of Special Projects, joined the CIPM for this item of the agenda. Prof. Mills was also present.

Dr Quinn presented a paper discussing the practical realization of a future definition of the kilogram. Dr Quinn is a member of a working group of the Académie des Sciences which has the task of drawing up a report on *Unités de base et constantes fondamentales*. Among the topics that have been addressed is the form of a possible future definition of the kilogram. This was also discussed briefly by the CIPM in 2000. At that time, the Committee stressed the importance of adopting a definition that would be widely understandable.

There seems to be general agreement that the most likely future definition will be one that effectively fixes the value of the Planck constant, either

through measurements made with a watt balance or measurements made using silicon crystal density. Few of the current suggested definitions, however, would meet the above CIPM requirement for ease of understanding. At a recent meeting of the Académie working group, Dr Quinn made a suggestion that takes particular account of the problem of the practical realization of a definition based upon a fundamental constant. He proposed that the kilogram be defined in such a way that the value of the Planck constant, h , takes the value of $6.626\,0693 \times 10^{-34}$ J s exactly. This value for h is the 2002 CODATA value.

The value for h would be fixed, but at the same time the CIPM would declare that the mass of the international prototype of the kilogram remained one kilogram exactly; in effect it would be given a conventional value of one kilogram. The CIPM would also choose an uncertainty that should be used if it was necessary to know mass with respect to the SI (today it would be 1.7 parts in 10^7). The worldwide comparisons of mass standards carried out by the BIPM would continue as well as occasional measurements of the mass of the international prototype using a watt balance or silicon reference. If, in due course, it became established that the mass of the international prototype had drifted, the CIPM would take a decision to assign a new conventional value to the international prototype. In this way worldwide uniformity in mass would be maintained at the level of parts in 10^8 , but the value would be formally linked to a fundamental constant. He said that in this way the proposed definition would remove the need to wait until the watt balance or silicon crystal density experiments achieve the desired uncertainty of a 1 part in 10^8 .

The procedure described above would also allow the electrical units to be linked to fundamental constants earlier than would otherwise be the case. In particular, fixing h would immediately improve the accuracy of K_J through the relation $K_J^2 = 8\alpha/(\mu_0 ch)$, from 2 parts in 10^7 to 1.5 parts in 10^9 , i.e., to half the uncertainty of α .

Dr Quinn concluded by saying that this was presented to the CIPM purely for information and as a point of discussion., he was not asking the CIPM to take any decision on the matter at this stage.

Prof. Mills commented that the effect of this definition would effectively be to transfer uncertainty from h (or the Avogadro constant) to the kilogram.

Prof. Moscati remarked that the proposed definition through h was not direct, but was linked through the definitions of the second and the metre by

the speed of light. Dr Quinn agreed that a reference might need to be included to the definition of the metre, which fixes the value of c .

Prof. Göbel commented that the validity of the proposed definition depended on α being constant with time.

Dr Valdés recommended waiting before making any changes to the kilogram. Since neither the watt balance experiments nor determinations of the Avogadro constant currently achieve the desired uncertainty of 1 part in 10^8 , it is not yet possible to choose a new definition which refers directly to the most suitable experiment for the realization. However, progress in nanotechnology and self-assembly techniques might allow in the not-too-distant future a practical means of realizing the kilogram through the Avogadro constant. Furthermore, a definition based on N_A would be more widely understood than one based on h .

Dr Luszyk agreed that the CIPM should not rush to change the definition, and warned that a definition based on h would be incomprehensible to the public at large. He also felt that public awareness and understanding of the Avogadro constant might be better than for the Planck constant.

Dr Tanaka asked what would be the status of the watt balance experiments if the proposed definition were adopted. Dr Quinn replied that the realization of the kilogram with the lowest possible uncertainty would be the international prototype. A watt balance or the Avogadro experiment would allow an independent realization, but with a larger uncertainty. Dr Davis pointed out that there is currently a discrepancy of almost 1 part in 10^6 , between realizations based on N_A (through silicon sphere experiments) and those based on h (through watt balances); he said it was essential to continue work on both sets of experiments.

Dr Bennett asked what would happen if knowledge of the Planck constant (h) advanced and its value was changed. The mass of the international prototype would change from being 1 kg *exactly*, to some slightly different value. If the Avogadro constant changed, for example, the silicon crystal used in that experiment would become the new best realization of the kilogram.

Dr Carneiro considered that the proposed definition addressed scientific academies rather than grocery shops, and counselled the CIPM to think about practical dissemination of the unit. He cautioned against redefining the kilogram in terms of the Avogadro constant, arguing that it would be unwise to fix the value of N_A while it was one of the worst-known fundamental constants.

He added that the buoyancy correction for a silicon crystal would be greater than for a platinum prototype of the same mass. Dr Davis replied that the need for air buoyancy corrections is eliminated when comparisons are made in vacuum, although additional measurements are then needed to determine the small changes of mass adsorbed and desorbed from surfaces when mass standards are cycled between air and vacuum conditions. He pointed out that changes in mass of the national prototypes with respect to the international prototype of the kilogram have been studied over a hundred years. The objective of redefining the unit of mass should be to establish a strong link between the mass of macroscopic artefacts, such as the international prototype of the kilogram, and the fundamental physical constants, such as atomic and sub-atomic masses.

Prof. Ugur commented that a problem with almost all of the definitions of the SI base units was that the realization had to be different from the definition. He called for an overview of the package as a whole, in collaboration with the various Consultative Committees involved. Prof. Göbel noted that, as mentioned under item 6 of the agenda, the new draft version of the SI Brochure contained an explanation of this difference between realizing a unit and reproducing it. However, he suggested that the CCU should be asked to study the consequences that such a redefinition of the kilogram would have on the entire concept. Prof. Mills agreed that the CCU would do this, in consultation with the Consultative Committees.

Dr Kaarls said he was not sure that all the definitions needed to be changed, the question was more one of practical realizations. The most important attribute of a definition was that it provided a stable long-term reference. If possible, he said, it should also be understandable.

Prof. Göbel concluded the discussion, noting the general view that the CIPM should not rush to change the definition, and asking the CCU to take the necessary time to review the system. Prof. Mills said he would report back on progress at the next meeting of the CIPM.

16.4 Proposal for work in materials testing

Dr Bennett presented a proposal from Colin Lea (NPL, Chairman of the Versailles Project on Advanced Materials and Standards (VAMAS)) and the ANMET (the APEC Network for Materials Evaluation Technology) for the CIPM to establish a working group for materials metrology. This proposal resulted from the call for cooperation among the NMIs with

respect to materials metrology, submitted by KRISS at the Directors' meeting of in 2003.

ANMET and VAMAS strive to develop and agree international harmonization of standards for materials. But the technical work involved in support of this harmonization is carried out in an *ad hoc* voluntary manner, driven by "bottom-up" local needs and interests of the scientists involved. Dr Lea's proposal requested the involvement of the CIPM to provide international "top-down" strategy, leadership, and rigour, along with the power of its reputation and experience, towards an international harmonization of measurement standards for materials. It was supported by letters from ANMET and VAMAS.

Dr Kaarls asked which properties were not yet treated within an existing Consultative Committee, saying that there was already the CCM Working Group on Hardness, for example, and the CCQM Working Group on Surface Analysis.

Prof. Gao Jie agreed that the objectives of the proposed working group would have to be carefully defined, cautioning that the concept of materials testing was broad. He pointed out that interest lies mainly in industrial measurements, and suggested that that it would be appropriate to make contact with, and perhaps obtain observer or member status of various bodies working regionally in the field. In particular, he cited the ASTM (United States), DIN (Germany), Gosstandart (now the Rostekh-regulirovaniye, Russian Fed.) and NIMC (Japan).

Dr Tanaka also agreed that this was a very important field and expressed his strong support for the proposal. He pointed out that not only the end-users but also the Consultative Committees could benefit from such work; citing as an example of interest a force transducer used as transfer device in a round-robin key comparison. He considered it would be appropriate for a CIPM working group to consider methodology and CRMs for materials metrology, and suggested that if the group should also consider instrumentation, then this should be done in a joint effort with ISO. Finally, he pointed out that there is also a lot of interest in the metrology of nanomaterials.

Prof. Issaev said that he was also in favour, and proposed the participation of the VNIIM as a full member. He noted that both the VNIIM and the UNIIM were very active in the domain of materials measurement, which Russia considered an important area.

Mr Énard said that there was no doubt that the field was very important for testing industries, but asked if materials metrology was really the domain of the CIPM. Dr Kaarls added that the main interest was in testing or standardization activities, which required a lower level of measurements rather than global traceability at the metrological level.

Dr Inglis commented, however, that traceability was rarely addressed by testing laboratories. He remarked that various issues of interest to VAMAS, such as microhardness for example, are at the frontiers of scientific research. As there are many such multidisciplinary issues, he recommended that a working group on materials metrology be created directly under the CIPM at first, rather than within a specific Consultative Committee.

Prof. Moscati commented that the new frontiers addressed by nanomaterials do not represent new physics, but new methods. He said that although he was not yet convinced of the need for a working group, this might be because the problem had not yet been clearly defined.

Prof. Ugur returned to the question of what properties are not covered by the existing system. Dr Semerjian suggested that ANMET and VAMAS be asked to define the measurement problem (as opposed to a testing or procedural problem), and resubmit it to the CIPM, pointing out that they would make faster progress between themselves than any new working group created by the CIPM. Dr Carneiro suggested that the Consultative Committees should also be asked to report back to the CIPM on any current activities in the field of materials metrology.

Dr Quinn remarked that the decision was an important one, and required careful discussion. Prof. Wallard also advised the CIPM not to rush the decision, saying that they had been approached because of a need perceived in the community. He called for the CIPM to respond positively, requesting more details before continuing the discussion, and suggested that a meeting between the various interested parties could be hosted at the BIPM.

Dr Kaarls warned that it was not clear who the audience would be, because the field was so broad, and Prof. Göbel noted that, instead, the Consultative Committees could be asked to define their interests in materials metrology. Dr Luszyk added that the materials metrology groups already established in various NMIs should also be consulted.

Dr Bennett reminded the Committee that the proposal was for a working group to be created to establish, in the first instance, the user needs for activity in materials metrology. The working group would be asked to define the specific needs, initial activities, and long-term aims, and then

establish a methodology for traceability, extending into materials testing, and recommend mechanisms for undertaking such activities. In particular, they would investigate the areas not currently covered by the Consultative Committees. He repeated Dr Inglis' comments about the need for traceable measurements in the field, saying that ANMET and VAMAS had approached the CIPM because they perceived a need for CIPM activity in this area.

Dr Chung called for the CIPM to respond positively to the request and to give their authority to the group that would study the issue.

Prof. Göbel said it was not yet clear to him what needs for traceability are not met. Dr Semerjian agreed that there was already significant activity in the field, saying that there was a strong group at the NIST, for example, and reference materials have already been defined for steel, aluminium and various other metals.

It was agreed that (in collaboration with Dr Bennett) Prof. Wallard would respond to the letters from the chairmen of ANMET and VAMAS, requesting further details about the perceived needs, and Prof. Wallard would also ask the Consultative Committees to define their activities and interests in the area.

17 DATE OF NEXT MEETING

The 94th meeting of the CIPM will take place at the Pavillon de Breteuil from Tuesday 4 to Friday 7 October 2005. The President closed the 93th meeting by thanking all present for coming and contributing to a successful meeting.

**RECOMMENDATION ADOPTED BY THE
INTERNATIONAL COMMITTEE FOR WEIGHTS AND MEASURES**

RECOMMENDATION 1 (CI-2004):

**On the relationship between national metrology institutes (NMIs) and
nationally recognised accreditation bodies (NABs)**

The International Committee for Weights and Measures,

considering that the 22nd General Conference on Weights and Measures, in its Resolution 11, welcomed the recent CIPM-ILAC Memorandum of Understanding between the International Committee for Weights and Measures and the International Laboratory Accreditation Cooperation (ILAC), and

called upon all accreditation organizations to recognize that NMIs and accredited calibration laboratories together provide an indispensable route to traceability to the SI and hence to reliability in measurements and worldwide comparability of measurement results for the whole economy and society and that they should work closely together, and

recommended

- that Member Governments of the Metre Convention ensure that an appropriate relationship exists between NMIs and NABs, and
- that this relationship fosters collaboration on matters concerning traceability of measurement results and ensures effective and complementary actions under the CIPM MRA and the ILAC arrangement,

noting

- that NMIs provide the essential technical information to ensure the existence of effective national measurement systems as the route to traceability to the SI,
- that recent developments, including those in documentary standards, are leading to an undue separation of some NMIs and some NABs,

recommends that

- NMIs and NABs work closely together to ensure that this essential technical exchange takes place, and
- appropriate safeguards are put in place to ensure impartiality,

and further notes that nothing in this recommendation or in Resolution 11 of the 22nd General Conference on Weights and Measures implies a particular model for a relationship between an NMI and an NAB.

LIST OF ACRONYMS USED IN THE PRESENT VOLUME

1 Acronyms for laboratories, committees and conferences

ANMET	Asia Pacific Economic Cooperation (APEC) Network for Materials Evaluation Technology
APMP	Asia/Pacific Metrology Programme
ASTM	American Society for Testing and Materials, West Conshohocken, PA (United States)
BARC	Bhabha Atomic Research Centre, Trombay (India)
BAWG	CCQM Working Group on Bioanalysis
BIH	Bureau International de l'Heure
BIML	Bureau International de Métrologie Légale
BIPM	International Bureau of Weights and Measures/ Bureau International des Poids et Mesures
BNM*	Bureau National de Métrologie, Paris (France), see LNE
CARICOM	Caribbean Community
CC	Consultative Committee
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
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

* Organizations marked with an asterisk either no longer exist or operate under a different acronym.

CCRI	Consultative Committee for Ionizing Radiation/ Comité Consultatif des Rayonnements Ionisants
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)
CENAM	Centro Nacional de Metrología, Querétaro (Mexico)
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 légale
CIPM	International Committee for Weights and Measures/ Comité International des Poids et Mesures
CNEA	Comisión Nacional de Energía Atómica, Buenos Aires (Argentina)
CODATA	Committee on Data for Science and Technology
COOMET	Cooperation in Metrology among the Central European Countries
CPEM	Conference on Precision Electromagnetic Measurements
CSIR-NML	Council for Scientific and Industrial Research, National Metrology Laboratory, Pretoria (South Africa)
DI	Designated Institute
DIN	Deutsches Institut für Normung e.V., Berlin (Germany)
DPLA	Danish Primary Laboratory for Acoustics, Naerum (Denmark)
DTI	Department of Trade and Industry (United Kingdom)
EAWG	CCQM Working Group on Electrochemical Analysis
EC	European Commission
ECNU	East China Normal University, Shanghai (China)
ESA	European Space Agency
ESWG	CCRI(II) Extended SIR Working Group
EUROMET	European Collaboration in Measurement Standards
FAO	United Nation's Food and Agriculture Organization
GAWG	CCQM Working Group on Gas Analysis

GCDI	Government-designated coordinating institute
Gosstandart*	Metrology and Certification, Moscow (Russian Fed.), see Rostekhnregulirovaniye
GT-RF	CCEM Working Group on Radiofrequency Quantities/ Groupe de travail du CCEM pour les Grandeurs aux Radiofréquences
GUM	Centre Office for Measures/Główny Urząd Miar, Warsaw (Poland)
IAC	International Avogadro Coordination
IAEA	International Atomic Energy Agency
IAWG	CCQM Working Group on Inorganic Analysis
ICU	International Customs Union
IEC	International Electrotechnical Commission
IEN*	Istituto Elettrotecnico Nazionale Galileo Ferraris, Turin (Italy), see INRIM
IFCC	International Federation of Clinical Chemistry and Laboratory Medicine
IFIN	Institutul de Fizica si Inginerie Nucleara, Bucarest (Romania)
ILAC	International Laboratory Accreditation Cooperation
IMGC*	Istituto di Metrologia G. Colonnetti, Turin (Italy), see INRIM
INMETRO	Instituto Nacional de Metrologia, Normalização e Qualidade Industrial, Rio de Janeiro (Brazil)
INRIM	(the former IEN and IMGC) Istituzione dell'Istituto Nazionale di Ricerca Metrologica, Turin (Italy)
IOPP	Institute of Physics Publishing, London (United Kingdom)
IPQ	Instituto Português da Qualidade, Caparica (Portugal)
IRMM	Institute for Reference Materials and Measurements, European Commission
ISO	International Organization for Standardization
ISO CASCO	International Organization for Standardization, Conformity Assessment Committee
ISO REMCO	International Organization for Standardization, Committee
ITU	International Telecommunication Union
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 on Traceability in Laboratory Medicine
JWG	Joint Working Group CCL/CCTF
KCWG	Key Comparison Working Group
KRISS	Korea Research Institute of Standards and Science, Daejeon (Rep. of Korea)
LACOMET	Laboratorio Nacional de Metrología, San José (Costa Rica)
LGC	Laboratory of the Government Chemist, Teddington (United Kingdom)
LNE	(the former BNM) Laboratoire National de Métrologie et d'Essais, Paris (France)
LNE-SYRTE	Laboratoire National de Métrologie et d'Essais, Systèmes de Référence Temps Espace, Paris (France)
LNMRI	Laboratório Nacional de Metrologia das Radiações Ionizantes, Rio de Janeiro (Brazil)
MePWG	CCL Working Group on the <i>Mise en Pratique</i>
METAS	Swiss Federal Office of Metrology and Accreditation, Wabern (Switzerland)
MIKES	Mittatekniikan Keskus/Centre for Metrology and Accreditation, Helsinki (Finland)
MoU	Memorandum of Understanding
MRA	Mutual Recognition Arrangement
NAB	National Accreditation Body
NCSLI	National Conference of Standards Laboratories, Boulder, CO (United States)
NEL	National Engineering Laboratory, Glasgow (United Kingdom)
NEWRAD	New Developments and Applications in Optical Radiometry Conference
NIM	National Institute of Metrology, Beijing (China)
NIMC*	National Institute of Material and Chemical Research, Tsukuba (Japan), see NMIJ
NIS	National Institute for Standards, Cairo (Egypt)
NIST	National Institute of Standards and Technology, Gaithersburg MD (United States)
NMI	National Metrology Institute
NMi	Nederlands Meetinstituut, Delft (Netherlands)

NMIA	National Measurement Institute, Australia, Lindfield (Australia)
NMIJ	National Metrology Institute of Japan, Tsukuba (Japan)
NML CSIRO	National Measurement Laboratory, CSIRO, Pretoria (Australia), see NMIA
NPL	National Physical Laboratory, Teddington (United Kingdom)
NPLI	National Physical Laboratory of India, New Delhi (India)
NRC	National Research Council of Canada, Ottawa (Canada)
NSB	National Standardization Body
OAWG	CCQM Working Group on Organic Analysis
OIML	International Organization of Legal Metrology/ Organisation Internationale de Métrologie Légale
PITTCON	Pittsburgh Conference
PTB	Physikalisch-Technische Bundesanstalt, Braunschweig and Berlin (Germany)
RAB	Regional Accreditation Body
RMO	Regional Metrology Organization
Rostekhregulirovaniye	Federal agency on technical regulating and metrology, Moscow (Russian Fed.)
SADCMET	Southern African Development Community Cooperation in Measurement Traceability
SAWG	CCQM Working Group on Surface Analysis
SIM	Sistema Interamericano de Metrología
STUK	Säteilyturvakeskus, Helsinki (Finland)
SYRTE*	Systèmes de Référence Temps Espace, see LNE-SYRTE
TC	Technical Committee
TCL	Technical Committee for Length
TempMeko	International Symposium on Temperature and Thermal Measurements in Industry and Science
UCWG	CCRI(II) Uncertainties Working Group
UKAS	United Kingdom Accreditation Service
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNIDO	United Nations Industrial Development Organization
UNIIM	Ural Scientific and Research Institute for Metrology, Rostekhregulirovaniye of Russia, Yekaterinburg (Russian Fed.)

VAMAS	Versailles Project on Advanced Materials and Standards
VNIIFTRI	All-Russian Research Institute for Physical, Technical and Radiophysical Measurements, Rostekhnregulirovaniye of Russia, Moscow (Russian Fed.)
VNIIM	D.I. Mendeleev Institute for Metrology, Rostekhnregulirovaniye of Russia, St Petersburg (Russian Fed.)
VNIIMS	Russian Research Institute for Metrological Service of Rostekhnregulirovaniye of Russia, Moscow (Russian Fed.)
WELMEC	European Cooperation in Legal Metrology
WGACQHR	CCEM Working Group on the Measurements of the Quantized Hall Resistance with Alternating Current
WGDM	CCL Working Group on Dimensional Metrology
WGLF	CCEM Working Group on Low-Frequency Quantities
WHO	World Health Organization
WMO	World Meteorological Organization
WTO	World Trade Organization
WTO-TBT	World Trade Organization, Technical Barriers to Trade Committee

2 Acronyms for scientific terms

BMC	Best Measurement Capability
CGS	Centimetre, gram, second system of unit
CMC	Calibration and measurement capabilities
CRM	Chemical reference material
GDP	Gross Domestic Product
GPS	Global Positioning System
GUM	Guide to the Expression of Uncertainty in Measurement
KCDB	BIPM Key Comparison Database
MAS	Metrology, Accreditation and Standardization
QS	Quality System
SI	International System of Units
SIR	International Reference System for gamma-ray emitting radionuclides
TAI	International Atomic Time
UTC	Coordinated Universal Time
VIM	International Vocabulary of Basic and General Terms in Metrology
VIML	International Vocabulary of Terms in Legal Metrology

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1, Boulevard Ney, 75018 Paris

Dépôt légal, n° 8682

ISBN 92-822-2211-X

ISSN 0370-2596

Achevé d'imprimer : août 2005

Imprimé en France

