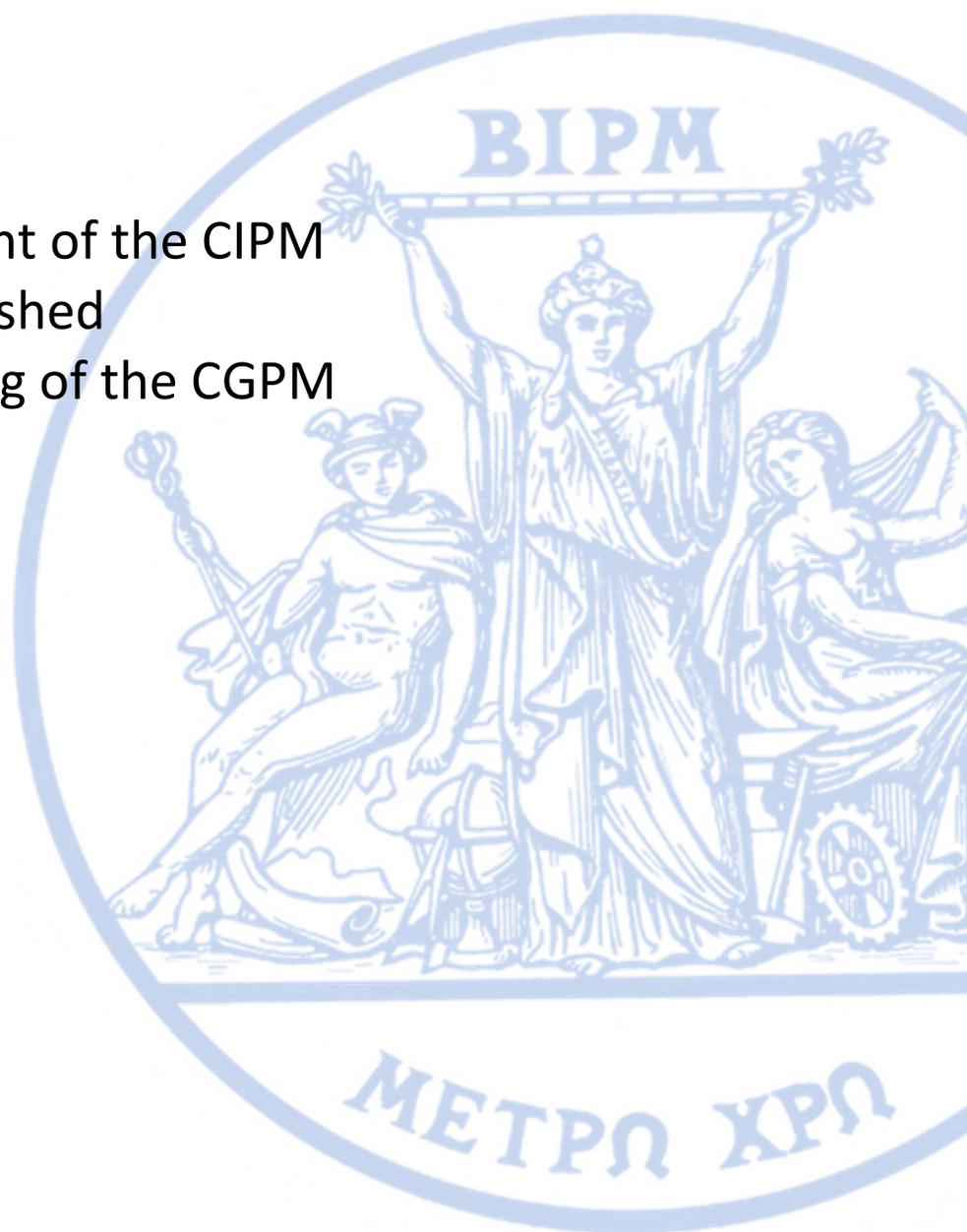


Bureau
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♦ **P**oids et
♦ **M**esures

Report of the President of the CIPM
on the work accomplished
since the 25th meeting of the CGPM



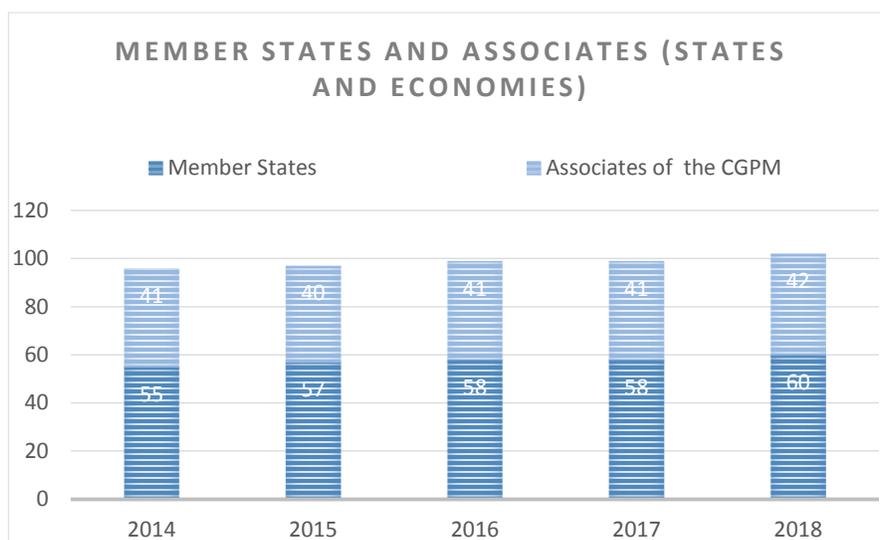
November 2018

Report by the President of CIPM ‘Highlights of work accomplished since the 25th meeting of the CGPM’ (November 2014 to November 2018)

In accordance with the Metre Convention it is my pleasure to report on the work accomplished since the 25th meeting of the CGPM held in 2014. Progress reports have been given at meetings of Government Representatives and Directors of National Metrology Institutes, which were held at BIPM on 13 and 14 October 2015, 24 and 25 October 2016 and 18 and 19 October 2017. It is not my intention to go into detail in this report but rather to highlight the main actions and achievements. More detailed reports will be presented by the Director of the BIPM, Presidents of the Consultative Committees, and Chairs of the various CIPM Sub-Committees.

Member States and Associates

I commence by particularly welcoming delegations from new Member States and new Associates of the CGPM. Since the 25th meeting of the CGPM, five States have acceded to the Metre Convention and six new Associates have joined. A seventh rejoined after a brief absence. There are currently 60 States Parties to the Metre Convention and 42 Associates of the CGPM.



New Member States (and date of accession):

- United Arab Emirates (27 April 2015)

Member States that acceded to the Metre Convention from Associate status:

- Lithuania (16 April 2015)
- Slovenia (23 March 2016)
- Montenegro (24 January 2018)
- Ukraine (7 August 2018)

New Associates of the CGPM (and date of association):

- Azerbaijan (1 January 2015)
- Qatar (10 March 2016)
- Sri Lanka (rejoined 17 August 2016)
- Ethiopia (1 January 2018)
- United Republic of Tanzania (1 January 2018)
- Kuwait (23 March 2018)
- Uzbekistan (13 July 2018)

Excluded Member States:

- Dominican Republic (1 January 2015)

Excluded Associates:

- Yemen (1 January 2018)

Associate States encouraged to accede to the Metre Convention

In accordance with Resolution 4 of the 24th CGPM (2011) there are currently ten Associate States that have met the criteria and have been encouraged to accede to the Metre Convention. They are on the so-called escalator mechanism. It will be recalled that once formally encouraged to accede, Associate States that do not accede have their subscriptions increased in steps over a period of 5 years until they pay as a subscription 90 % of the amount they would pay as a Member State. Overall this approach has worked well, with a number of accessions surely attributable to this mechanism.

Associates with a UN coefficient of < 0.02%

In implementing the practice of escalating subscriptions for Associates to encourage them to accede to the Metre Convention, the CIPM has been concerned that a number of the Associate States with the very smallest economies were likely to either withdraw or be excluded. Furthermore it was felt that the criteria for commencing the escalation could discourage States at the lower end of the UN scale who wished to participate in the future. Accordingly, in 2017, the CIPM decided (Decision CIPM/106-20) that when considering whether it is appropriate for an Associate State of the CGPM to be encouraged to accede to the Metre Convention and hence become a Member State, it will take into account whether it has:

- been an Associate State of the CGPM for at least 5 years,
- a National Metrology Institute (NMI) that has signed the CIPM MRA,
- published comparison results in the key comparison database (KCDB),
- one or more Calibration and Measurement Capability (CMC) listed in the KCDB, and
- a contribution level higher than 0.02 percent on the “Scale of assessments for the apportionment of the expenses of the United Nations”.

This decision amended the criteria previously adopted by the addition of the final bullet point, effectively exempting the smallest states from the escalator. The 0.02 percent UN point relates to those Associate States

with scale weightings less than approximately one fifth of the minimum set for Associate States and one twenty-fifth of that set as a minimum for Member States.

In taking this decision the CIPM was mindful that six States with a coefficient of less than 0.02 percent were already on the escalator, with a further three about to start, with Associate States on the escalator already in arrears and with one facing exclusion at the end of 2017. The CIPM took two further decisions (CIPM/106-21 and CIPM/106-22) to address these situations.

Following the implementation of CIPM Decisions the current status of Associate States encouraged to accede and paying enhanced subscriptions is as follows¹:

Associate State	Date meeting criteria	Period of increasing subscription	
		Start	90 % MS
Belarus	in 2011	2013	2017
Costa Rica	in 2011	2013	2017
Cuba	in 2011	2013	2017
Ecuador	in 2011	2013	2017
Latvia	in 2011	2013	2017
Panama	in 2011	2013	2017
Viet Nam	in 2011	2013	2017
Estonia	May 2014	2016	2020
Peru	May 2014	2016	2020
Republic of Philippines	December 2013	2016	2020

The effect on the dotation calculation and BIPM budget:

At the time of issuing the Convocation (in February 2018) for the 26th meeting of the CGPM, four new states had acceded and become Member States since the 25th meeting of the CGPM, resulting in an uplift in the 2020 - 2023 dotation of an additional 254 k€per annum.

Since the issue of the Convocation there has been an additional accession of a Member State (Ukraine in August 2018) which further uplifts the dotation. However, as this increase is approximately offset by downwards adjustment of the dotation from the expected exclusion of Venezuela, it is not proposed to amend the draft Resolution D figures as a consequence of these two post Convocation changes.

It should be noted that four of the five acceding states were previously Associate States of the CGPM, so whilst the dotation is uplifted by approximately 254 k€per annum, in terms of the overall budget, this is offset by a reduction of approximately 187 k€per annum from the loss of subscriptions that these four states would have paid had they remained Associate States

If we consider the income from the new Member States and Associate States, and take account of the exclusion of Yemen as an Associate State in January 2018 and expected exclusion of Venezuela, together with the new approach for the very 'small' Associate States, the BIPM has seen a reduction in its overall income compared with that which was planned and presented to the 25th meeting of the CGPM in 2014.

¹ Pursuant to [Resolution 4 of the 24th meeting of the CGPM](#) the progressive and irreversible increase in the amount of annual subscription will be applicable starting on the 1 January of the second year following the CIPM decision to encourage an Associate State to become a State Party to the Metre Convention.

Actions arising from Resolutions taken at the 25th CGPM (2014)

Resolution 1 (2014): On the future revision of the International System of Units, the SI

Conditions set by the 24th meeting of the CGPM (2011) before such a revised SI could be adopted, and which were confirmed at the 25th CGPM meeting (2014), have now been met.

The CIPM (Decision CIPM/106-11) authorized the CIPM President to convey its support for the publication of the final numerical values for the defining constants to the Task Group for Fundamental Constants convened by CODATA.

A draft resolution for the 26th meeting of the CGPM on the redefinition of four of the SI base units has been submitted, proposing revisions of the SI, to be effective from 20 May 2019.

A draft 9th edition of the Brochure entitled “The International System of Units” as well as an update of the *mises en pratique* were approved by the CIPM at its 106th meeting in October 2017, reviewed at its 107th meeting in June 2018 and finally approved in October 2018. This work item will be addressed in full in the CCU President’s report.

SI promotion

The CIPM (Decision CIPM/104-10) recognized the need to commence an awareness campaign and, through the CCU, established an SI Promotion Task Group under the Chairmanship of Prof. Joachim Ullrich and including public relations experts from KRISS, LNE, NIST, NMIJ, NPL and PTB. Membership of the Task Group was limited to selected NMIs and CCs but observers from ILAC, ISO, OIML, IEC and CIE were also welcomed. A further five NMIs (CENAM, INMETRO, NIM, NMISA, VNIIM) have since joined the Task Group.

Consultative Committees (Decision CIPM/105-25) prepared a joint statement for all stakeholders addressing the changes to be expected under the revised SI.

Resolution 2 (2014): On the election of the International Committee for Weights and Measures

Election of CIPM Members

In accordance with Resolution 2 of the 25th meeting of the CGPM (2014), all positions on the CIPM were declared vacant at the time of the 25th CGPM and an election was held to fill all 18 CIPM positions. Elected Members subsequently met and elected a bureau comprising a President, Secretary and two Vice-Presidents. Since that time, there have been three resignations from the CIPM and subsequently three new members were provisionally elected in December 2016:

- Dr H. Laiz (Argentina)
- Dr M.L. Rastello (Italy)
- Dr M. Sené (United-Kingdom)

The current CIPM Membership is as follows:

	Initial Election	Last Elected
President		
Dr B. Inglis (Australia)	7 August 2000	2014
Secretary		
Dr J. McLaren (Canada)	6 March 2006	2014
Vice-Presidents		
Dr W.E. May (USA)	9 June 2008	2014
Prof. J. Ullrich (Germany)	15 May 2013	2014
Other CIPM members		
Dr F. Bulygin (Russian Federation)		2014
Dr M. Buzoianu (Romania)		2014
Dr I. Castelazo (Mexico)		2014
Dr Y. Duan (P.R. China)	8 March 2010	2014
Mr L. Énard (France)	13 September 2004	2014
Dr D.-I. Kang (Korea)	12 December 2013	2014
Dr H. Laiz (Argentina)		7 December 2016
Dr T. Liew (Singapore)		2014
Dr W. Louw (South Africa)	15 May 2013	2014
Dr M.L. Rastello (Italy)		7 December 2016
Dr P. Richard (Switzerland)		2014
Dr G. Rietveld (Netherlands)		2014
Dr M. Sené (UK)		7 December 2016
Dr T. Usuda (Japan)	1 July 2012	2014

In recognition of outstanding contributions to the work of CIPM over many years, the CIPM appointed Dr Kaarls (Decision CIPM/104-12, March 2015): an honorary member of the CIPM.

CIPM Sub-Committees and ad hoc Groups

In keeping with the desire of the CIPM to maximize its effectiveness and to use of expertise within its membership, the CIPM (Decision CIPM/104-21) allocated responsibilities to all CIPM members to serve on CIPM Sub-Committees and *ad hoc* Working Groups. The current membership is:

1. CIPM Sub-Committee for Strategy

Chairperson: Dr Martin J.T. Milton

Members: Dr Barry D. Inglis, Dr Thomas Liew, Dr Willie E. May,
Dr James W. McLaren, Dr Maria Luisa Rastello, Dr Gerrit Rietveld,
Prof. Joachim Ullrich

2. CIPM Sub-Committee on Finance

Chairperson: Dr Martyn Sené

Members: Dr Yuning Duan, Dr Wynand Louw, Dr James W. McLaren,
Dr Martin J.T. Milton [BIPM Director], Dr Philippe Richard

3. CIPM Pension Fund Advisory Board (PFAB):

Chairperson: Mr Luc Erard

Members: Dr Takashi Usuda [CIPM Member], Mr Thomas Grenon [Expert],
Dr Martin J.T. Milton [BIPM Director], Dr Carine Michotte [Staff representative],
Dr Gérard Petit [Staff representative], Dr Stéphane Solve [Staff representative],
Dr Thomas Witt [Pensioner representative] Mr Felipe Rojas Ceballos [BIPM staff in support], Mrs Céline Fellag Ariouet [BIPM staff in support]

4. CIPM *ad hoc* Working Group on Conditions of Employment:

Chairperson: Dr James W. McLaren

Members: Dr Mirella Maria Buzoianu, Dr Ismael Castelazo, Mr Luc Erard,
Dr Martin J.T. Milton [BIPM Director], Dr Robert I. Wielgosz [Staff representative],
Executive Secretary: M. Felipe Rojas Ceballos BIPM Legal Advisor

5. CIPM *ad hoc* Working Group on the Reproducibility of Research Data and Related Topics

Chairperson: Dr Thomas Liew

Members: Dr Fedor Bulygin, Dr Ismael Castelazo, Dr Héctor Laiz, Dr Maria Luisa Rastello,
Dr Martyn Sené, Dr Martin J.T. Milton [BIPM Director]

6. CIPM Sub-Committee on Awards

Chairperson: Dr Fedor Bulygin

Members: Dr Thomas Liew, Dr Dae-Im Kang

7. CIPM Task Group for Promotion of the SI

Chairperson: Prof. Joachim Ullrich

Secretary: Dr Estefanía de Mirandés (CCU Executive Secretary)

Members: BIPM, CENAM, INMETRO, KRISS, LNE, NIM, NIST, NMIJ/AIST, NMISA, NPL,
PTB, VNIIM, CCEM, CCM, CCQM, CCT, CCU

Observers: ILAC, ISO, OIML, IEC, CIE

PR Expert Group: Ms Fiona Auty, NPL [rapporteur], Dr Valérie Morazzani, LNE,
Ms Gail Porter, NIST, Dr Jens Simon, PTB

The CIPM appointed and reappointed the Presidents of the Consultative Committees for 4-year terms, the current appointments are as follows:

- Consultative Committee for Acoustics, Ultrasound and Vibration (CCAUV): Dr T. Usuda
 - Consultative Committee for Electricity and Magnetism (CCEM): Dr G. Rietveld
 - Consultative Committee for Length (CCL): Dr I.A. Castelazo
 - Consultative Committee for Mass and Related Quantities (CCM): Dr P. Richard
 - Consultative Committee for Photometry and Radiometry (CCPR): Dr M.L. Rastello
 - Consultative Committee for Amount of Substance: Metrology in Chemistry and Biology (CCQM): Dr W.E. May
 - Consultative Committee for Ionizing Radiation (CCRI): Dr W. Louw
 - Consultative Committee for Thermometry (CCT): Dr Y. Duan
 - Consultative Committee for Time and Frequency (CCTF): M. L. Érad
 - Consultative Committee for Units (CCU): Dr J. Ullrich
- Amendment to the CIPM Member Election Document

On the basis of the experience gained in the first CIPM Election using the new procedure, the CIPM adopted a number of minor amendments to the document “Criteria and Process for Election of CIPM Members” (September 2014) and asked Dr Willie May as Chair of the former CIPM *ad hoc* Working Group on Membership to propose some clarification of the text in “Step 5: Seating of a newly elected CIPM”. The revised document appears on the BIPM web page at:

<https://www.bipm.org/en/committees/cipm/cipm-election-process.html>

Sad News

It is with great sadness that I note the passing of two of our former CIPM Presidents in 2018: Professor Dieter Kind and Professor Jean Kovalevsky. Both of these former colleagues provided outstanding leadership for CIPM and the BIPM and their passing is a great loss. Their many contributions to international metrology will be long remembered.



Professor Dieter Kind,
Honorary member of the CIPM,
President of the CIPM during 1984-1996



Professor Jean Kovalevsky,
Honorary member of the CIPM,
President of the CIPM during 1997-2004

Resolution 3 (2014): On the Pension and Provident Fund of the BIPM

A CIPM Pension Fund Advisory Board (PFAB) was established 16 October 2015 to supersede the former CIPM Sub-Committee on the BIPM Pension and Provident Fund and Health Insurance. The newly constituted PFAB includes representation from staff, representation from pensioners plus an external expert. The newly constituted Advisory Board aims to provide improved governance, transparency and effectiveness.

With advice from the PFAB and CIPM, BIPM implemented a plan to provide sustainability for the BIPM Pension and Provident Fund. New contribution and benefit schedules came into effect on 1 January 2017.

Details of actions taken to stabilize the BIPM Pension and Provident Fund and to ensure its long-term viability will be addressed in the report to be presented by the Chair of the PFAB, M. L. Énard.

Resolution 4 (2014): Dotation of the BIPM for the years 2016 to 2019

The CIPM has overseen the BIPM's budgets and financial performance with successive Audit Reports for the years 2015-2018 containing no qualifications. The BIPM has remained within budget and significant steps have been taken to address future financial challenges associated particularly with the BIPM Pension and Provident Fund. This reflects, in no small way, on the competence and hard work of the BIPM Director and his staff. Further details will be provided by the BIPM Director and the Chair of the CIPM Sub-Committee on Finance, Dr M. Sené.

Resolution 5 (2014): On the importance of the CIPM Mutual Recognition Arrangement

In response to the resolution a CIPM MRA Review Workshop was convened on 13–14 October 2015. Workshop attendees included NMI Directors, representatives of Member States, representatives of Regional Metrology Organizations (RMOs) and other relevant stakeholders. The Workshop identified a number of issues considered critical and appointed a Working Group on the Implementation and Operation of the CIPM MRA (finally 19 + 3 invitees) to be Chaired by the CIPM President. Following preliminary discussions, the Working Group met formally at the BIPM on 14–15 March 2016. A report was prepared and sent to NMI Directors for comment on 2 June 2016. The final report made 28 recommendations and sub-recommendations and was presented to a meeting of Government Representatives and Directors in October 2016. To ensure effective action and implementation of the Recommendations the CIPM proposed the establishment of a CIPM *ad hoc* Working Group on Implementing the Recommendations from the Review of the CIPM MRA, to be chaired by the CIPM President, to oversee the implementation of the recommendations. The meeting supported the proposal.

The *ad hoc* WG identified specific actions for the BIPM, Consultative Committees, the Joint Committee of Regional Metrology Organizations and the BIPM (JCRB), Regional Metrology Organizations (RMOs) and NMIs and presented these actions at meetings of the JCRB and CC Presidents in March and June 2017 respectively. It also reported on progress to a meeting of Government Representatives and NMI Directors in October 2017. Progress on implementation of the recommendations was monitored and reported to the JCRB and a meeting of CC Presidents and RMOs in March and June 2018 respectively. Substantial progress on the implementation of the recommendations had been achieved to the point where, in June 2018, the CIPM took the decision to close the *ad hoc* WG on the grounds that its objectives had been achieved.

Present Status of the CIPM MRA and the RMOs

The CIPM MRA is highly valued by Member States and continues to be a major responsibility for the BIPM. Currently a total of 260 institutes participate in the CIPM MRA. These comprise 101 National Metrology Institutes, plus a further 156 Designated Institutes, from 59 Member States and 42 Associates, along with with four International Organizations (ESA, IAEA, JRC, WMO).

Maintenance of the KCDB database is an ongoing workload for the BIPM with a total of 260 institutes participating in the MRA and more than 25 000 CMC entries and 1600 comparisons in the KCDB database.

Key Comparison Database (KCDB) 2.0

A key action on the BIPM staff following the CIPM MRA Review was to upgrade the KCDB to increase its effectiveness and the efficiency of data entry handling and transfer. This is probably the most important action to come out of the Review and is not a trivial task, requiring the development of a whole new database (referred to as KCDB 2.0). Contractors have been engaged and significant progress has been made on its development. Special features of the new database include the following:

- NMI/DI draft CMCs will go directly onto the platform and communicate to the RMO TC-CHAIR for review,
- intra-RMO CMC review will be integrated into the platform,
- review process and publication database will be combined,
- improved user experience, and
- no manual transfer of data for review / publication.

The new database is expected to be completed and in full operation by late 2019.

GULFMET

The new Regional Metrology Organization (Gulf Association for Metrology - GULFMET) is making good progress following the decision at the 104th CIPM meeting (Decision CIPM/104-38) to grant it provisional recognition as an RMO within the meaning of the CIPM MRA. Its main challenge remains the limited capability in the region.

Communication between JCRB, RMOs, CCs and CIPM

One issue identified by the CIPM MRA Review was the need for improved lines of communication between the JCRB, RMOs, CCs and CIPM. To address this issue the CIPM has:

- identified a dedicated CIPM member to serve as the liaison between the JCRB and the CIPM and to attend all JCRB meetings,
- committed to maintain regular annual meetings between RMO Chairs and the CIPM bureau. The 4th RMO-bureau meeting was held at BIPM on 18 and 22 June 2018, and
- invited delegates from the RMOs to attend a meeting of CC Presidents on 19 June 2018.

Further reports on the CIPM MRA, its importance and operation will be presented by Mr G. Rietveld and Dr H. Laiz later in the agenda.

The CIPM and its Consultative Committees

CC objectives and strategies

In the course of conducting the CIPM MRA Review, the differences in operation and strategy between CCs were apparent. There are clear and valid reasons for some of the differences but for others there are benefits from greater uniformity and sharing. To assist in addressing these issues the CIPM decided to revise the text in the document CIPM-D-01 *Rules of procedure for the Consultative Committees (CCs) created by the CIPM, CC working groups and CC workshops* (Decision CIPM/106-16). For greater clarity, the following three common objectives have been introduced:

In order to be informed of technical developments and evolving stakeholder needs in different areas of metrology, the CIPM has Consultative Committees with agreed scopes and the following three objectives:

- to progress the state-of-the art by providing a global forum for NMIs to exchange information about the state of the art and best practices,
- to define new possibilities for metrology to have impact on global measurement challenges by facilitating dialogue between the NMIs and new and established stakeholders, and
- to demonstrate and improve the global comparability of measurements. Particularly by working with the RMOs in the context of the CIPM MRA to:
 - plan, execute and monitor KCs, and to
 - support the process of CMC review.

Document CIPM-D-01 was updated accordingly and published in July 2018, and over time the CC strategies will be structured to reflect the newly stated objectives. These are already reflected in some of the presentations and posters at this conference.

Meeting of the CC Presidents

The CIPM is mindful that many challenging metrological problems these days require a multi-disciplinary solution. With this in mind and with a view to greater commonality in strategic approach, the CIPM has initiated regular annual meetings of the CC Presidents, supported by the CC Executive Secretaries, to discuss a collegiate approach, particularly to the CIPM MRA implementation. The fourth CC Presidents' meeting was held at BIPM on 19 and 20 June 2018. Furthermore, following a suggestion from the JCRB, the CIPM (Decision CIPM/106-27) invited representatives from the RMOs to attend the first day of this meeting to discuss and gain a common understanding between the CCs and the RMOs on responsibilities, technical and quality-system issues. The CIPM will monitor the effectiveness and benefits of such a meeting and may decide to make this a standing annual invitation.

Changes to the membership and observership of the Consultative Committees

Reflecting the need to remain relevant to an ever increasing and more varied set of Member States the CIPM decided (Decision CIPM/105-26) to revise the Rules for Membership of the Consultative Committees as follows: all Member States will have the right for one national laboratory charged with establishing national

standards in a particular field to be an Observer at the applicable Consultative Committee and to send one person (only) to a meeting after submitting a formal request. Document CIPM-D-01 was updated accordingly.

Other attendees at CC meetings

In order to gain greater consistency between CCs and to align with international practice, the CIPM decided (Decision CIPM/105-27) that for all Consultative Committee meetings in 2017 and thereafter:

- International organizations will be referred to as “liaisons” and will not be offered membership.
- Named individuals will be “guests” or “experts” and will not be offered membership.

Recalling that decision making in CCs is by consensus, the CIPM emphasizes that this change in nomenclature in no way intends to detract from the recognition and valuable contributions that ‘liaisons’, ‘guests’ and ‘experts’ make.

International liaisons

OIML

The BIPM staff are working ever more closely and effectively with the staff of the BIML, the bureau of the International Organization of Legal Metrology (*Organisation Internationale de Métrologie Légale*, OIML). The legal metrology community has provided important input to the SI redefinition, indeed the uncertainty that must be achieved by our scientific community in mass for the redefinition of the kilogram comes largely from their needs. BIPM staff will again form part of the drafting team for the revision of one of the principle OIML publications, OIML Document D 1 ‘Considerations for a Law on Metrology’. The BIPM staff and the BIML are jointly responsible for the World Metrology Day initiative promoting metrology. They work together to project a coherent view of metrology to the wider world and collaborate extensively on the identity and needs of potential new Member States and Associates, as well as on a wide range of back office topics such as the engagement of secondees, IT operation, and policy on various topics.

Joint Committee for Guides in Metrology (JCGM)

CIPM maintains representation on the JCGM and the current representative (Decision CIPM/104-22) JCGM WG2 (VIM) is Dr Buzoianu.

DCMAS Network (INetQI)

BIPM staff are actively engaged in this network. The network allows exchange between ten international and intergovernmental organizations with the objective of promoting an effective metrology, accreditation and standards system in developing countries, and has made great progress in recent years. The act of agreeing a common definition for ‘Quality Infrastructure’ by the network (plus the World Bank) represents a significant step forward. Furthermore, the network has come to the view that good quality infrastructure is important for all states and economies, not just those in developing countries. Consequently, the network is in the process of changing its name to the ‘*International Network on Quality Infrastructure INetQI*’ and is expected to amend its terms of reference in due course. We will be hearing more about the importance of the Quality Infrastructure from the BIPM Director and a number of our speakers.

Capacity Building and Knowledge Transfer (CBKT)

Following Resolution 4 of the 25th CGPM and the discussions afterwards, the BIPM has launched a sponsorship-based Capacity Building and Knowledge Transfer Programme (CBKT). The aim is to increase the effectiveness with which Member States and Associates engage in the world-wide coordinated metrological system. Emphasis is placed on transferring established expertise and technologies to countries without well-developed metrology infrastructure.

The past 4 years have witnessed the rapid growth and the undeniable success of this initiative. Twelve projects were completed, four are ongoing and four are planned. So far, 308 participants from 83 countries covering all six RMOs have participated in various training courses, including 20 secondees who were placed at the BIPM, and 13 placements for young scientist were provided under the programme at partner NMIs. Fifty-six invited lecturers from 27 countries have shared their experiences. Eight NMIs and five RMOs have provided voluntary sponsorship in various forms. We are really happy to see that the targets set for this programme were realized. One example, among many others, is that Azerbaijan, Namibia, Zambia and Zimbabwe have published their first ever CMCs following participation in CBKT training.

The CIPM thanks all sponsors for their generosity and commitment. For the next fiscal cycle 2020-2023, the CIPM continues to welcome Member States, as well as international organizations, private organizations and foundations to maintain the provision of additional voluntary support of all kinds to this specific BIPM mission-related programme.

Looking to the future

As the outgoing President, I take this opportunity to make a few general comments for thought and reflection:

- The BIPM is a unique organization that provides unique opportunities and benefits for Member States.
- Maintaining the BIPM on a shared basis makes for high rate of return on investment with a relative low cost per state.
- The CIPM and BIPM staff face major challenges in the coming years to maintain the level of activity expected by the CGPM in the face of increasing salary costs and dotation levels not compensating at least for inflation – this is unsustainable in the long term. The CIPM and BIPM staff have been very active in recent years helping those states that are interested to participate either as new Member States or as Associates States to engage effectively. It will be recalled that of the last five new Member States, four were previously Associates, and that their accession brings little new money, and likewise the vast majority of the potential new Associate States have very small economies, and their participation has a minimal impact of the overall BIPM income.
- In a world with changing demands in metrology there are major challenges for BIPM in the future. The BIPM has always adapted to meet the changing needs and demands of metrology and I am sure it will again. However, it is important that Member States recognize the challenge and play an active role, consider the benefits, the returns and the necessary level of dotation for an effective BIPM.

Conclusion

The period since the 25th meeting of the CGPM has been a very busy one for the CIPM and BIPM staff with the CIPM MRA review, restructuring of the pension fund, proactive engagement with new Members, new Associates, international liaison, preparation for the proposed redefinitions, the highly successful Capacity Building and Knowledge Transfer programme, successful fulfilment of the Work Programme, and effective financial management. There have been sizable challenges along the way, but by any measure, this has been a most productive and successful four years. Much of the credit for this must go to Dr Martin Milton, BIPM Director, for his outstanding leadership and management. I thank Martin, the management team and all the hard working BIPM staff for their untiring effort, dedication and commitment. I have never ceased to be amazed at what is achieved at the BIPM with such a relatively small, but dedicated staff.

I extend special thanks to my CIPM colleagues for their support, ongoing commitment and hard work over the past four years, and I acknowledge and thank all of the external members of our CCs, Working Groups and sub-Committees without whom we would not be able to function.

Finally, at this CGPM we anticipate witnessing an historical milestone in metrology with the redefinition of four of the SI base units in terms of fundamental constants. This is the culmination of many years of devoted scientific research in many laboratories throughout the world and the commitment of many individuals. To everyone who has contributed I thank and compliment you on a wonderful achievement!

Dr B.D. Inglis

President, CIPM