

**Bureau International des Poids et Mesures**

# **Comité International des Poids et Mesures**

92nd meeting (October 2003)

#### 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 9 October 2003

**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
Cuba	Malta
Ecuador	Panama
Hong Kong, China	Philippines
Jamaica	Slovenia
Kenya	Ukraine

## **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 m<sup>2</sup>) of the Pavillon de Breteuil (Parc de Saint-Cloud) placed at its disposal by the French Government; its upkeep is financed jointly by the Member States 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 (CCEM), new name given in 1997 to the Consultative Committee for Electricity (CCE) set up in 1927;

2. The Consultative Committee for Photometry and Radiometry (CCPR), new name given in 1971 to the Consultative Committee for Photometry (CCP) set up in 1933 (between 1930 and 1933 the CCE dealt with matters concerning photometry);
3. The Consultative Committee for Thermometry (CCT), set up in 1937;
4. The Consultative Committee for Length (CCL), new name given in 1997 to the Consultative Committee for the Definition of the Metre (CCDM), set up in 1952;
5. The Consultative Committee for Time and Frequency (CCTF), new name given in 1997 to the Consultative Committee for the Definition of the Second (CCDS) set up in 1956;
6. The Consultative Committee for Ionizing Radiation (CCRI), new name given in 1997 to the Consultative Committee for Standards of Ionizing Radiation (CCEMRI) set up in 1958 (in 1969 this committee established four sections: Section I (X- and  $\gamma$ -rays, electrons), Section II (Measurement of radionuclides), Section III (Neutron measurements), Section IV ( $\alpha$ -energy standards); in 1975 this last section was dissolved and Section II was made responsible for its field of activity);
7. The Consultative Committee for Units (CCU), set up in 1964 (this committee replaced the “Commission for the System of Units” set up by the CIPM in 1954);
8. The Consultative Committee for Mass and Related Quantities (CCM), set up in 1980;
9. The Consultative Committee for Amount of Substance: Metrology in chemistry (CCQM), set up in 1993;
10. The Consultative Committee for Acoustics, Ultrasound and Vibration (CCAUV), set up in 1999.

The proceedings of the 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.

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

as of 9 October 2003

### **President**

1. J. Kovalevsky, President of the Bureau National de Métrologie, Observatoire de la Côte d'Azur, avenue N. Copernic, 06130 Grasse, France.

### **Secretary**

2. R. Kaarls, Klaverwydenstraat 13, 2381 VX Zoeterwoude, The Netherlands.

### **Members**

3. S. Bennett, Deputy Director and Director International Metrology, National Physical Laboratory, Teddington TW11 0LW, United Kingdom.
4. K.H. Brown, 13109 Madrone Mountain Way, Austin TX 78737, United States.
5. Chung Myung Sai, President, University of Science and Technology (UST), 52 Eoeun-dong, Yuseong-gu, Daejeon 305-333, Rep. of Korea.
6. Gao Jie, Emeritus Director, National Institute of Measurement and Testing Technology, P.O. Box 659, Chengdu 610061, Sichuan, China.
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8. E.S.R. Gopal, Emeritus scientist, Department of Physics, Indian Institute of Science, Bangalore 560 012, India.
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15. W. Schwitz, Director, Swiss Federal Office of Metrology and Accreditation, Lindenweg 50, CH-3003 Bern-Wabern, Switzerland.
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5. J.V. Dunworth, Apt. 902, Kings Court, Ramsey, Isle of Man, United Kingdom.
6. K. Iizuka, Japan Association for Metrology Promotion, 25-1 Nandocho, Shinjuku-ku, Tokyo 162-0837, Japan.
7. D. Kind, Knappstrasse 4, 38116 Braunschweig, Germany.
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on 1 January 2004

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

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1 Senior Research Fellow.

2 Research Fellow.

3 Also Publications.

4 Also site maintenance.

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**International Committee  
for Weights and Measures**

**Proceedings of the sessions  
of the 92nd meeting  
(9, 10 and 17 October 2003)**



## Agenda

1. Opening of the meeting; quorum; agenda.
2. Report of the Secretary and activities of the bureau of the CIPM (October 2002 – September 2003).
3. Membership of the CIPM.
4. 22nd CGPM.
5. The CIPM Mutual Recognition Arrangement (MRA).
6. Consultative Committees.
7. Joint Committee for Traceability in Laboratory Medicine (JCTLM).
8. Metre Convention/ILAC/OIML joint working group.
9. Contacts with other international organizations.
10. Joint Committee for Guides on Metrology (JCGM).
11. Work of the BIPM.
12. *Metrologia*.
13. Administrative and financial affairs.
14. Other business.
15. Election of the bureau of the CIPM.
16. Date of next meeting.

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

The International Committee for Weights and Measures (CIPM) held its 92nd meeting on Thursday 9 and Friday 10 October 2003 at the Pavillon de Breteuil, Sèvres. A brief meeting was also held at the Centre de Conférences Internationales, Paris, on the afternoon of Friday 17 October 2003 following the 22nd CGPM.

Present: S. Bennett, Chung Myung Sai, Gao Jie, E. O. Göbel, E. S. R. Gopal, F. Hengstberger, B. Inglis, L. K. Issaev, R. Kaarls, J. Kovalevsky, S. Leschiutta, J. Lusztyk, G. Moscati, T. J. Quinn (Director of the BIPM), W. Schwitz, M. Tanaka, J. Valdés.

Also attending: Prof. P. Giacomo (Emeritus Director of the BIPM), Prof. A.J. Wallard (Director Designate of the BIPM), Drs E. Ambler, B. Blevin, D. Kind (on 10 October) and H. Preston-Thomas (Honorary members of the CIPM); Prof. I. M. Mills (President of the CCU), Dr H. Semerjian (guest); Mrs B. Perent (administrator of the BIPM), and Mrs F. Joly and Dr J. R. Miles (secretariat). Prof. Ch. Bordé was also present during the afternoon of Friday 10 October.

Prof. Kovalevsky, President of the CIPM, opened the meeting by welcoming all present, and particularly the honorary members, Drs Ambler, Blevin, and Preston-Thomas. He welcomed the two guests, Prof. Mills and Dr Semerjian, and noted the regrets of Dr Ugur. The quorum was amply satisfied according to Article 12 of the Rules annexed to the Metre Convention.

Prof. Kovalevsky was sad to announce the death of Dr Lounasmaa, former member of the CIPM, in December 2002. He paid tribute to Dr Lounasmaa's prestige in the field of thermometry and his active role in the CIPM until his retirement four years ago. The CIPM stood for a few moments' silence in his memory.

The agenda for the meeting was adopted.

The President then 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 2002 – September 2003)

Most matters arising in the report of the Secretary were taken up later in the meeting. However, for convenience, references to these subsequent discussions are included in this section of the report of the meeting.

The bureau of the CIPM met three times during the year, twice at the Pavillon de Breteuil (25 February and 8 October 2003) and once in Grasse (2–4 June 2003).

### **2.1 Member States of the Metre Convention**

The number of Member States of the Metre Convention remains at fifty-one. Following the decision of the CIPM in 1999 relating to non-paying Member States, letters were written to the Embassies in Paris of the Dominican Republic and Iran informing them that they will be excluded from the Convention unless arrangements can be made for the payment of overdue contributions. Correspondence continues and no final conclusion has yet been reached. Contacts at a technical level have been established with the national metrology institute of Iran.

### **2.2 Associates of the CGPM**

There are now fourteen Associate States and Economies of the CGPM, namely: Belarus, Chinese Taipei, Cuba, Ecuador, Hong Kong (China), Jamaica, Kenya, Latvia, Lithuania, Malta, Panama, the Philippines, Slovenia, and the Ukraine. Discussions are under way with a number of other countries with a view to them becoming Associates. So far, the directors of the national metrology institutes (NMIs) of eleven Associates have signed the Mutual Recognition Arrangement (MRA). A letter has been sent to directors of NMIs of all those members of APMP, COOMET, EUROMET, SADC MET and SIM who are not yet Members of the Convention or Associates of the CGPM encouraging them to become Members of the Convention or Associates of the CGPM (about fifty countries in all). A copy of this letter has been posted on the BIPM website.

### **2.3 Membership and officers of the International Committee**

Since the last meeting of the CIPM, no new members have been elected. As a result of discussions with Dr A. Bement (Director of the NIST), the name of Dr Hratch Semerjian (NIST) will be included in the list proposed by the CIPM instead of that of Karen Brown who has left her position at NIST.

The bureau has continued to seek suitable candidates for membership of the CIPM, and invites members of the CIPM and other persons to submit the names and curricula vitae of suitable candidates to the Committee. The policy of the CIPM in relation to elections and details of how to apply were presented at the 21st CGPM and are given on the BIPM website.

### **2.4 The Mutual Recognition Arrangement (MRA)**

The bureau has been kept informed of the progress in the implementation of the MRA, including the meetings of the Joint Committee of the Regional Metrology Organizations and the BIPM (JCRB), and progress with the BIPM key comparison database (KCDB). The status of the KCDB and the results of the 11th meeting of the JCRB, that took place at the Pavillon de Breteuil on the 6 and 7 October 2003, were discussed further under item 5 of the agenda (section 5.1). A report on the first four years of operation of the MRA and activities of the JCRB has been prepared by the Director and distributed to members of the CIPM, to directors of signatory institutes, and to members of the JCRB.

The bureau encourages directors to develop plans to raise awareness of the MRA nationally so as to promote its adoption by regulators and legislators.

### **2.5 CIPM/ILAC/OIML discussions**

A meeting of the joint CIPM/ILAC/OIML discussion group took place at the Bureau International de Métrologie Légale (BIML) on 26 February 2003. In addition to continuing our collaborations in the Joint Committees reported elsewhere, the principal activities proposed for joint action by the three organizations focus on a number of issues concerned with traceability, uncertainty and confidence in NMIs, and accredited laboratory measurements world-wide.

With ILAC, we are pursuing ideas on how to raise laboratory assessors' awareness of the CIPM MRA and, in particular, acceptability of NMI

certificates produced within it and which contain the JCRB “acceptability declaration”. In a number of cases, national accreditation bodies (NABs) have found uncertainty claims in their accredited laboratories that appear smaller than those either of the national NMI or of other NMIs to which traceability is claimed. To tackle this issue, we need to work together so as to encourage assessors to make better use of the data on calibration and measurement capabilities (CMCs) in the KCDB. ILAC is also interested in using the MRA's approach to service level descriptors in accredited scopes, as well as the components of uncertainty budgets used in key comparisons so as to draw assessors' attention to all the elements that need to be considered. We have also made good progress in ensuring that ILAC has the same level of confidence in both of the MRA options for NMI quality systems.

In addition, we have had some useful interactions with BIML/OIML over the details in their ‘Draft Law on Metrology’.

## **2.6 The Joint Committee on Coordination of Assistance to Developing Countries in Metrology, Accreditation and Standardization (JCDCMAS)**

Since the last CIPM, we have made considerable progress on the JCDCMAS and it is now beginning to develop a sound work plan. We have addressed and resolved concerns expressed by some Member States as to the mandate under which the BIPM acts in the Joint Committee and have established appropriate information and consultation processes. The scope of the activity has been clarified so as to ensure that no predetermined model of MAS (Metrology, Accreditation, Standardization) will be used by the JCDCMAS partners (BIPM, IAF, IEC, ILAC, ISO, ITU, OIML, UNIDO) and that the initiative is open to other bodies that are active in MAS at an international level. The World Bank has expressed interest in working with the Committee, and our partners who have representation on the World Trade Organization (WTO) Committee on Technical Barriers to Trade (TBT) are actively pressing for the WTO to recognize that accreditation and metrology are necessary complements to its current emphasis on written standards. Specific initiatives include the preparation of a PowerPoint presentation on the responsibilities of the various partner bodies and what they can bring to developing and emerging countries and economies as well as an up-to-date written review. The Committee has also

been invited to take part in a presentation and round-table discussion, to be followed by a workshop at the UNIDO Council meeting in December 2003.

## **2.7 The CIPM and the World Meteorological Organization (WMO)**

The BIPM was represented by Dr R.I. Wielgosz at the 13th session of the Commission for Instruments and Methods of Observation (CIMO-XIII) of the WMO (September 2002) and the 14th World Meteorological Congress of the WMO (May 2003). The WMO Congress stressed the need for a continued collaboration of CIMO with other technical commissions and bodies outside the WMO, including the BIPM and ISO. A new working structure of the CIMO has been adopted, which includes task-oriented expert teams overseen by Open Programme Area Groups. The BIPM was asked by the WMO to consider the nomination of experts to these teams. Subsequently after consultation with the CCPR, Dr N. Fox (NPL) and Dr W. Schmutz (PMOD-World Radiation Center) were nominated for the Expert Team on Meteorological Radiation and Atmospheric Composition Measurements. Dr R.I. Wielgosz (BIPM) was nominated to the Expert Team on Regional Instrument Centres (RICs), Quality Management Systems and Commercial Instrument Initiatives, in order to initiate further interaction between the RICs and the regional metrology organizations. At a further meeting held in Cairns (Australia), the BIPM was represented by Dr L. Besley (NARL-AGAL).

## **2.8 The Conformity Assessment Committee of the International Organization for Standardization (ISO CASCO)**

The BIPM is now an official observer at ISO CASCO and we are generally kept informed of matters related to traceability and laboratory accreditation that might affect NMIs. To be more precise, we are kept informed of matters that are to be discussed by the main ISO CASCO Committee but not of activities within its working groups. As a result, we are not always able to give our input to views before they become embedded in near-final drafts. This year, for example, another problem has arisen related to the content of a new draft of ISO standard 17000 that will replace certain ISO Guides. It is in the interests of the NMIs that it is clearly stated in ISO standards that calibration and accreditation of calibration laboratories is not a conformity assessment activity. Stimulated by a request from the

Chairman of EUROMET, the Director wrote to the Chairman of ISO CASCO with regard to this matter, and as a result the BIPM was invited to take part in a meeting of the relevant ISO CASCO Working Group in November 2003. Copies of the Director's letter and the response from the Chairman of ISO CASCO were distributed to the Committee and the matter was discussed further under item 9 of the agenda (section 9.2).

## **2.9 NMIs and national accreditation bodies (NABs)**

In response to concerns expressed by some NMIs, which were discussed at the 2003 meeting of EUROMET, the bureau has prepared a draft Resolution (draft Resolution N) for the CGPM on the relations between NMIs and NABs. Many directors consider that this is a matter of sufficient importance that it merits being the subject of a Resolution at the 22nd CGPM. The draft was sent to members of the CIPM in July and will be discussed during this meeting at which ILAC's comments can also be considered.

## **2.10 Traceability: definition of the term**

There have been a number of discussions about the current definition of traceability in the *International Vocabulary of Basic and General Terms in Metrology* (VIM); all concerning the need to cover not only the well-established concept of "vertical traceability" but also "equivalence or comparability" between SI units and quantities as realized at NMIs, which is essentially the business of the CIPM MRA. A definition of traceability and comparability that clearly covers both senses of "traceability" would be advantageous in helping remove technical barriers to trade and dealing with the naming of certain NMIs in national or other requirements. The issue is mentioned in the President's address to the CGPM but the CIPM did not see the need for a Resolution, preferring that the VIM group deals with this at its next meeting.

## **2.11 Traceability in laboratory medicine and the Joint Committee on Traceability in Laboratory Medicine (JCTLM)**

The European Directive on in vitro diagnostics (IVD) is having a significant effect on the medical diagnostics industry. This Directive will

require all instrumentation used in the European Union from 2004, to be calibrated against standards of “higher order”. The NMIs have a responsibility to ensure that the standards used are traceable to the SI, or if this is not yet possible to other internationally agreed references.

Many discussions have taken place this year and a provisional agreement has been reached between the BIPM, the IFCC and ILAC as to the formal setting up of the JCTLM. A second meeting of the proposed JCTLM took place in 2003. The three organisations have also agreed on the texts of draft letters to be exchanged between them together with documents related to a framework for international agreement on reference materials and reference methods and criteria for membership of the JCTLM. These are presented to the CIPM for approval, which was subsequently given (see section 7). In parallel with the discussions on the formalities, two JCTLM working groups established last year have been preparing lists of reference materials and reference methods and a list will soon be ready for putting on the BIPM and IFCC websites. This work is proceeding very quickly because there is an urgent demand from industry for such an agreed list in order for manufacturers to be able to meet the IVD directive in 2004.

We have not yet been able to reach agreement on how the World Health Organization (WHO) can participate formally, although a WHO representative is taking part in the meetings. Part of the difficulty in reaching agreement has been that a new Director General of WHO was appointed this year, as was the Executive Director who was dealing with this matter, and so discussions need to be restarted.

One of the joint activities planned with the WHO, in the context of the Memorandum of Understanding (MoU), is a world-wide consultation of regulatory bodies concerning the needs for traceability in laboratory medicine. This whole matter of traceability in laboratory medicine is of great importance and the fact that the BIPM is seen to be helping when needed will no doubt be beneficial to us in the future.

## **2.12 World Trade Organization (WTO)**

No progress has been made in our attempt to obtain observer status in the WTO TBT Committee. It appears that certain Member States of the TBT Committee are refusing to accept any changes to the list of Observers whilst matters quite unrelated to membership of the Committee are awaiting resolution. This is a matter upon which we have no influence despite having



asked some major NMIs to intervene on our part. In the meantime, OIML is an effective representative of our views.

In a recent exchange of letters between the secretary of the CIPM and the Director-General of the WTO, the latter indicated that the WTO is working hard on finding a solution to the problem and that we should stay in contact with the WTO's Trade and Environmental Division in order to be informed of developments in the TBT area.

### **2.13 New study of evolving needs for national and international metrology**

The Report on "Evolving needs for national and international metrology and the role of the BIPM" was finalized after the last meeting of the CIPM and distributed to Member States, to Associates of the CGPM and to some international organizations in May 2003.

### **2.14 Directors meeting in 2003**

Following the extensive consultation of directors of NMIs during 2002, no meeting of directors was arranged in the spring of 2003; instead there will be a meeting during the 22nd CGPM on Wednesday 15 October 2003.

### **2.15 22nd CGPM**

The 22nd CGPM will take place at the International Conference Centre, Avenue Kléber, Paris from 13 to 17 October 2003. The Convocation was sent to Member States, to Associates of the CGPM and to some international organizations in December 2002 and was followed in May 2003 by the detailed Programme and Budget of the BIPM, the Report on Evolving Needs, and three new draft Resolutions related to the decimal marker sent in by the governments of Australia, United Kingdom and the United States. In July 2003, the BIPM distributed a further draft Resolution on the relationship between NMIs and NABs.

## 2.16 BIPM affairs

The bureau has been kept informed by the Director of the implementation of the decisions taken by the CIPM in October 2002 related to the programme of the BIPM. The Director noted that the reaction of the Consultative Committee for Length (CCL) at its 2003 meeting will be mentioned under item 6.

An ISO/IEC 17025-based Quality System is being put in place for the BIPM to meet the requirements of paragraph 7 of the MRA in respect of the calibration services delivered to NMIs. The Secretary of the CIPM attended the first Management Review at the BIPM in September. The Director provided further details under item 11 of the agenda (section 11.2).

## 2.17 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	2000	2001	2002	2003
I. Ordinary funds	6 291 144.60	6 197 805.86	6 849 066.09	6 796 242.47
II. Pension fund	8 047 087.14	8 679 664.82	10 547 903.46	10 895 038.83
III. Special fund for the improvement of scientific equipment	32 615.36	0.00	0.00	0.00
IV. Staff loan fund	173 976.29	185 723.29	194 983.92	202 427.33
V. Building reserve fund	2 780 504.29	1 216 406.49	0.00	0.00
VI. <i>Metrologia</i>	0.00	0.00	0.00	0.00
VII. Medical insurance reserve fund	584 681.75	625 077.75	653 741.11	630 883.82
Totals	17 910 009.43	16 904 678.21	18 245 694.58	18 524 592.45

Prof. Kovalevsky thanked Dr Kaarls and the Secretary's report was duly approved by the Committee.

### **3 MEMBERSHIP OF THE CIPM**

#### **3.1 Possible future candidates**

Prof. Kovalevsky noted that there would be two vacancies on the CIPM next year: the vacancy left by his own resignation (with effect from July 2004), and the other arising from the resignation of Prof. Gopal (with effect from December 2003 or January 2004).

The Committee then examined the special case of the resignation of Dr Karen Brown and the proposed election of Dr Hratch Semerjian to fill the resulting vacancy. The Committee decided to adopt the procedure proposed in the Note by the Director (see Appendix 1 of this Report).

Prof. Kovalevsky invited members to suggest other candidates and present their CVs at next year's meeting of the CIPM.

#### **3.2 Drawing up of the list to be presented to the CGPM**

Dr Quinn reminded the Committee of the formal procedure, according to Article 8 (1921) of the Metre Convention, of electing or re-electing nine members of the CIPM at each General Conference. The list of "candidates" would comprise the six members provisionally elected by the CIPM since the last CGPM, plus Dr Semerjian in place of Dr Brown (see Note referred to in 3.1), and be made up to nine by drawing two names amongst the others out of a hat. The names of Dr Chung and Dr Kaarls were drawn.

#### **3.3 Membership of the bureau of the CIPM**

Prof. Kovalevsky reminded the Committee that re-election of the bureau would take place on Friday 17 October 2003, immediately after the 22nd General Conference. Prof. Göbel, as President Elect of the CIPM, attended the meeting of the bureau of the CIPM in June 2003.

## 4 THE 22ND CGPM

Prof. Kovalevsky reminded the Committee that detailed arrangements for the CGPM would be discussed the following day (10 October) in the presence of Prof. Bordé, who would act as President of the Conference. He gave a brief summary of the items he would highlight during his report to the CGPM, noting topics such as the new States associated with the General Conference, the celebrations held to mark the 125th anniversary of the Metre Convention, the “Kaarls report”, *Evolving Needs for Metrology in Trade, Industry and Society, and the Role of the BIPM*, which is an update of the “Blevin report” presented by the CIPM at the 21st CGPM, the completion of the Pavillon du Mail, the appointment of Prof. Andrew Wallard as successor to Terry Quinn as Director of the BIPM, and progress with the BIPM website, the KCDB, and *Metrologia*.

### 4.1 BIPM budget and proposed programme of work for the period 2005-2008

Discussion then turned to the dotation of the BIPM. Dr Quinn gave a short presentation showing the BIPM expenditure across different sections, the cost of maintenance of the buildings, and the differences between the budgets for 2000–2004 and 2005–2008.

Dr Luszyk noted that a fairly large fraction of the budget is tied up in the pension fund and asked if there were any plans to recruit more temporary staff in favour of permanent staff. Dr Quinn replied that unfortunately the category of “research fellow” had had to be eliminated due to budget restrictions, and Mrs Perent, Administrator of the BIPM, added that there were several retirements during 2003, and some of these positions were not being replaced. Future recruitments would have to be considered on a case by case basis; she warned that reducing the number of permanent staff could lead to a problem financing the pension fund in the long term, however the actuarial study carried out in 2001 had shown that the pension fund should be able to support payments for many years to come..

Prof. Göbel asked whether short-term staff contributed to the fund. Dr Quinn explained that the statute states that pensions are not paid to members of staff who leave before completing seven years of service, and that staff who left after less than seven years service had their pension

contributions reimbursed. Prof. Gopal said that it was a social problem and it was important to consider the younger generation. Dr Luszyk countered that the BIPM was in a unique position to employ staff from NMIs on short-term contracts; such personnel could then return to their NMI and thus share the burden. Prof. Wallard drew attention to the post of Executive Secretary of the JCRB, which had indeed been financed in this way, but noted that short-term posts were not always appropriate.

Dr Valdés suggested that criteria should be defined for short-term/permanent posts; for example, that two- to three-year projects could be undertaken by temporary staff and maintenance of standards by permanent staff. Prof. Wallard noted that in the immediate term none of the retirements matched short-term positions.

Prof. Issaev remarked that it was also important to consider how to raise additional funds for the BIPM, noting that this could be done through new Members adhering to the Convention. He wondered whether there were other means. He pointed out that OIML now has 110 members, and suggested that the CIPM should perhaps be looking at new areas of work, to increase its relevance. He suggested the field of flow metering for oil and gas, and cited the example of ILAC as another organization with a wide impact. He said that it was important to explore all possible resources, including commercial companies, regional metrology organizations, and other international organizations, and contended that the BIPM should not continue to fulfil, without additional funding, work that relates to the roles of other organizations. It was important to consider the future on the longer-term, not just the next four years.

Prof. Kovalevsky noted that the addition of new Member States would not in fact affect the dotation, because the global dotation decided by each CGPM is simply distributed amongst the Members. On the other hand, new Associates bring additional income. Dr Quinn noted that with the addition of new Members, one would press for the approval of a higher dotation by subsequent CGPMs, and Mrs Perent added that new Members and new Associates both lead to increased expenditure.

Dr Tanaka turned the discussion to the unique activities of the BIPM, and particularly its important role in international coordination. He said it would be interesting to monitor the travel budget if staff were asked to attend regional metrology organization (RMO) and other meetings. Dr Quinn agreed that this was an important point, and added that senior BIPM staff were devoting an increasing proportion of their time to coordination

activities. He emphasized that their work as Executive Secretaries to the Consultative Committees is considered particularly useful precisely because they are highly experienced technical experts, but warned that they were already operating close to the possible limit. Currently, the senior staff spend only about 40 % of their time on maintenance of standards, and this is roughly 10 % lower than at the major NMIs.

Prof. Wallard highlighted the important role played by Dr R. Wielgosz, the Head of the BIPM Chemistry Section, in coordination with the WHO and WMO. Dr Quinn agreed that it would have been difficult to undertake this work without someone of Dr Wielgosz's experience, and it is essential that the BIPM maintains its laboratory facilities in order to be able to attract good staff.

Dr Semerjian noted that changes are intrinsic to life, and we are moving from a period when the BIPM maintains artefacts to a period when NMIs can have intrinsic standards. Also, with the success of the CIPM MRA the nature of the BIPM activities is changing. The CIPM should consider what essential contributions the BIPM can make, and what critical mass it requires in order to bring them about. Regarding temporary posts at the BIPM, he added that some people could come to learn, whereas other established experts could come to provide expertise.

Dr Quinn agreed that the role of the BIPM is changing, but this was due to increased pressure for coordination rather than because of changes in the standards themselves. The consequence was, however, that the BIPM should develop robust travelling standards so as to undertake key and other comparisons required by Member States.

Dr Hengstberger noted that the question is not simply of budget but of benefit to the NMIs; the interaction with the WMO, for instance, does not bring in any money. Yet NMIs benefit from such interactions in that they raise the profile of metrology in the eyes of the governments of Member States. It also opens up links at the international level, so opening up the opportunity to reinforce these links nationally. The role of coordination is currently very high and time-consuming in the field of chemistry, but in twenty years' time the necessary liaisons and infrastructure will have been established as in existing areas of physics and engineering. Some other field will in the future become the priority area for the coordination and the establishment of new international links.

Dr Luszyk warned that the CGPM must be very clear when advocating new activities that the BIPM will undertake. If no more money is supplied, new activities should not be started.

Dr Kaarls replied by saying that in fact chemistry and other activities started since the last CGPM had been achieved without any increase in dotation.

Prof. Kovalevsky noted that the shift towards coordination activities was already visible in the histograms presented by the Director: indeed, two of the sections listed (the JCRB and the KCDB) are entirely devoted to coordination work. This shows that the BIPM is moving in the right direction, but means that there will be fewer staff in the laboratories. He suggested that if the CGPM did not approve the proposed budget, the delegates should be asked to choose what in the proposed programme of work the BIPM should not pursue. Dr Schwitz added that Member States should be aware that support for traditional activities could not be continued if new work was started and budgets did not increase.

Dr Luszyk recommended that if NMIs are unhappy with the cuts that have been made, their directors should make representations to their governments; the NMIs interact with the BIPM on a technical level, but funding for that work is voted by the CGPM, which is largely non-technical.

Dr Quinn reminded the Committee of the results of the KPMG study which showed that the central coordination (by the BIPM) of multilateral relationships between individual NMIs is more efficient than the establishment of multiple bilateral arrangements. Further, a number of key comparisons have been piloted by the BIPM, while others have been piloted by the NMIs. The NIST and PTB have both devoted 1.5 man years to piloting comparisons that might otherwise have been run on a shared cost basis by the BIPM. In financial terms, this contribution is much higher than the requested increase in the dotation.

Prof. Kovalevsky concluded the discussion by calling for all members to defend the proposed four-year programme, approved by the CIPM in 2002, at the Conference.

#### **4.2 Draft Resolution J on the dotation**

The composition of the CGPM Working Group on the Dotation was then discussed. This working group will be set up during the Conference to consider the dotation and present their recommended (revised) version of Draft Resolution J for discussion. Prof. Kovalevsky reminded the Committee that this working group comprised all the Member States contributing at the maximum level, and a representation of Members contributing at the minimum level. He proposed that Argentina, Singapore and the Czech Republic, who had participated in the working group at the 21st CGPM, should be replaced this time by invitations to Mexico, the Republic of Korea, Serbia and Montenegro, and the Netherlands. Other countries concerned about the dotation would also be invited to participate. This was approved and will be proposed to the General Conference.

#### **4.3 Draft Resolution L on the decimal marker**

Dr Quinn asked the Committee to approve Draft Resolution L, which is a composite based on three proposals from the Governments of Australia, the United Kingdom, and the United States.

He explained that the current ISO standard 31, specifying that the comma is the decimal marker, is causing increasing problems due to the fact that WTO regulations require international standards to be followed in international trade. For many countries it is not acceptable to use the comma as the decimal marker, i.e., it is not acceptable to use ISO standard 31 in this respect and thus they fear that they will be in breach of WTO regulations.

Dr Bennett gave a brief introduction and there was unanimous support from the Committee for the principle that use of the point should be allowed, and that choice between the comma and the point was not language-dependent or country-dependent but free for each user to decide.

The CIPM agreed a number of minor changes to the wording and unanimously approved the revised text of the Resolution as Recommendation 2 (CI-2003). The Resolution will be presented at the CGPM by Prof. Kovalevsky after the report by the CCU.



## 5 THE CIPM MUTUAL RECOGNITION ARRANGEMENT

### 5.1 Report of the Chairman of the JCRB

Dr Quinn gave a summary of his report as the Chairman of the JCRB 1998–2003, which will be distributed at the CGPM. This brochure summarized all JCRB activities since 1998 (the JCRB was created the year before the MRA was signed) and includes a general report as well as the reports of all ten meetings prior to the 11th, held on 6-7 October 2003.

Some 500 key comparisons are under way and the results of about 100 are already published on the KCDB. During the first couple of years of the MRA, the discussions of the Consultative Committees were concentrated almost uniquely on key comparisons, but as the number of comparisons becomes stable, Committees are returning to other matters.

Dr Quinn warned that some key comparisons had led to prolonged discussions on statistics, even when the impact on the uncertainty of the key comparison reference value was minor.

There are now 16 000 validated CMCs listed in Appendix C of the KCDB, providing a unique resource for metrologists, accreditors and customers.

Dr Quinn then turned to implementation of quality systems which are being put in place in all NMIs and the BIPM. The process has been accelerated, and the split between the two alternatives, third party accreditation, usually to ISO/IEC 17025, and self-declaration (peer review), is about 50:50.

The process of peer review is still being studied and a number of issues are being pursued with ILAC and within the JCRB. At its 11th meeting (6-7 October 2003), for example, the JCRB set up a working group charged with drafting recommended criteria for naming assessors and peer reviewers. As far as possible, the system should be completely transparent.

On the end of the transition period, Dr Quinn reminded the Committee that Paragraph 11.4 of the CIPM MRA states that “after the initial period of four years, signatories may, with the approval of the appropriate governmental or other official authorities in their own country, make changes to this arrangement at meetings organized by the CIPM of directors of the national metrology institutes.” Other changes, however, might not concern the MRA text but rather the *Technical supplement* to the Arrangement or the

*Guidelines for CIPM key comparisons.* Dr Quinn proposed that minor changes to these auxiliary documents may be put forward by the JCRB at any time, be approved by the CIPM and be incorporated without the need to refer to the MRA signatories. He proposed a number of minor modifications to these two documents, and presented some interpretative statements and operational guidance proposed by the JCRB to provide clarifications of the MRA text itself. The JCRB proposals were based on their documents JCRB-11/6(2), JCRB-11/7, and JCRB-10/7\_rev.

Dr Quinn informed the Committee that the BIPM/ILAC working group was discussing their respective MRAs, with the view to including new information on very best capabilities and “special calibrations”, not just the capabilities on which routine calibration services were based.

He also drew attention to the need to increase awareness among users of the existence and importance of the CIPM MRA and the KCDB. He said that efforts to promote the MRA and the KCDB must be increased, particularly towards trade and regulatory agencies and industry. This is an activity in which JCRB members can play a lead role, including encouraging promotion by NMI directors to national representatives within trade/regulatory and industry sectors.

Finally, he mentioned the need to assist participation in the MRA by developing countries, and raised the question of the Caribbean Communities (CARICOM). The recognition of the MRA by such a regional body would allow a number of very small countries to become part of the system.

Prof. Kovalevsky thanked Dr Quinn for his report and invited questions from the Committee.

Dr Schwitz congratulated the JCRB on the success of their work and thanked Dr Quinn for his chairmanship. He asked how the concept of “best measurement capabilities” could be peer reviewed, and encouraged the instigation of a common effort to “sell” the MRA in the language of its customers. Dr Hengstberger called for a closer relationship between the CIPM MRA and the ILAC Arrangement in order to realize the full value of both. Prof. Göbel suggested the development of a “flyer” (publicity material) for distribution to users of both Arrangements.

Dr Bennett returned the discussion to “best CMCs”, saying that there was some urgency to the subject because some services are already being offered at a higher level than the NMI-declared CMCs. Dr Quinn said that

he had asked the RMOs to consult with their members. The JCRB would then try to put in place an appropriate procedure for the declaration of these “best” capabilities.

On the subject of promoting the MRA, Dr Semerjian emphasized that a coordinated, concerted activity was required. Reference to the MRA must be multilateral, not just unilateral; individual interaction with regulators and others will always run into the problem of “what’s in it for us?” For regulators to use the CIPM MRA, we must be in a position to give convincing answers to this question, and they must be able to see the benefits. He believed that a strong selling point was the *mutual* acceptance of test and calibration certificates.

Dr Inglis praised the compilation of the JCRB reports, and called for complete transparency as the way towards improving the uniformity of assessment of quality systems between regions. He commended the creation of the new JCRB working group and urged them to address the critical issues such as what exactly is meant by peer review.

Dr Kaarls agreed that great progress had been made, and reminded the Committee that interest in forming the JCTLM had stemmed from the JCRB and MRA. He reiterated that it was important to increase the profile of the MRA, and again called, with Dr Valdés, for the BIPM to be admitted as Observer to the WTO Committee on Technical Barriers to Trade. He told the CIPM that ILAC was already an important user of the KCDB, and stressed that it was important to differentiate between calibration and conformity assessment.

Dr Issaev supported the JCRB work as well as a closer working relationship between the OIML and the Metre Convention and stressed the importance of covering equivalence and comparability in any redefinition of traceability. The MRA would provide the technical basis for any revised definition of traceability.

## **5.2 Appointment of the new Executive Secretary of the JCRB**

Dr Quinn thanked Dr Angela Samuel, who had been recruited as Executive Secretary of the JCRB on secondment from the NML CSIRO. He said that she had been a huge success, fulfilling a key post for the operation of the JCRB with great competence. Dr Samuel would be returning to the NML CSIRO at the end of October 2003, at the end of her two-year contract at the BIPM. For the next two years, the position will be filled by

Dr Ismael Castelazo, on secondment from the CENAM, who arrived at the BIPM at the beginning of October 2003.

### **5.3 End of transition period of the MRA and criteria for CRMs in Appendix C**

Dr Quinn then read the document JCRB-11/7, concerning the review of CMCs published during the transition period of the CIPM MRA. Dr Kaarls said that for chemical reference materials (CRMs) it is essential that ISO Guide 34 be in place when the CRMs are delivered, as this is the means of delivering traceability. The Committee briefly discussed whether CRMs should be listed separately from CMCs, but decided to defer any decision to the following year.

Dr Inglis commented that clause C was rather open-ended and the Committee agreed that the provisional evidence must be reviewed at the end of another year. A sentence was added to this effect.

Dr Inglis then returned to his suggestion that guidelines be established for peer reviews, renewing his call to the JCRB to establish uniformity between regions. Prof. Göbel noted that this was the responsibility of the RMOs, not the CIPM, and Dr Quinn suggested that the idea of guidelines could be addressed during the extended JCRB in October 2004. Dr Semerjian commented that EUROMET was exemplary in the field of peer review, always providing additional evidence when required. He added that the RMOs in general were doing a good job, and that at their 11th meeting the JCRB had agreed to examine the processes and check that procedures were harmonized. The SIM had decided not to impose reviewers, but reserves the right to judge whether or not to accept the reports. Prof. Wallard reminded the Committee that the idea behind the extended JCRB was to bring together members of the different RMOs, to share ideas on best practice and improve transparency and confidence between regions.

The CIPM then gave their formal approval of the revised version of JCRB-11/7.

### **5.4 Consultative Committee Working Groups on CMCs**

Dr Quinn then read document JCRB-11/6(2) on the creation of Consultative Committee Working Groups on CMCs. Dr Valdés wondered how such an arrangement would work in a Committee such as the CCAUV and

suggested that three separate working groups would be needed to cover the separate fields of Acoustics, Ultrasound and Vibration. Dr Semerjian noted that in the CCQM the range of interests is extremely broad. He had found that transparency was greatly improved by a round-table inter-regional review, and because the people involved in the review were more or less the same group of people as at the Consultative Committee meeting, it made sense to hold the two meetings one after the other.

Prof. Göbel reminded the Committee that the idea of establishing such groups had been discussed the previous year, but at that time the CIPM had held back through concern about imposing too much MRA work on the Consultative Committees. He reminded the Committee that the review of CMCs is the job of the RMOs, not the CCs, and Dr Quinn agreed that the idea was simply to facilitate the closure of the loop of inter-regional review.

Prof. Kovalevsky summarized the view of the Committee by saying that the CIPM left the organization up to the Presidents of the CCs.

## **5.5 Participation of non-NMIs in key comparisons**

Finally, Dr Quinn raised the question of participation in key comparisons, saying that the bureau of the Committee was working on a document, which they would put to the CIPM in 2004. The CIPM agreed that only signatory NMIs and the institutes designated by the NMIs in Appendix A of the MRA should be allowed to participate in key comparisons. They also agreed that, by participating in a key comparison an institute should be committing itself to the declaration and maintenance of CMCs and external calibration services.

## **6 CONSULTATIVE COMMITTEES**

### **6.1 Consultative Committee for Units**

Prof. I.M. Mills, President of the Consultative Committee for Units (CCU), gave a brief report of the work of the Committee, describing their progress with the 8th edition of the SI brochure. Relatively minor changes will be

made, notably to the first chapter, making it more tutorial in style and including an explanation of what is meant by coherence in terms of units and a new section on biological units. The second chapter, along with the definitions of the base units, will explain which quantity is fixed by each definition (the speed of light, the Planck constant, etc.). The CCU is also planning to circulate a letter on the uno to directors of NMIs. It is hoped that the text of the new edition of the brochure will be ready for presentation to the CIPM for approval in 2004. As with the 7th edition, the intention is that the 8th edition will be made available in electronic form on the BIPM website.

On behalf of the CIPM, Prof. Kovalevsky thanked Prof. Mills for the work of the CCU, agreeing that it was high time for a new edition of the SI brochure and adding that he thought the suggestion of including the links to the fundamental constants was a useful one.

## **6.2 Consultative Committee for Amount of Substance: Metrology in chemistry**

Dr Kaarls presented a report on the 9th meeting of the Consultative Committee for Amount of Substance: Metrology in chemistry (CCQM) held at the BIPM in April 2003, at which the tenth anniversary of its creation had been celebrated. He told the CIPM that the area addressed by the CCQM continues to broaden and now includes measurements related to clinical chemistry and laboratory medicine, drugs testing, and food testing. This implies intensified cooperation with other intergovernmental and international organizations, including the Codex Alimentarius Commission, IFCC, ILAC, WADA, WHO and WMO.

In connection with institutes delivering certified reference materials (CRMs), it is clear that they have to comply with ISO Guide 34 in addition to ISO 17025 or equivalent. The CCQM called for these quality criteria to be mentioned in the text of the CIPM MRA or its appendices on technical interpretation. The CCQM also called for more guidance on the criteria for “designation” of institutes in the context of the CIPM MRA. This is related to the extent to which a designated institute can present, as its own CMC, a measurement capability that is in fact sub-contracted to another institute that is itself not a designated institute. Dr Tanaka asked whether the text on sub-contracting in ISO 17025 would suffice. Dr Kaarls replied that the question was more the interpretation of the text of the CIPM MRA. NMIs

should not simply rubber-stamp the work of others; it would be preferable for the second party to be designated. This was discussed further by the CIPM under item 5 of the agenda.

The CCQM work on the JCTLM was discussed under item 7.

Dr Semerjian thanked Dr Kaarls and Dr Quinn for the huge amount of work that had been achieved in this new and vast area.

### **6.3 Consultative Committee for Ionizing Radiation**

Prof. Moscati presented a brief report on the 16th meeting of the Consultative Committee for Ionizing Radiation (CCRI), the written report of which is in preparation. On the subject of CMCs he reminded the Committee that the reviews pass through the regional metrology organizations, not the CCRI itself, but noted that a recent meeting of an RMO working group on CMCs had been very successful.

Prof. Göbel commented that a large number of CMCs were being processed in the field of ionizing radiation and Dr Hengstberger agreed that, particularly for Section II of the CCRI, these CMCs appeared to be too closely based on individual key comparisons for each radionuclide. This leads to a heavy load of key comparisons. Prof. Moscati replied that every isotope is different, but said that the CCRI was looking for a solution to the problem. Dr Kaarls pointed out that in the field of chemistry it was totally impossible to carry out a key comparison for each measurand.

Dr Semerjian noted that this issue had been discussed many times in the JCRB and, unfortunately, some Consultative Committees continued to interpret the MRA too conservatively. He called for the CIPM to send out a stronger message concerning the role of key comparisons, but Dr Quinn said that the message should be passed not only by the CIPM but also by the President of the Committees involved!

Prof. Moscati concluded his presentation by describing the concept of a “standard” ionization chamber which is being developed for use in activity standards laboratories; this could facilitate comparisons.

#### **6.4 Consultative Committee for Thermometry**

In the absence of Prof. Ugur, President of the Consultative Committee for Thermometry (CCT), Prof. Quinn gave a brief presentation of the work of the CCT. He then commented that very few key comparison results were currently available in the field of thermometry, and no CMCs had yet been published on the KCDB.

#### **6.5 Consultative Committee for Photometry and Radiometry**

Dr Hengstberger, President of the Consultative Committee for Photometry and Radiometry (CCPR), gave a brief presentation on the work of the CCPR, outlining the terms of reference established for the various working groups.

#### **6.6 Consultative Committee for Length**

Dr Chung summarized the activities of the Consultative Committee for Length (CCL) and read out the three Recommendations made at the last meeting of the CCL.

Concerning Recommendation 1 (2003), which expressed the Committee's concerns over the proposed reduction of BIPM work in laser and length metrology, Prof. Kovalevsky answered that the priorities for the scientific work of the BIPM had been discussed extensively by the CIPM the previous year. The CIPM took note of the Recommendation, commenting that no further action could be taken immediately, but that the subject could be re-discussed when the implications of the CGPM decisions on the BIPM budget are known.

CCL Recommendation 2 (2003), proposing revisions to the list of recommended radiations in the *mise en pratique*, was adopted by the CIPM as Recommendation 1 (CI-2003).

#### **6.7 CCL-CCTF joint working group**

Prof. Wallard reported that, following the wishes of the CIPM, a very productive two-day joint meeting had been held between experts from the CCL and CCTF to consider convergence of interests in work that could lead to secondary representations of the second. Criteria had been established to



judge candidate radiations, and the microwave rubidium transition currently appeared to be a good candidate for assessment. The CCL-CCTF group will report to the CCTF in April 2004 and the CCL will be kept fully informed. Another joint meeting is planned for 2004.

## 6.8 Reports of Consultative Committee meetings

Dr Quinn proposed that future reports of Consultative Committee meetings should no longer be translated and printed in the full bilingual version but instead the report in its original language plus all relevant working group reports and other working documents be placed on the BIPM website with public access.

Dr Hengstberger welcomed the suggestion, pointing out that this would eliminate the time spent hunting for mislaid printed copies and also reduce the amount of storage space required to house such reports. Prof. Leschiutta asked how the longevity of the records would be ensured for the future and Dr Quinn assured him that best practice would be followed concerning file types, but that at least one printed copy of all reports and working documents would also be stored. Dr Semerjian agreed that electronic publication was the best way to increase availability of the reports, but expressed doubt that the proposal would save money in the long term. There would be an ongoing problem with upgrading new files and the electronic archive to keep abreast of changes in software.

After brief discussion the CIPM approved the proposal.

## 6.9 Membership of Consultative Committees

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

<b>Committee</b>	<b>New members</b>	<b>New observers</b>
CCEM		MIKES
CCTF		Centre de recherches spatiales AOS
CCQM	CENAM	
CCRI Section I	METAS	CMI IIR
CCRI Section II	CMI IIR	
CCRI Section III	CMI IIR	

Requests for membership of the CCL will be considered next year, as part of a full CIPM review of Consultative Committee membership.

### **6.10 Future meetings**

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

#### **2004**

CCL-CCTF	31 March
CCTF	1-2 April
CCQM	22-23 April
CCU	13-14 May
CCEM	9-10 September
CCAUV	27-28 September
JCRB Workshop	29 September
JCRB	29-30 September
Directors' meeting	30 September – 1 October
CIPM	5-8 October

#### **2005**

CCM	25-29 April (linking with a symposium at NPL )
CCQM	April
CCRI	May
CCL	early September
CCPR	September (associated with NEWRAD)
CCT	

## 7 **JOINT COMMITTEE FOR TRACEABILITY IN LABORATORY MEDICINE (JCTLM)**

Dr Quinn read to the Committee four documents concerning the JCTLM: a declaration of cooperation between the CIPM, the IFCC and ILAC for the establishment of a Joint Committee for Traceability in Laboratory Medicine; the names associated with the two working groups that have been established; the JCTLM framework for the international recognition of available higher order reference materials, available higher order reference measurement procedures and reference measurement laboratories for laboratory medicine; and an appendix on the participation of organizations in the JCTLM.

He commented that this was an important matter, already discussed by the CIPM the previous year, and apologized for the short notice in distributing the documents, the current drafts of which were dated 22 September 2003.

In answer to questions from the Committee, Dr Quinn clarified that the use of the word “mandatory” referred to the European Union Directive, not the JCTLM framework, and that the role of the BIPM would be as facilitator and (joint) developer and coordinator of the database of reference materials. Dr Lusztyk asked what cost was involved and whether the BIPM would have to recruit someone to undertake the work required. Dr Quinn replied that thus far the cost of this work had been high, including part of his time and part of that of Dr Wielgosz. In addition, three meetings had already been organized and paid for. However, tens of billions of dollars are involved and he is seeking support from the large pharmaceutical companies for the creation of the database. There can be no question of the BIPM not participating in the project; it is an obligation. Prof. Wallard added that although the JCTLM framework had taken a long time to develop, it could now prove a useful model for other developing areas of work, such as that of food.

Dr Semerjian called for the activities of the JCTLM to be brought up at the General Conference, saying that the project requires resources and the economic impact is huge. Politicians will understand the argument.

Dr Kaarls commented that it was an excellent example of NMIs and industries working together. The CIPM approved the work and encouraged the BIPM to continue with the JCTLM activities.

## **8 METRE CONVENTION/OIML/ILAC JOINT WORKING GROUP**

### **8.1 Present status of discussions**

Prof. Wallard reported that ILAC and the bureau of the CIPM had been working closely with the OIML on the OIML draft law on metrology.

Dr Schwitz asked to what extent the relation between NMIs and NABs was an issue for ILAC. Prof. Wallard reassured him that the question had been asked, and that he was not aware that ILAC had raised any specific problems with the distinction.

Prof. Göbel noted that it is important that the CIPM and NMIs should make their procedures transparent to ILAC. Dr Inglis agreed, saying that the CIPM's work, particularly concerning the MRA, must move forward in partnership with ILAC.

Prof. Kovalevsky asked Prof. Wallard to take these comments on board in his continued discussions with the ILAC and OIML.

### **8.2 Joint Committee on Assistance to Developing Countries in Metrology, Accreditation and Standardization (JCDCMAS)**

Prof. Wallard circulated a document on the JCDCMAS, saying that the aim of the initiative is to pool expertise and to provide information as a way of raising awareness of the various activities that make an appropriate and coherent MAS infrastructure to support sustainable economic development. The emphasis will always be on supporting, enhancing and adding value to existing activities. The countries and regions concerned can then set their own priorities and develop a MAS model that best meets their needs and conforms to international requirements. The JCDCMAS will act as a source of up-to-date and expert information but neither has, nor intends to promote a preconceived model for MAS infrastructure. It is not the role of the JCDCMAS to seek external funding as a group; this is the function of each partner body, as deemed appropriate by its constituency.

Prof. Göbel thanked the BIPM for their involvement in this important area, which is one in which the PTB has a long tradition of activity. However, he asked what the JCDCMAS hoped to achieve without a means of funding, pointing out that the CIPM has higher priorities.

Dr Quinn gave an account of the exchanges he had had with the Head of Conformity Assessment at ISO in which he had requested that the NMI view that calibration is not a conformity assessment activity should be expressly included in draft new ISO 17000 and 17010. He reported that he had so far only limited success.

Dr Hengstberger expressed his strong support for the BIPM's participation in the work with developing countries, saying that without input from the metrology community there was a risk that developing infrastructures would be skewed towards standardization activities.

On behalf of the CIPM, Prof. Kovalevsky encouraged Prof. Wallard to continue the work of the JCDCMAS.

## **9 CONTACTS WITH OTHER INTERNATIONAL ORGANIZATIONS**

### **9.1 ILAC, WHO, WMO, WTO**

The interactions with the ILAC, WHO, WMO and WTO are discussed under items 2 and 8 of the agenda.

Prof. Issaev added that the WMO was still using the IPTS-48 but he would contact the President of the WMO and would see if he could exert an influence. Dr Quinn added that Dr Wielgosz was also now attending various working groups of the WMO.

### **9.2 ISO CASCO**

Dr Quinn read out the response he had received from the Head of Conformity Assessment at ISO, to a letter he had sent in June expressing concern that a distinction should be made between conformity assessment and calibration. Dr Kaarls will attend the next WG5 meeting as the BIPM representative.

Prof. Göbel agreed that NMIs could undertake conformity assessment, but that it was important to understand the difference.

### 9.3 **Contacts with the Codex Alimentarius Commission, WADA and others**

Dr Kaarls informed the Committee that a CCQM Workshop on Comparability and Traceability in Food Analysis would be held at the BIPM on 18 and 19 November 2003. In addition to the Codex Alimentarius Commission, the CCQM were also establishing contact with the World Anti-Doping Agency (WADA).

Dr Hengstberger gave his strong support to the application of metrological principles in food testing, emphasizing the importance of this area of work, particularly to developing countries.

## 10 **JOINT COMMITTEE FOR GUIDES IN METROLOGY (JCGM)**

Dr Quinn reported that the work of the JCGM Working Group 1 on the Expression of Uncertainty in Measurement (GUM) is progressing well. They are producing guidance documents to extend but not change the original *Guide to the Expression of Uncertainty in Measurement*, and expect to have new documents ready during 2004.

The JCGM Working Group 2 on the *International Vocabulary of Basic and General Terms in Metrology* (VIM) has met twice since the last CIPM but has made less progress and discussions on Chapter 1 in particular seem to be protracted. Dr Hengstberger cautioned that it was important for only incremental changes to be made to a vocabulary. If significant changes were made, users would lose confidence in the document. He mentioned that individual terms in the CIE vocabulary are only changed if there is unanimous agreement on this specific change. This tends to assure a significant measure of stability for established terms and also speeds up the work of the committee dealing with the revisions. Dr Kaarls asked if any new words were being discussed, and Dr Quinn gave the example of “equivalence”.

## **11 WORK OF THE BIPM**

### **11.1 Director's Report and proposals for future scientific work**

The Director introduced his reports in the following terms:

In my introduction to the Director's Report 2002, I highlighted the many other activities carried out by the staff of the BIPM in addition to the scientific work in the laboratories. It was clear from responses to the questionnaire sent to directors of NMIs in 2001 that these other activities are seen by the NMIs to be of high importance. This has been reinforced this year by the ever-increasing number of meetings at the BIPM and contacts with other organizations and extensions into new fields, notably our response to an urgent industrial need for international recognition of reference materials for laboratory medicine.

I would like to emphasize this year that the success of the BIPM in carrying out all these other activities rests in large part on the technical competence of the staff, a technical competence that comes from their active engagement in scientific work in the BIPM laboratories, i.e. metrology. It was very clear from the responses to last year's questionnaire that NMIs greatly appreciate the technical support that BIPM staff give to Consultative Committees. In this respect the senior staff at the BIPM have spent a great deal of time assisting in the analysis and interpretation of data from CIPM key comparisons and their linking to the corresponding RMO comparisons. The presence of BIPM staff at RMO technical meetings is also highly valued, which certainly would not be the case if they lacked technical competence.

The BIPM laboratory work, described in this Report, gives us the technical competence to supply all these services, including the ability to act as pilot laboratory for a number of key comparisons. Some of these are the permanent ongoing key comparisons and others are carried out from time to time. I draw your attention particularly this year to the beginning of what will in the future be an ongoing key comparison on atmospheric ozone content. The experience of many NMIs shows that the piloting of key comparisons is a time-consuming and costly process.

BIPM technical competence also allows us to provide certain calibrations that are used by nearly half of the Member States of the Metre Convention. Technology transfer during BIPM calibrations and particularly during

BIPM key comparisons was also highlighted as a significant benefit to NMIs. Overall, the technical competence of the BIPM allows us to provide many services that benefit all NMIs, both large and small.

While I cannot hide the fact that the decisions we took in October 2002 to close the Radiometry and photometry section and to greatly reduce the effort in length will weaken the impact that the BIPM can have in these areas, the new work in organic chemistry will, however, meet a pressing need. The staff of the BIPM will continue to make every possible effort to maintain the support to NMIs and Consultative Committees in all these areas.

While recognizing the financial constraints that led us to make these decisions and the essential nature of the move into organic chemistry, I would like to use this occasion to draw the attention of directors of NMIs to the overall cost effectiveness of the BIPM and to the advantages for all in maintaining it at maximum efficiency.

The following is a summary of the scientific and technical activities carried out at the BIPM since July 2002.

**Length:** The main activity in the Length section during 2003 was the development of our comb system, its use in thirteen absolute frequency calibrations of lasers from NMIs, and in experiments to demonstrate the current limitations of comb technology. We now have two comb systems, placing us in an excellent position to assess the current state of the art, and allowing us to offer calibrations as a replacement for the long-standing service of heterodyne comparisons.

The outstanding achievement was a collaboration with East China Normal University that demonstrated sub-hertz performance in a simultaneous measurement on a single laser using two combs. This result has been followed by a similar comparison at NIST/JILA (United States) that is currently in progress.

We continue to improve our compact laser source. We expect to use it in improvements to the BIPM gravimeter and in the dimensional measurements that will be needed for the calculable capacitor and the watt balance projects. In gravimetry itself, we have published the results of the 2001 international comparison of absolute gravimeters using novel analytical software.

**Mass:** Three new 1 kg prototypes have been made and calibrated and two others are nearing completion. A modified finishing process has been



developed using a diamond-paste final polishing rather than diamond machining. This work requires close coordination among the machine shops and the services within the Mass section for volume and mass calibrations. On the research side, additional measurements tend to confirm a small, systematic difference between air density determined through the CIPM-1981/91 equation and through buoyancy artefacts. A possible explanation is being sought. Surface effects have also been studied using both gravimetry and ellipsometry. Development of our new apparatus for the determination of the Newtonian gravitational constant,  $G$ , continues to make steady progress and should soon produce definitive results. Finally, the BIPM is now engaged on the development of a novel watt balance and members of the Mass section are active in the team that has been formed to carry out this work.

**Time:** The calculation process for International Atomic Time (TAI) has been automated, and since May 2003 BIPM *Circular T* has been improved: results are given to a tenth of a nanosecond and information on the time links for TAI is provided in a new section. The medium-term stability of TAI, expressed in terms of an Allan deviation, is estimated to be about  $0.6 \times 10^{-15}$  for averaging times of 20 d to 40 d. The accuracy of TAI is based on the data from nine primary frequency standards that include at present five caesium fountains (IEN CSF1, BNM-SYRTE FOM, BNM-SYRTE FO2, NIST-F1, and PTB CSF1). The scale unit of TAI has been estimated to match the SI second to within  $2 \times 10^{-15}$  since August 2002. An important part of the activity of the section deals with studies of time and frequency comparison using navigation satellite systems. The network of international time links, which classically relied only on the Global Positioning System (GPS) common-view technique based on C/A-code measurements obtained from one-channel receivers, has today twelve GPS multi-channel links and nine two-way time-transfer links. Work has been done to evaluate the Type A and Type B uncertainties of TAI time links, soon to be published in *Circular T*. A pilot experiment to test the use in TAI links of dual-frequency P-code measurements from geodetic type GPS receivers is under way. Calibration programmes of GPS receivers have been organized and run by the section.

Research work is also dedicated to space-time reference systems, particularly to the relativistic framework for defining and realizing coordinate times. The BIPM Time section and the USNO (United States) jointly provide the Conventions Product Centre of the International Earth

Rotation Service with the responsibility of establishing conventions for space-time reference systems. Other research subjects are pulsars, future clocks in space and atom interferometry.

**Electricity:** In March 2003 we received our first programmable array of Josephson junctions from the PTB (Germany). Our first task was to carry out systematic checks that when the 0.6 V output of half of the junctions is compared with that of the other half, the measured difference is zero to within 0.1 nV. Next, when the total 1.2 V output is compared with that of a conventional unbiased array, that the difference is zero to within the same uncertainty. In the voltage calibration area, automation of the calibration measurements for Zener standards has been completed. In impedance metrology, a new lower uncertainty has been assigned to the ac/dc resistance difference in the coaxial resistors that are critical links in the BIPM measurement chain linking the quantized Hall resistance to the impedances of standard capacitors. This work supports BIPM capacitance calibrations that are now in high demand as evidenced by the forty certificates issued to twelve NMIs this year. The activities aimed at characterizing the noise and stability of dc metrology instruments using Allan variance and spectral density techniques have turned towards the analysis of reversed-polarity measurements closely modelling the classical methods in this area. The data demonstrate that the noise levels obtained in the two simultaneous reversed-polarity measurements, that of the signal under test and that of the unreversed voltages are coherent with the results of single-polarity experiments. Our noise analysis techniques are beginning to attract the interest of NMIs and a collaborative project has been successful in transferring them to the NIST. Another interesting collaboration is that with the Chemistry section where the techniques of time-series analysis are being applied to molar concentration measurements. Finally, the Electricity section continues to play an active role in comparison activities, including a second participation in EUROMET Project 626 (testing programmable arrays), calculation of the linking of key comparison EUROMET.EM.BIPM-K11 of 10 V standards to BIPM ongoing key comparison BIPM.EM-K11.b, a second round of measurements of the 100  $\Omega$  travelling standards in comparison CCEM-K10, and completion of a new bilateral comparison at 10 V in BIPM.EM-K11.b. Members of the Electricity section participate in the preliminary discussions on the BIPM watt balance project.











the issues of 2003 to date had been published on time. *Metrologia* had made more money than had been budgeted for, and arrangements were in hand for back issues (prior to issue 32(4)) to be made available electronically. Prof. Kovalevsky commented that this was another potential source of revenue.

Dr Quinn announced that Dr Jeffrey Williams, currently working for the Leverhulme Trust in London, had been appointed as Editor to replace Prof. Peter Martin on his retirement in January 2004.

## 13 ADMINISTRATIVE AND FINANCIAL AFFAIRS

### 13.1 ***Rapport annuel aux Gouvernements; quietus; progress report on the 2003 exercise; budget for 2004***

Mrs Perent announced that the contribution from Viet Nam had been received during the meeting, and Viet Nam was henceforth an Associate of the CGPM.

Dr Quinn confirmed that the *Rapport annuel aux Gouvernements des Hautes parties contractantes sur la situation administrative et financière du Bureau International des Poids et Mesures en 2002* had been distributed in March 2003 and the CIPM duly approved the accounts for 2002. The required formal discharge was given to the Director and Administrator of the BIPM.

Dr Quinn then presented a summary of the BIPM's accounts for 2003 and Prof. Wallard presented the proposed budget for 2004. Both were approved after short discussion.

Dr Semerjian asked whether savings might be made under the heading "publications", referring in particular to the boxed presentation of the report of the 21st CGPM. Dr Lusztyk asked whether it could be published electronically and only in English. Dr Quinn replied that it was a requirement of the Metre Convention that official reports should be published in French, and said that a printed version was required for sending to Member Governments.



**Budget for 2004**

<b>Income</b>		euros
<i>Budgetary income:</i>		
1. Contributions from the States		9 254 054
2. Interest on capital		268 800
3. Miscellaneous income		26 000
4. Subscriptions from the Associates		163 692
5. <i>Metrologia</i>		71 000
Total		<b>9 783 546</b>
<b>Expenditure</b>		
<i>A. Staff expenses:</i>		
1. Salaries	4 023 000	} 5 355 400
2. Family and social allowances	878 600	
3. Social expenses	453 800	
<i>B. Contribution to the pension fund:</i>		1 425 000
<i>C. Operating expenses:</i>		
1. Heating, water, electrical energy	168 900	} 1 145 400
2. Insurance	34 000	
3. Publications	144 300	
4. Office expenses	149 200	
5. Meeting expenses	85 000	
6. Travel expenses and freight charges	330 000	
7. Library	198 000	
8. Bureau of the CIPM	36 000	
<i>D. Laboratories:</i>		1 390 000
<i>E. Buildings (major maintenance and renovation):</i>		400 000
<i>F. Miscellaneous and unforeseen expenses:</i>		67 746
Total		<b>9 783 546</b>

**13.2 Staff promotions**

The CIPM approved the appointment of Jeffrey Williams, Head of Publications, at the grade of *physicien principal*, and approved the promotions of Alain Picard and Roland Goebel to *physicien principal* and of Leonid Vitushkin to *physicien chercheur principal*.

### **13.3 BIPM statute**

Dr Quinn proposed some minor modifications of the BIPM staff statute, proposing that all the staff commissions should be made statutory, introducing new job titles and formalizing the days of absence for various personal reasons. This was approved.

## **14 OTHER BUSINESS**

### **14.1 BIPM Summer School in 2003**

Dr Quinn reported that the BIPM Metrology Summer School 2003 had been a great success, attended by eighty students from a total of thirty countries.

He then reminded the Committee of the two main aims of the School, the first was to present a broad review of metrology by a group of world-class lecturers and the second was to provide the occasion for a select group of young people from national metrology institutes around the world to meet and make the contacts and friendships that are essential for the future well being of the metrology community.

He said that in the first of these aims we undoubtedly succeeded and as regards the second only time will tell, but the overwhelming response of the students to the lectures and to everything related to the School was very positive. All the students requested that a BIPM Metrology Summer School be repeated, perhaps in three or four years time.

Dr Bennett asked what the average student age had been. This had not been asked of the participants, but Dr Quinn estimated mid-30s.

Prof. Leschiutta congratulated Dr Quinn and added that the next Varenna Summer School was planned for 2006.

### **14.2 KRISS proposal for work in materials testing**

Dr Quinn said that Dr Myung Sai Chung had forwarded a request from the director of the KRISS for work in materials testing. The CIPM agreed with

Dr Quinn that this should be discussed at the meeting of directors during the CGPM the following week, when the Director of the KRISS could present his proposal.

### **14.3 Nomination of Dr Quinn as Emeritus Director**

In Dr Quinn's absence, Prof. Kovalevsky proposed that he should be nominated Emeritus Director as from January 2004. This was accepted unanimously.

Prof. Kind presented Dr Quinn with an article printed in *Metrologia* (issue 40(5), 2003, 255-257), dedicated to Terry Quinn, FRS, Director of the BIPM from 1988 to 2003, in recognition of the important contributions he made to metrology.

Dr Quinn thanked Prof. Kind and the Committee recorded their gratitude to him for his achievements during his tenure as Director of the BIPM.

### **14.4 Selling Pt-Ir prototypes to non-member States**

Dr Quinn raised the possibility of selling Pt-Ir prototypes to non-member States and asked at what margin they should be priced. Dr Kaarls reminded the Committee that calibrations were not undertaken by the BIPM for non-member States or Associates, and the Committee agreed that this also applied to the production of Pt-Ir prototypes and stainless steel kilogram standards.

### **14.5 Access to the safe containing the kilogram prototypes**

Dr Quinn requested the Committee's permission for Prof. Kovalevsky to leave him with the key held by the President of the CIPM to the safe containing the international prototype of the kilogram. He explained that he would like to have access to the safe in order to re-organize the kilogram prototypes, and also to facilitate the transfer of the Director's key to Prof. Wallard. He would not need to handle the kilogram itself. The National Archives of France have already sent their key, which must be returned within three months. The CIPM approved the request.

**15 ELECTION OF THE BUREAU OF THE CIPM**

Prof. Kovalevsky reminded those present that the bureau of the CIPM was elected by ballot during the short meeting held on the Friday afternoon at the end of the General Conference. In the absence of Prof. Kovalevsky, who left the chair to Prof. Moscati, nominations were invited for the post of President of the CIPM. Prof. Kovalevsky was re-elected unanimously. Dr Quinn proposed that Prof. Kovalevsky should also be elected Honorary Member after his retirement, and the Committee gave their full support.

In the absence of the concerned parties, Prof. Kovalevsky then renewed the elections of Prof. Göbel as President Elect, Prof. Moscati and Dr Inglis as Vice-Presidents, and Dr Kaarls as Secretary, all being re-elected unanimously.

Prof. Kovalevsky praised the contributions of all of the bureau members during the last year, and thanked Dr Kaarls in particular for the enormous amount of work he had done on behalf of the Metre Convention.

He then renewed his thanks to Dr Quinn, who expressed his thanks in turn for everyone's help, noting in particular the roles played by Mrs Brigitte Perent and Mrs Françoise Joly. Dr Quinn wished Prof. Wallard every success in his tenure as Director of the BIPM from 1 January 2004.

Prof. Kovalevsky then thanked Prof. Gopal, who will be retiring from the CIPM before the next meeting, saying that he had been a valuable member of the Committee for twelve years and wishing him a long and happy retirement.

Finally, as Prof. Kovalevsky had announced that he would be retiring from the CIPM on 2 July 2004, he said how much he had enjoyed his interactions with the CIPM, as Member, Secretary and then President, and that he would treasure fond memories of the spirit of the Committee.

**16 DATE OF NEXT MEETING**

The 93rd meeting of the CIPM will take place at the Pavillon de Breteuil from Tuesday 5 to Friday 8 October 2004. The President closed the 92nd meeting by thanking the Committee again for their contribution to the success of the General Conference.

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

**RECOMMENDATION 1 (CI-2003):**  
**Revision of the *Mise en Pratique* list of recommended radiations**

The International Committee for Weights and Measures,

**considering** that

- improved frequency values for radiations of some high-stability cold ion standards already documented in the recommended radiations list have recently become available;
- improved frequency values for the infra-red gas-cell-based optical frequency standard in the optical telecommunications region, already documented in the recommended radiations list, have been determined;
- femtosecond comb-based frequency measurements for certain iodine gas-cell standards on the subsidiary recommended source list have recently been made for the first time, leading to significantly reduced uncertainty;

**proposes** that the *recommended radiation* list be revised to include the following:

- updated frequency values for the single trapped  $^{88}\text{Sr}^+$  ion quadrupole transition and the single trapped  $^{171}\text{Yb}^+$  octupole transition;
- an updated frequency value for the  $\text{C}_2\text{H}_2$ -stabilized standard at 1.54  $\mu\text{m}$ ;
- updated frequency values for the  $\text{I}_2$ -stabilized standards at 543 nm and 515 nm.

**RECOMMENDATION 2 (CI-2003):  
Symbol for the decimal marker in the International System of Units (SI)**

The International Committee for Weights and Measures,

**considering** that

- a principal purpose of the International System of Units (SI) is to enable values of quantities to be expressed in a manner that can be readily understood throughout the world,
- values of quantities are normally expressed as a number times a unit,
- often the number in the expression of the value of a quantity contains multiple digits with an integral part and a decimal part,
- in Resolution 7 of the 9th General Conference, 1948, it is stated that “In numbers, the comma (French practice) or the dot (British practice) is used only to separate the integral part of numbers from the decimal part”,
- following a decision of the International Committee made at its 86th meeting (1997), the International Bureau of Weights and Measures now uses the dot (point on the line) as the decimal marker in all English language versions, including the English text of the SI Brochure (the definitive international reference on the SI), with the comma (on the line) remaining the decimal marker in all of its French language publications,
- nevertheless, some international bodies use the comma on the line as the decimal marker in their English language documents,
- furthermore, some international bodies, including some international standards organizations, specify the decimal marker to be the comma on the line in all languages,
- the prescription of the comma on the line as the decimal marker in many languages is in conflict with the customary usage of the point on the line as the decimal marker in those languages,
- in some languages that are native to more than one country, either the point on the line or the comma on the line is used as the decimal marker depending on the country, while in some countries with more



than one native language, either the point on the line or comma on the line is used depending on the language,

**declares** that

- the SI symbol for the decimal marker shall be either the point on the line or the comma on the line,

**reaffirms** that

- “Numbers may be divided in groups of three in order to facilitate reading; neither dots nor commas are ever inserted in the spaces between groups”, as stated in Resolution 7 of the 9th CGPM, 1948.

## **APPENDIX 1. Election of Dr Semerjian to the CIPM**

The following is the revised version of my Note for the October 2003 meeting of the CIPM

### **Procedure for the election of Hratch Semerjian to the CIPM by the 22nd CGPM in October 2003**

**A Note for the record by T.J. Quinn, revised May 2004**

#### **The formal situation as regards elections to the CIPM**

Elections to the CIPM are treated in Articles 7 (1875), 8 (1921) and 9 (1921) of the Rules Annexed to the Metre Convention. These Rules have the same force as the Convention itself, see Article 22 (1875) of the Rules.

In Article 7 (1875) of the Rules it is stated that one of the tasks of each General Conference is to elect or re-elect half of the CIPM.

In Article 8 (1921) it is stated that in selecting the names to be submitted to the Conference, first those that have been provisionally elected by the CIPM since the last Conference are taken then the remainder (to make up a total of nine) are chosen by lot from among the remaining members of the CIPM.

In Article 9 (1921) it is stated that the CIPM can proceed to a (provisional) election only after three months have elapsed from the time that all members of the Committee have been informed of a vacancy.

Taken together, these Articles mean that members of the CIPM are elected by the CGPM but between CGPMs the CIPM itself makes provisional elections subject to ratification at the next CGPM.

#### **Election procedure at a CGPM**

At the moment of the election of members of the CIPM, which normally takes place right at the end of the Conference, the Secretary of the Committee explains the procedure to the delegates and invites them to complete the ballot paper that is given to each delegation. He will say that the names on the list drawn up by the CIPM are only proposals and that each delegation has the right to delete one or more names and replace them

by others or leave them blank. It is a real election and it is quite rare that all members are elected or re-elected unanimously.

### **The departure of Karen Brown from the NIST**

Karen Brown (Deputy Director of the NIST, United States) had been provisionally elected by the CIPM since the 21st CGPM, in consequence her name would normally have been on the list that the CIPM proposed for election by the 22nd CGPM in October 2003. However, she had left the NIST in the early Summer of 2003.

The bureau had been informed at the beginning of August 2003 of the departure of Karen Brown from the NIST and of her intention to resign from the CIPM and that the candidate of American nationality to replace her would be Hratch Semerjian, also of the NIST. Note that it has long been the practice of the CIPM to have a member from each of the Member States paying at the maximum, of which the United States is one. According to Article 9 (1921) of the Rules, however, by the beginning of August 2003, it was already too late to proceed to an election by the CIPM before the 22nd CGPM. In any case, the CIPM does not elect candidates whose curriculum vitae has not been previously discussed at a meeting and that of Hratch Semerjian had not yet been discussed by the CIPM.

### **Procedure decided by the CIPM**

The CIPM at its meeting just before the 22nd CGPM examined the cv of Hratch Semerjian from the NIST, which had been distributed to all members of the CIPM at the beginning of September 2003.

With the agreement of all concerned, the CIPM then decided that the best way of proceeding would be as follows: instead of putting Karen Brown's name on the list of those to be elected or re-elected by the Conference, the name of Hratch Semerjian would be put in its place and the Conference would be invited to elect him directly.

By this procedure, Karen Brown would not have to resign from the CIPM, instead, she would simply not be putting herself forward for election. Furthermore, by this procedure the CIPM would be following its rule that it does not proceed to the election of a candidate without his or her curriculum vitae having been reviewed at a previous meeting of the Committee. Although the CIPM would not in fact be electing Hratch

Semerjian, it would be putting his name on the list of candidates for election by the CGPM, which really comes to the same thing.

The modification to the application of Article 8 (1921) of the Rules, namely the addition of a name not of someone already a member or provisionally elected, was a decision of the CIPM and, although it does not seem to have happened before, was considered by the CIPM to be within the rules of the Convention. The 22nd CGPM agreed and Hratch Semerjian was duly elected a member of the CIPM.

## LIST OF ACRONYMS USED IN THE PRESENT VOLUME

### 1 Acronyms for laboratories, committees and conferences

AGAL	Australian Government Analytical Laboratories
AIST*	National Institute of Advanced Industrial Science and Technology, see NMIJ/AIST
AOS	Astrogeodynamical Observatory, Borowiec (Poland)
APMP	Asia/Pacific Metrology Programme
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)
BNM-LNE	Bureau National de Métrologie, Laboratoire National d'Essais, Paris (France)
BNM-SYRTE	Bureau National de Métrologie, Systèmes de Référence Temps Espace, Paris (France)
CARICOM	Caribbean Community
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
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
CENAM	Centro Nacional de Metrología, Querétaro (Mexico)
CGPM	General Conference on Weights and Measures/ Conférence Générale des Poids et Mesures
CIMO	Commission for Instruments and Methods of Observation of the WMO, see WMO
CIPM	International Committee for Weights and Measures/ Comité International des Poids et Mesures
CMI-IIR	Český Metrologický Institut /Czech Metrological Institute, Inspectorate for Ionizing Radiation, Prague and Brno (Czech Rep.)
COOMET	Cooperation in Metrology among the Central European Countries
CSIR-NML	Council for Scientific and Industrial Research, National Metrology Laboratory, Pretoria (South Africa)
CSIRO*	see NML CSIRO
EUROMET	European Collaboration in Measurement Standards
IAF	International Accreditation Forum
IEC	International Electrotechnical Commission
IEN	Istituto Elettrotecnico Nazionale Galileo Ferraris, Turin (Italy)
IFCC	International Federation of Clinical Chemistry and Laboratory Medicine
ILAC	International Laboratory Accreditation Conference
INMETRO	Instituto Nacional de Metrologia, Normalização e Qualidade Industrial, Rio de Janeiro (Brazil)
INTI	Instituto Nacional de Tecnología Industrial, Buenos Aires (Argentina)
IOPP	Institute of Physics Publishing, London (United Kingdom)
ISO	International Organization for Standardization
ISO CASCO	International Organization for Standardization, Conformity Assessment Committee
ITU	International Telecommunication Union

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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
JILA	Joint Institute for Laboratory Astrophysics, Boulder CO (United States)
KRISS	Korea Research Institute of Standards and Science, Daejeon (Rep. of Korea)
LNE*	Laboratoire National d'Essais, Paris (France), see BNM-LNE
METAS	Swiss Federal Office of Metrology and Accreditation, Wabern (Switzerland)
MIKES	Mittatekniikan Keskus/Centre for Metrology and Accreditation, Helsinki (Finland)
MoU	Memorandum of Understanding (between the CIPM and ILAC)
MRA	Mutual Recognition Arrangement
NAB	National Accreditation Body
NARL	National Analytical Reference Laboratory, Canberra and Pymble (Australia)
NEWRAD	New Developments and Applications in Optical Radiometry Conference
NIST	National Institute of Standards and Technology, Gaithersburg MD (United States)
NMI	National Metrology Institute
NMIJ/AIST	National Metrology Institute of Japan, National Institute of Advanced Industrial Science and Technology, Tsukuba (Japan)
NML CSIRO	National Measurement Laboratory, CSIRO, Pretoria (Australia)
NPL	National Physical Laboratory, Teddington (United Kingdom)
OIML	International Organization of Legal Metrology/ Organisation Internationale de Métrologie Légale
PITTCON	Pittsburgh Conference
PMOD	Physikalisch-Meteorologisches Observatorium Davos, Davos (Switzerland)

PTB	Physikalisch-Technische Bundesanstalt, Braunschweig and Berlin (Germany)
RIC	Regional Instrument Centre
RMO	Regional Metrology Organization
SADC MET	Southern African Development Community Cooperation in Measurement Traceability
SIM	Sistema Interamericano de Metrología
SYRTE*	Systèmes de Référence Temps Espace, see BNM-SYRTE
UNIDO	United Nations Industrial Development Organization
USNO	U.S. Naval Observatory, Washington DC (United States)
VNIIMS	Russian Research Institute for Metrological Service of Gosstandart of Russia, Moscow (Russian Fed.)
VNII OFI	Institute for Optico-Physical Measurements, Gosstandart of Russia, Moscow (Russian Fed.)
WADA	World Anti-Doping Agency
WHO	World Health Organization
WMO	World Meteorological Organization
WTO	World Trade Organization
WTO-TBT	World Trade Organization, Committee on Technical Barriers to Trade

## 2 Acronyms for scientific terms

CMC	Calibration and measurement capabilities
CRM	Chemical reference material
GPS	Global Positioning System
GUM	Guide to the Expression of Uncertainty in Measurement
IPTS-48	International Practical Temperature Scale of 1948
IT	Information Technology
IVD	In Vitro Diagnostic
KCDB	BIPM key comparison database
MAS	Metrology, accreditation and standardization
SI	International System of Units
SIR	International Reference System for gamma-ray emitting radionuclides
SRP	Standard Reference Photometer
TAI	International Atomic Time
VIM	International Vocabulary of Basic and General Terms in Metrology



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