

**International Committee  
for Weights and Measures  
Proceedings of the 105th meeting  
(26-28 October 2016)**

## Executive Summary

### **The 105th meeting of the CIPM (26-28 October 2016)**

#### **BIPM Pension Fund**

The CIPM will amend the Rules of the BIPM Pension Fund to implement changes consistent with the proposals in the Mercer report and the proposals will be sent to the CCE for an advisory opinion.

The CIPM invited the PFAB to initiate an actuarial review of the fund in 2019.

The CIPM recommended engagement of the current pensioners with the PFAB.

#### **CIPM *ad hoc* Working Group on Implementing the Recommendations from the Review of the CIPM MRA**

The CIPM agreed to set up an *ad hoc* Working Group to oversee the implementation of the recommendations from the review of the CIPM MRA.

#### **Date of implementation of the revised SI**

The CIPM recommended that the revised SI shall come into force on 20 May 2019 (World Metrology Day).

#### **9th edition of the SI Brochure**

The CIPM passed a series of decisions relating to the drafting of the 9th edition of the SI Brochure.

#### **Rules for Membership of the Consultative Committees**

The CIPM revised the Rules for Membership of the Consultative Committees.

#### **New members of the CIPM**

The CIPM elected a slate of three candidates for provisional election and submission to the Committee for Election of the CIPM (CEC), following the resignations of Dr Bowsher, Prof. Brandi and Prof. Inguscio.

#### **26th CGPM**

The CIPM agreed that the 26th CGPM will be held at the *Palais des Congrès de Versailles* on 13-16 November 2018.

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

As of 26 October 2016

**President**

B. Inglis, Lindfield, Australia.

**Secretary**

J.W. McLaren, Ottawa, Canada.

**Members**

B.R. Bowsher, Teddington, United Kingdom.

H.S. Brandi, Rio de Janeiro, Brazil.

F. Bulygin, Moscow, Russian Federation.

M. Buzoianu, Bucharest, Romania.

I. Castelazo, Querétaro, Mexico.

Y. Duan, Beijing, China.

L. Érard, Paris, France.

M. Inguscio, Turin, Italy.

D.-I. Kang, Daejeon, Republic of Korea.

T. Liew, Singapore.

W. Louw, Pretoria, South Africa.

W.E. May, Gaithersburg, United States of America. *CIPM Vice-President.*

P. Richard, Bern-Wabern, Switzerland.

G. Rietveld, Delft, the Netherlands.

J. Ullrich, Braunschweig, Germany. *CIPM Vice-President.*

T. Usuda, Tsukuba, Japan.

**Honorary members**

E. Ambler, Hilton Head Island, United States of America.

W.R. Blevin, Glenhaven, Australia.

L.M. Branscomb, La Jolla, United States of America.

J.V. Dunworth, Ramsey, Isle of Man, United Kingdom.

E.O. Göbel, Braunschweig, Germany.

K. Iizuka, Tokyo, Japan.

R. Kaarls, Zoeterwoude, the Netherlands.

D. Kind, Braunschweig, Germany.

J. Kovalevsky, Grasse, France.

J. Skákala, Bratislava, Slovakia.

## Agenda

1. Opening of the session, quorum and approval of the agenda
2. Confirmation of the minutes of Session II of the 104th meeting (15–16 October 2015) and list of decisions
3. Report on the work of the CIPM bureau by the CIPM Secretary
4. Update on the activities of the BIPM by the Director
5. BIPM finance
6. Proposal to revise the process for dealing with Member States in arrears
7. The BIPM Pension and Provident Fund
8. Letter received from the “*Association des Anciens*”
9. Report from the *ad hoc* Working Group on Conditions of Employment
10. Review of the CIPM MRA
11. Report from the JCRB
12. Reports from the BIPM Physical Metrology Department, CCEM, CCM and CCPR
13. Reports from the BIPM Chemistry Department, BIPM/WADA workshop, JCTLM and CCQM
14. Reports from the BIPM Ionizing Radiation Department, CCRI, CCAUV and CCT
15. Reports from the BIPM Time Department, CCTF and CCL
16. Depository of the metric prototypes
17. Report from the CCU
18. Agreement of new rules for membership and observership of the CCs
19. Applications for membership and observership of the CCs
20. BIPM Liaison and Communication
21. Revision of the Vision, Mission and Objectives of the BIPM
22. Plans for the 26th CGPM
23. Interim election of three CIPM members
24. Election of a President for the CCL
25. Dates for meetings in 2017 and 2018
26. BIPM workshops
27. Any other business

## **1. OPENING OF THE SESSION; QUORUM; AGENDA**

The International Committee for Weights and Measures (CIPM) held its 105th meeting on Wednesday 26 to Friday 28 October 2016 at the International Bureau of Weights and Measures (BIPM).

Present: B.R. Bowsher, F. Bulygin, M. Buzoianu, I. Castelazo, Y. Duan, L. Énard, B. Inglis, D.-I. Kang, T. Liew, W. Louw, W.E. May, J.W. McLaren, M.J.T. Milton (Director of the BIPM), P. Richard, G. Rietveld, J. Ullrich and T. Usuda.

Also attending the meeting were: C. Fellag Ariouet (Personal Assistant to the Director and Head of the Secretariat and Housekeeping Office) and R. Sitton (Publications Officer).

The following were in attendance for parts of the meeting: S. Arlen (Head of Legal, Administration and HR Services), E.F. Arias (Director of the Time Department and Executive Secretary of the CCTF), F. Auty (Head of Communications, NPL, UK), H. Fang (Executive Secretary of the CCM), A. Henson (Director of the International Liaison and Communication Department), R. Guliyeva (WTO), J.-M. Los Arcos (Director of the Ionizing Radiation Department and Executive Secretary of the CCRI), E. de Mirandés (Executive Secretary of the CCU), G. Panfilo (Executive Secretary of the CCAUV), S. Picard (KCDB Coordinator and Executive Secretary of the CCT), T.J. Quinn (Emeritus Director), L. Robertsson (Executive Secretary of the CCL), M. Stock (Director of the Physical Metrology Department and Executive Secretary of the CCEM), J. Viallon (Executive Secretary of the CCPR) and R. Wielgosz (Director of the Chemistry Department and Executive Secretary of the CCQM and JCTLM).

Dr Inglis, President of the CIPM, opened the session. He noted that Prof. Brandi and Prof. Inguscio had resigned from the CIPM since the last meeting and would therefore not be attending. Dr Bowsher would resign at the end of the current meeting. With 16 members present the quorum was satisfied according to Article 12 of the Regulations annexed to the Metre Convention.

He asked for any comments on the agenda. It was proposed that there should be a discussion on membership of CIPM Sub-Committees and also on the possibility of appointing Deputy Chairpersons for the Consultative Committees, as these items were not on the agenda. The agenda was approved.

The President reported that Dr Katherine Gebbie, a member of the CIPM from 1994 to 2000 and Vice-President for three years, had died on 17 August 2016. He asked Dr May to say a few words. Dr May commented that she had worked at NIST for five decades and was an inspirational leader, a champion for all aspects of physics and required excellence in everything done by those who worked for her. The committee observed a minute's silence as a mark of respect.

## **2. CONFIRMATION OF THE MINUTES OF SESSION II OF THE 104TH MEETING (15-16 OCTOBER 2015) AND LIST OF DECISIONS**

Dr Richard commented that the French version of the minutes contained a number of incorrect citations to METAS. It was noted that appropriate editorial corrections will be made.

The minutes of Session II of the 104th meeting (2015) had been approved by correspondence and were accepted as a true record.

**Decision CIPM/105-01** The CIPM accepted the minutes of Session II of the 104th meeting of the CIPM as a true record.

The President reviewed the decisions from Session II. The status of the following point was noted:

**Decision CIPM/104-32** *The CIPM decided to transfer responsibility for the BIPM Health Insurance scheme from the CIPM Sub-Committee on the BIPM Pension and Provident Fund and Health Insurance (PF&HI) to the CIPM ad hoc Working Group on Conditions of Employment.*

The President and Secretary commented that the review of the BIPM health insurance scheme has been postponed until after the review of the Pension Fund is complete.

There were no further comments on the Decisions from Session II.

### 3. REPORT ON THE WORK OF THE CIPM BUREAU BY THE SECRETARY

Dr McLaren, Secretary of the CIPM, gave his report (see Appendix 1). The report covered the bureau meetings held on 10-11 March 2016, 14 and 17 June 2016 and 22-23 October 2016. It also covered the annual Management Review meetings for the BIPM Quality Management System and the Health and Safety System, the annual BIPM/ILAC and BIPM/OIML bilateral meetings and the annual BIPM/ILAC/OIML/ISO quadrilateral meeting, all of which were held in March 2016.

### 4. UPDATE ON THE ACTIVITIES OF THE BIPM BY THE DIRECTOR

Dr Milton started his report by recalling that in his previous reports to the CIPM he had been able to highlight how the BIPM has been changing since he took over as Director nearly 4 years ago. A target for the Director is “openness”, both as an approach and as an attitude; amongst the BIPM’s staff and reflected in everything it does. He spoke about how the BIPM has become open and how it is embracing modern approaches that are increasing its efficiency and impact.

The improved openness at the BIPM is demonstrated in many ways. Firstly, it is open to visitors, and there have been some important visits since the last meeting of the CIPM. These have included: the *Préfet des Hauts-de-Seine*, Mr Pierre Soubelet, and the French Minister of State for Sport, Mr Thierry Braillard in September 2016, for a joint symposium with the World Anti-Doping Agency (WADA). The BIPM has also hosted a Minister and the Ambassador from the United Arab Emirates, a delegation from the embassy in Paris of Argentina and a Ministerial delegation from the Dominican Republic.

The BIPM has implemented changes that allow improved access to information. These changes include access through the website to archival material including, most recently, all of the reports and publications of the Time Department. A presumption towards open-access for papers submitted to the Consultative Committees (CCs) is further increasing visibility of their work. A new style of publications has also been introduced, including the first publication of the Annual Report in a new format and re-naming what was formerly known as the *Rapport Annuel* as the *Rapport Financier*. These changes

have already received very positive feedback.

The Director noted that since he encouraged the Regional Metrology Organizations (RMOs) to take responsibility for the preparation of the poster and the development of ideas for the theme of World Metrology Day it has had greater impact and reached wider audiences than before.

The BIPM is undergoing a modernization programme to prepare its infrastructure for the future. As planned, the project to renovate the Observatoire is half complete. On completion this will bring scientists in the Physical Metrology Department closer to their laboratories. The project includes new windows to improve energy performance and a false ceiling with improved lighting. In order to accommodate the growing number of visiting scientists, the BIPM is moving towards all offices for scientists being shared.

A new office is being installed in the Nouveau Pavillon to bring the publications team together in one room and to increase space for the International Liaison and Communication Department. There are improvements ongoing to the organization of meetings, including the installation of the tent in the garden and new lightweight furniture. Site security has been improved. The renewal of the perimeter fence is complete, access to the laboratories is now by magnetic card and site access by staff vehicles is by an RF tag.

The BIPM IT security project is close to completion. All office computers are now administered centrally in order to control their access to external software and a plan is in place to raise all laboratory computers to the same standard. The protocols for setting and renewing passwords have been improved.

The first comprehensive report on progress in the laboratories has been submitted to this meeting. In the future, this style of summary report will be produced annually and published on the website.

The balance of skills in the BIPM staff is changing. The proportion of *contrat de travail à durée déterminée* (CDD – or fixed-term contracts) is increasing and the proportion of visiting scientists in the BIPM laboratories will reach 20 % in 2017. The Director commented that this is a significant milestone along the way to the objective of showing that the BIPM laboratory activities are truly shared activities with the Member States and for the Member States.

The financial report will be presented later in the agenda. As a result of the dismissal of the Finance Director following evidence that she was in paid employment whilst on sick leave, the accounts were prepared in 2016 by an external firm of accountants. This proved to be a more efficient process than was in place previously. The estimated cost of their involvement in 2017 will be more than an order of magnitude less than the salary of the former Finance Director. Other consequences of the change are that Ms Daniela Etter in the Finance Department will have an opportunity to work at a higher level and that the Director will take more direct involvement in finance matters.

Another change in support services is the recruitment of Mr Philippe Imbert, who will start as Human Resources (HR) Officer at the beginning of November 2016. He comes to the BIPM after service in the French Army. This new post will enable Ms Sigrid Arlen to focus on the job of Legal Adviser and restrict her involvement in HR matters to certain strategic initiatives.

A new Secretary for the JCRB has been appointed. The Director recalled that this post is filled on a two-year secondment from one of the NMIs. The current Secretary is Dr Doug Olson from NIST (USA), who has done an excellent job. His successor, Dr Nikita Zviagin from VNIIM (Russian Federation), has been appointed and will start in January 2017.

The Director said that during the meeting, the CIPM will hear a lot about the success of the BIPM's new activities in capacity building and knowledge transfer. In order to sustain this new work, Mr Chingis Kuanbayev (from Kazakhstan) has been recruited into the International Liaison and Communication Department. He worked previously at the BIPM on secondment as the JCRB Secretary. The BIPM will also hire a Liaison Officer on a two-year post to support its work during preparations for the 26th General Conference on Weights and Measures (CGPM).

Ms Marie José Fernandes has retired as housekeeper and now works 50 % of her previous hours. She is being replaced by Ms Dalia Meulien, who presently works at 80 % of full-time hours.

Dr Gianna Panfilo has been appointed as the new Executive Secretary of the Consultative Committee for Acoustics, Ultrasound and Vibration (CCAUV) since the last meeting of the CIPM.

The Director gave a brief summary of his travel since the last meeting of the CIPM. His visits had included: Beijing (China) for the APMP General Assembly; the Dominican Republic for the SIM General Assembly; Iran to visit ISIRI; Qatar for participation in a GULFMET-sponsored conference; Saudi Arabia to visit SASO; India for the ANAMET conference; Norway for the EURAMET General Assembly; Kenya for the Joint Committee of the Regional Metrology Organizations and the BIPM (JCRB) meeting; and Strasbourg for the International Organization of Legal Metrology (OIML) Conference.

The Director concluded by looking forward to some of the decisions that he hoped would be made at the CIPM meeting. He commented that he is coming to the end of three long rounds of discussion with staff about the future of the BIPM Pension Fund. The members of the CIPM Bureau and the President of the Pension Fund Advisory Board (PFAB) will meet with the staff during this CIPM meeting and it is hoped that the CIPM will be in a position to authorize the Director to submit a draft modification to the Pension Fund rules to the *Commission des conditions d'emploi* (CCE) for their advisory opinion. This is the next step in the process of changing staff terms and conditions.

Some early plans for the 26th CGPM (2018) will be proposed to the CIPM later in the agenda and the meeting will discuss some revisions to the Vision, Mission and Objectives for the BIPM. This will establish the foundations from which the BIPM can revise its strategy and then develop a work programme with a new perspective for its work particularly in liaison, capacity building and the laboratories. This will involve the Director and the Department Directors holding discussions with the relevant CC Presidents in 2017, prior to discussions with the CIPM and wider consultation.

The Director observed that hard work carried out in 2016 on the review of the implementation of the CIPM MRA was welcomed at the meeting of NMI Directors, which had been held immediately before this CIPM meeting.

Finally, the Director informed the CIPM that he had been nominated to receive the 2016 Finkelstein Medal of the Institute of Measurement and Control. This award is made on an annual basis to a person who has made outstanding contributions to measurement science at a global level. The Director concluded by recalling a small incident that he said was memorable. Whilst at a meeting, a Director from the WMO had said "I like working with the BIPM because you are open-minded to new ideas". That small comment from an outsider, the Director observed, exemplifies the recent success of the BIPM.

The President thanked Dr Milton for his report and invited questions and comments.

There was a discussion on how the BIPM will proceed without a Finance Director. It was noted that the current Director possesses the necessary skills to carry out the functions of the Finance Director, however

this may not be the case with future Directors. This raises the question of whether it should be a requirement for future Directors to possess the required set of skills to undertake the financial operations of the BIPM. Dr Bowsher, the Chairperson of the CIPM Sub-Committee on Finance, commented that he had discussed the situation with the Director and also the issue of good governance, particularly the potential dangers of having the management of both the BIPM and its finances in the hands of one person. They had decided that it would be appropriate for the Chairperson of the Sub-Committee on Finance to play a more active liaison role in the financial management of the BIPM. He added that although there are benefits to the Director having financial skills, these should not be a pre-requisite for future Directors.

The Director commented that an external accounting company (In Extenso) had prepared the Financial Report in 2016 and that the process had been very efficient. The same accountant estimated that in 2017 the process will take 6.5 days in total. The intention is for the BIPM's accounts to continue to be prepared externally, with the Director carrying out the long-term planning and budgeting. The auditor had commented that the BIPM is a small organization with skilled staff in the Finance Department and that with support from the Sub-Committee on Finance, the current situation is satisfactory. The Finance Department has been restructured since the departure of the Finance Director, with the existing staff undergoing the necessary training to take on more responsibilities. Recalling the issue of good governance, the Director said that he has asked the accountant to carry out an independent review of the BIPM's internal financial controls. The report will be shared with the Chairperson of the Sub-Committee on Finance.

The Director's actions to improve security at the BIPM were commended. He stated that the BIPM is committed to bringing its cybersecurity measures up to the highest standard and an external audit of IT security will be carried out by the end of 2017. He gave a summary of the measures that have already been introduced.

The President said that he wished to congratulate Dr Milton on behalf of the CIPM for his nomination to receive the 2016 Finkelstein medal.

**Decision CIPM/105-02** The CIPM congratulated the Director of the BIPM who has been nominated to receive the 2016 Finkelstein medal of the Institute of Measurement and Control. This award is made on an annual basis to a person who has made outstanding contributions to measurement science at a global level.

## 5. BIPM FINANCE

### Report from the Chair of the CIPM Sub-Committee on Finance

Dr Bowsher said that many topics regarding BIPM finance had already been covered in §4 and in the notes of the last meeting of the Sub-Committee on Finance, held on 14 June 2016, which had been circulated in advance of the CIPM meeting. The Sub-Committee meeting had reviewed the accounts of both the BIPM and the Pension Fund and, under the Chairmanship of Mr Érard (the Chairperson of the Pension Fund Advisory Board), took the opportunity to reach a common understanding of the current position with the Pension Fund. Dr Bowsher commented that positive feedback on the BIPM audit had been received from the auditor, Mr Griton (KPMG). He acknowledged that the audit was 'clean' with no qualifications. A few suggestions were made at the meeting on how the BIPM can further improve the presentation of the accounts, recognizing that it is carried out within the constraints of IPSAS accounting

and the Metre Convention.

The President thanked Dr Bowsher and commented that the accounting process had been difficult in 2016 following the dismissal of the Finance Director and thanked Dr Milton, Dr Bowsher and the members of the Sub-Committee for their hard work.

### **Quietus for the 2015 Financial Report**

The Director requested quietus for the audited financial statements of the BIPM and of the BIPM Pension and Provident Fund for 2015. The CIPM Sub-Committee on Finance had unanimously agreed at its meeting on 14 June 2016 that the accounts should be recommended for approval by the CIPM and that the Director be granted quietus. The process of approving the statements had been carried out by correspondence and final unanimous support had been received in July 2016.

**Decision CIPM/105-03** The CIPM confirmed its approval of the audited financial statements of the BIPM and of the BIPM Pension and Provident Fund which it had approved by correspondence in July 2016. The CIPM gave the BIPM Director quietus for the 2015 exercise.

### **Budget**

The Director said that over the three year period 2013-2015 current staff costs and laboratory, building and operating expenditure had reduced, pensions costs had increased and capital investments remained almost constant, although they were significantly less than the previous three-year period. Operating expenses (without investment spend) showed a steady improvement from the level at the end of the previous work programme. Revenue is increasing and the escalator mechanism is working (see Resolution 4 of the CGPM (2011)). There are now 17 Associates on the escalator, resulting in an increase in subscriptions. In 2017, ten Associates will reach the top of the escalator. Revenue is also benefitting from 'other income' such as work in the Chemistry Department supported by grants in previous years and grants to support the Capacity Building and Knowledge Transfer (CB&KT) programme in 2016. The net result, reported as Earnings before interest, taxes, depreciation and amortization (EBITDA) corrected for healthcare and retirement indemnity provision, has increased.

The Director gave a brief summary of the balance sheet and commented that cash flow in 2015 was not as good as 2014. This was mainly due to many Member State contributions having been received early in 2014 with the consequence that less money was received in 2015. He added that the new distribution of contributions is a cause for concern as there are now Member States with substantial contributions that had not previously been paying at such a high level. This could create problems with cash flow in the future if such payments are late. The reserve of 35 %, approved by the CIPM, may have to be increased to 50-60 % to cover such eventualities. The Director will discuss this proposed increase with the Sub-Committee on Finance, recognizing that projections indicate that the remaining reserves will be exhausted in 2020-2023 unless the financial model is changed. The balance between operating income and expenditure has improved over the last three years. The projection is that this will decline in 2017 due to rising costs including inflation, combined with the absence of any increase in the dotation for the Work Programme 2016-2019. He stated that the healthcare deficit currently stands at approximately 15 million € and there is no asset to match it.

A revision of the 2016 budget is required as a result of the contracting out of cleaning, security, reception and certain garden tasks. These costs are now expenses rather than salaries. A new line has therefore been inserted into the budget for "Contract Suppliers" to reflect this change and will reach 270 k€ in 2016 and 2017. This amount will come from staff salaries (170 k€) and building maintenance (100 k€).

Expenditure on contract services to the end of September 2016 totalled 183 k€. The Director also noted that a short-term increase in payments to the pension fund had been needed, as cash outflow from the pension fund has exceeded cash inflow. He concluded by saying that CIPM approval was required for the 2017 budget and the retrospective changes to the 2016 budget.

The Director was asked to clarify why it was necessary to increase the contribution to the Pension Fund and why there is a difference between the amount proposed and the plans discussed at the 25th CGPM to address the long-term sustainability of the pension fund, whereby the BIPM would pay an additional 150 k€ into the fund each year. He commented that the model presented to the CGPM had envisaged an extra 150 k€ being paid in 2016. However, the agreement on reform of the Pension Fund was not yet in place, so the payment was not yet due. In addition, more staff had decided to retire than had been planned, so extra resources were required.

He summarized the budget for 2016 and noted that pro rata spend is within budget for the year to date. The spend on the CB&KT programme is presented separately to the budget as this does not form part of the dotation; these costs are covered by various grants. Two new items have been included in the budget to show the cost of “Guest workers” and, as mentioned previously, “Contract Suppliers”. It was clarified that the costs associated with guest workers depend on the individual agreement and may include travel, accommodation and subsistence payments. The BIPM currently has around six guest workers at any one time and it is expected that this will increase to 12 in 2017. This could potentially increase to 16 in the future and budgeting and logistics for this are being considered. The Director confirmed that the terms and conditions for each guest worker are different depending on the requirements of their own institute.

**Decision CIPM/105-04** The CIPM approved the budget proposed by the Director for 2017 (document CIPM/2016 - 23).

## 6. PROPOSAL TO REVISE THE PROCESS FOR DEALING WITH MEMBER STATES IN ARREARS

The meeting was joined by S. Arlen and R. Guliyeva.

Before moving on to the proposal to revise the process for dealing with Member States in arrears, the Director reported on the outstanding subscriptions and contributions. Venezuela has not paid its contributions since 2012, and if no payment is received before December 2016, its contribution will be redistributed. There has been no engagement with Venezuela despite many attempts by the BIPM to establish contact. The Director has written to the Venezuelan Ambassador in Paris to try to obtain an update on the situation.

The Director referred to document CIPM 16-11<sup>1</sup>, which summarizes discussions between the Director and Mr Henson to review the current state-of-play with the decisions taken at the 23rd and 24th CGPMs (See: Resolution 8 of the 23rd CGPM (2007); Resolution 6 of the 24th CGPM (2011); and Resolution 7 of the 24th CGPM (2011)) on Member States in arrears. He said that the statements and provisions in the Metre Convention regarding the circumstances triggering the suspension and subsequent exclusion of a State are clear. The decisions taken at the 24th CGPM gave the CIPM the authority to enter into rescheduling agreements with Member States in arrears. This authority was at the discretion of the CIPM

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<sup>1</sup> CIPM 16-11 “*Note to the CIPM on the suspension and exclusion of Member States*”.

and was used in the cases of the Dominican Republic and the Islamic Republic of Iran.

Document CIPM 16-11 reviews historic and current practices for the rescheduling of arrears for a State that does not pay its contribution for six consecutive years.

The Director described the background to the situation with the Islamic Republic of Iran with regard to the rescheduling of their arrears (See §27 of the report of Session II of the 103rd meeting of the CIPM for more detail). The CIPM signed a rescheduling agreement with Iran on 12 October 2012. This recognized the intention of Iran to raise the question of the exact amount of its arrears at the 25th CGPM in view of its position with regard to its membership since 1979. (In particular, it had written to the BIPM on 22 March 1979 to request suspension of its membership and it believes that the BIPM should have acted to stop the build-up of arrears). Payments to meet the terms of the rescheduling agreement were received too late for the matter to be included on the agenda for the 25th CGPM. Subsequently, an amended rescheduling agreement was signed on 14 November 2014 in view of the fact that Iran had shown good faith in adhering to the terms of the agreement. Iran has now paid its contributions as a member in full for 2012-2016 in addition to the payment of 416 k€, which fully meets the terms of the rescheduling agreement for 2012-2014.

Mr Henson added that the Iranian claim had two main points. Firstly, the withdrawal request that was conveyed to the BIPM in the letter from 1979, which had clear intent, and secondly, the application of the ‘six-year’ exclusion rule. He added that the letter was sent to the BIPM and the BIPM had a duty of care to determine the intention and to inform Iran of the correct procedure. Iran’s second claim is that regardless of the letter, they should have been excluded automatically after six years of non-payment of their contributions in accordance with the Metre Convention. He added that there is no status of “suspension” that a State can request; a State is suspended if it is three-years behind with its payments, but this is not at the request of a State.

The Director added that there is a real difference between a Member State that is engaged with the activities of the BIPM and its RMO and which falls behind with its payments and a State that has no contact with the BIPM over a long period, as is the case with Iran. The CIPM should recognize that in the first case, a rescheduling agreement may be appropriate, but in the latter, the six-year exclusion rule should apply as outlined in the Metre Convention. There is no clash between the Metre Convention and the resolutions passed at the 23rd and 24th CGPMs, allowing either arrangement to be applied depending on the individual situation. It was suggested that the CIPM should look at individual cases when a State is approaching six years of non-payment and decide which solution to apply.

There was a brief discussion with support from the CIPM for the paper prepared by the BIPM.

Ms Guliyeva left the meeting and Mr Henson left temporarily during the *in camera* session.

## **7. THE BIPM PENSION AND PROVIDENT FUND**

The President opened the *in camera* session by introducing the need to appoint a new external expert to the Pension Fund Advisory Board (PFAB). This has become necessary following the departure of the previous external expert, Dr Christian Bock, former Director of METAS. Mr Thomas Grenon, Director of the LNE (France), has been proposed as a replacement and Mr Érard, Chair of the PFAB, gave a brief

summary of his skills, experience and suitability for the role. The CIPM agreed to ask Mr Grenon and requested the President to send him a formal invitation. The CIPM also requested the President to write to Dr Bock thanking him for his extremely valuable work as an external expert.

Mr Énard gave his report on the activities of the PFAB since the last CIPM meeting. The PFAB met in February and October 2016 and there have been meetings with representatives of the *Commission des conditions d'emploi* (CCE) and the bureau to explain the different proposals to reform the BIPM Pension and Provident Fund to address its long-term financial stability and to answer questions raised by staff. These questions included whether it is possible for the BIPM to contribute more into the Pension Fund. This is not possible because a contribution 150 k€ per year had already been agreed at the 25th CGPM and there is no more money available. He summarized the current proposals to address the long-term financial stability which include a stepped increase in staff contributions from 1 January 2017. Mercer, the international actuary company, recommended in its report of 29 September 2016, that the existing pensioners should be involved in the reform of the pension fund. Mr Énard commented that the proposals have been reviewed by the PFAB in response to feedback and been submitted to the BIPM staff. There will be a meeting between the bureau, the Director, Mr Énard and the staff on 26 October 2016.

The Director expanded on the summary given by Mr Énard and mentioned the outline proposals to address the long-term financial stability of the Pension Fund, as presented to Member States at the 25th CGPM, as well as the extensive work carried out by the CIPM Sub-Committee on the Pension and Provident Fund and Health Insurance and the PFAB. He observed that the process is now reaching a conclusion and that a third set of proposals had been submitted for consultation with staff. In its advisory opinion on the second set of proposals dated 7 June 2016, the CCE requested the BIPM to consider: other sources of funding for the Fund; a stepped increase in staff contributions; the smallest possible final contributions; larger contributions for new staff; and ‘involvement’ of existing pensioners. In response, a number of changes have been implemented in the latest proposals that were put forward in October 2016. These include the contribution rate for staff recruited after 1 January 2017 being increased to 15%; and contributions for current staff increasing in a step of 2 %, then 1.5 % (up to 19.8 % for staff recruited before 2010 “Pre 2010” and 18.8 % for those recruited after 2010 “Post 2010”). The proposal includes a BIPM contribution to the Pension Fund of 46 % of salaries plus an additional 150 k€ each year as agreed at the 25th CGPM and an extra one-off payment of 400 k€ from the reserves.

The Director said that the timetable for implementation of the reforms requires the first step to commence on 1 January 2017. The calculations carried out by Mercer assume that there will be no impact on pensioners until 2018: this will allow discussions to be carried out with pensioners during 2017. It is proposed that an actuarial review should be carried out in 2019: the date at which all staff will be contributing 15 % in the stepped increase.

If the proposals for the Pension Fund are approved by the CIPM, the Director will submit them to the CCE for its advisory opinion on 1 November 2016, with a deadline of 28 November. The proposed changes with the advisory opinion would then be circulated to the CIPM for voting during December 2016. On the basis of this vote, the new payments would start on 1 January 2017 as discussed above. He noted that CIPM approval is required for the timetable.

The Director invited questions. It was asked if there is scope to increase staff contributions further if the CGPM, for example, were to reject the proposal to freeze pensions. The Director clarified that the latest proposal is for staff contributions to increase to almost 20 %. He added that under the existing rules, the CIPM is empowered to change the contribution rate and freeze the pensions if it is necessary. However it has been decided to carry out a full consultation exercise. He said that there is a risk of the BIPM staff launching an action at the International Labour Organization Tribunal. It was also noted that there will

possibly be three new members of the CIPM being asked to vote on the pension issues without knowing the background. The Director commented that any new members of the CIPM will need to be fully briefed<sup>2</sup>. Ms Arlen clarified that there is a difference between a litigation risk and legal risk. The litigation risk is the risk of being taken to the tribunal regardless of the outcome. The legal risk is the risk of losing at the tribunal. It was recalled that the Director had commissioned external legal advice, which has been followed.

The Secretary asked the Director to give a brief explanation of the BIPM *point*, in particular how a pension freeze is actually a freeze on cost-of-living increases. The Director recalled that the *point* is an internal conversion factor that is used in calculations to correct salaries, allowances and pensions for the cost of living under the present rules; freezing the *point* results in a freeze in all three. It has been capped at 1 % in recent years (See Decision CIPM/104-29). It was pointed out that the only way in which pensions rise is through this cost-of-living increase.

It was questioned again whether it is possible to approach the Member States to request an increase in their contributions to provide additional funding for the pensions. The consensus among the CIPM members was that their governments would be unable to increase their contributions. The CIPM was reminded that there is a distinction between the dotation to support the science programme, which is agreed at the CGPM and funded through contributions, and asking for one-off payments from the Member States to support the Pension Fund. Dr Bowsher recalled that the extra 150 k€ per year agreed at the 25th CGPM to support the Pension Fund was dependant on reaching a satisfactory agreement with staff. The Director commented that it is not possible to ask the CGPM for more money to support the Pension Fund until all other possibilities have been exhausted and after the current proposals have been implemented. The situation will be subject to an actuarial review in 2019.

The Director asked the CIPM to consider a series of decisions relating to the discussions on the BIPM Pension Fund. The CIPM stressed that the decisions had been developed after the views of the staff, expressed during the consultation process, had been taken into account. Following a discussion, decisions CIPM/105-05 to CIPM/105-08 were agreed.

**Decision CIPM/105-05** The CIPM reviewed the advisory opinion received from the CCE (dated 7 June 2016), the available data on the financial position of the Pension Fund and the assumptions and expert advice received from the actuary (Mercer).

The CIPM noted that the Mercer study projected that reaching long-term financial sustainability will require contributions from existing staff to reach 19.8 % for the Pre-2010 Section and 18.8 % for the Post-2010 Section. The CIPM considered the request from the staff representatives and agreed to reach these rates following a series of stepped increases.

The modelling assumed that all staff joining the BIPM from 1 January 2017 will have reduced benefits and contribute at a level of 15 % of salary.

**Decision CIPM/105-06** The CIPM decided to amend the Rules of the BIPM Pension Fund to implement changes consistent with the proposals of the Mercer report of 29 September 2016 and requested the Director of the BIPM to send the proposals to the CCE for their advisory opinion.

**Decision CIPM/105-07** In anticipation of the agreement of the proposed reforms to the BIPM Pension Fund with staff and following the Mercer study of 29 September 2016 reviewed by the PFAB, the CIPM invited the PFAB to initiate an actuarial review of the Fund in 2019. This study will *inter alia* allow the

<sup>2</sup> It was later agreed (see §24) that the new members of the CIPM would start their terms of office on 1 January 2017, thereby allowing the existing members to vote on the pension issues.

PFAB to consider the introduction of a choice for active staff to join the “Post 2017” section if they choose and also to confirm the maximum rates of contribution from staff needed to address the long-term financial stability of the Fund.

**Decision CIPM/105-08** The CIPM requested the President of the CIPM to write to Dr Christian Bock, former Director of METAS, thanking him for his extremely valuable work as an external expert on the PFAB. The CIPM decided to ask Mr Thomas Grenon, Director of the LNE, to act as an external expert to the PFAB, and requested the CIPM President to write with a formal invitation.

## 8. LETTER RECEIVED FROM THE “ASSOCIATION DES ANCIENS”

The Director said that a letter had been received from the “*Association des Anciens*” asking for more engagement of retired staff with the PFAB. The letter, which requested that pensioners must be informed and consulted about any proposals that directly affect them, had been circulated to the CIPM. The CIPM Secretary, President and BIPM Director had met with the “*Association of Anciens*” in mid-October, where it had been agreed that they should become more involved. The Director of the BIPM, the President of the PFAB and the BIPM Legal Advisor had subsequently been asked to develop a proposal for the involvement of pensioners, which will be voted on by correspondence, by the CIPM, in early 2017.

**Decision CIPM/105-09** The CIPM recommended engagement of the pensioners with the PFAB and invited the Director of the BIPM, the President of the PFAB and the BIPM Legal Advisor to develop a proposal.

Ms Arlen left the meeting and the *in camera* session ended. Mr Henson re-joined the meeting.

## 9. REPORT FROM THE AD HOC WORKING GROUP ON CONDITIONS OF EMPLOYMENT

Dr McLaren stated that the Working Group has been inactive since the last meeting of the CIPM. A review of the BIPM health insurance plan has been postponed until after the work on the Pension Fund has been completed.

## 10. REVIEW OF THE CIPM MRA

Mr Henson commented that the recommendations related to the review of the CIPM MRA had been discussed at the meeting of NMI Directors on 24-25 October 2016 and he summarized the current state-of-play.

The President thanked Mr Henson and the CIPM discussed the best way to proceed. It was agreed that it

would be beneficial to establish a CIPM *ad hoc* Working Group to address the implementation of the review. The President proposed Dr Louw, Dr Rietveld, Dr Usuda, Dr Castelazo, Dr May and Mr Henson as members of the *ad hoc* Working Group but indicated that other CIPM members could join if they wished. There was a brief discussion on whether the work of this proposed *ad hoc* Working Group would be better carried out at the meeting of CC Presidents. It was agreed that this would not be suitable because rapid action was needed on the implementation of the review and waiting for the meeting of CC Presidents would introduce a delay. It was asked if the terms of reference for the *ad hoc* Working Group would include oversight for all actions or only those assigned to the CIPM and CC Presidents. Mr Henson suggested that there are specific tasks for the CC Presidents, others for the CIPM and there is also the oversight of the implementation of all the recommendations. The review is of the CIPM MRA, so therefore the CIPM should maintain oversight of the whole process. Terms of reference had been drafted by Mr Henson and reviewed by the President and Dr Rietveld. They were presented to the CIPM for comment. There was a brief discussion and they were adopted.

The CIPM agreed the following decision.

**Decision CIPM/105-10** The CIPM welcomed the recommendations of the Working Group on the Implementation and Operation of the CIPM MRA and thanked the participants for their contributions. The CIPM agreed to establish an *ad hoc* Working Group to oversee the implementation of the recommendations with agreed terms of reference.

The CIPM appointed Dr Inglis (Chair), Dr Louw, Dr Rietveld, Dr Usuda, Dr Castelazo, Dr May and Mr Henson as members of the *ad hoc* Working Group.

## 11. REPORT FROM THE JCRB

Mr Henson introduced the background to the issue of reporting comparisons that involve participants who are non-signatories to the CIPM MRA and the problems that this causes<sup>3</sup>. He said that the CIPM should consider revising document CIPM 2005-06(REV)<sup>4</sup> as a consequence of Decision CIPM/104-39.

He added that Resolution 34/1 of the JCRB clarifies the policy on publishing the results of comparisons that include participants who are non-signatories to the CIPM MRA. This clarification has been included in the revised document CIPM MRA-D-05<sup>5</sup> (JCRB action item 35/11, published in 2016). CIPM MRA-D-05 and the policy stated therein are now in conflict with point 6 of CIPM 2005-06(REV). Mr Henson recommended that document CIPM 2005-06(REV) be modified to make it consistent with Resolution 34/1 and the revised guidance document. Mr Henson said that the possibility of retiring document CIPM 2005-06(REV) had been considered, as some of the information has, over the years, been incorporated into the guidance documents. However, a detailed analysis had been undertaken, and it was clear that there is merit in the CIPM document being revised and retained.

The proposed change is to modify Point 6, found on page 3 of document CIPM 2005-06(REV). The document can be modified by inserting text from JCRB Resolution 34/1 as the Point of Clarification, with some minor changes to the surrounding wording. The proposed text was presented and is available

<sup>3</sup> See the Report of Session II of the 104th meeting of the CIPM, §10, pp 23-24 for full details.

<sup>4</sup> CIPM 2005-06(REV) “*The CIPM MRA: 2005 Interpretation Document*”.

<sup>5</sup> CIPM MRA-D-05 “*Measurement comparisons in the CIPM MRA*”.

in document CIPM/16-19<sup>6</sup>.

Dr Louw worked with Mr Henson to further refine and simplify the proposed text, which was then agreed by the CIPM.

**Decision CIPM/105-12** Further to CIPM Decision CIPM/104-39 regarding the changes in policy on reporting the results of comparisons with participants who are non-signatories to the CIPM MRA, the CIPM took note of JCRB Action 35/11 which approved the revision to document CIPM MRA-D-05, “Measurement comparisons in the CIPM MRA” to align the text of this policy document accordingly. The CIPM also noted JCRB Recommendation 35/1 and consequently decided that the CIPM Interpretive Document on the CIPM MRA “CIPM 2005-06:Rev.2013” should also be updated to align with the policy. The CIPM approved the proposed text and requested the BIPM to update the document and its associated reference accordingly and to publish it on the website with an assigned date of October 2016.

Dr Rietveld commented that a problem remains with participation in RMO comparisons and there is an occasional lack of awareness on the sensitivities of commercial companies participating in a comparison. Mr Henson reminded the CIPM that all CCs should be using the guidelines that had been developed by the CCQM, which binds commercial companies through a series of conditions for their participation. The Director added that this issue should be revisited by the JCRB so that the CCQM guidelines could be re-published as part of the JCRB’s portfolio of documents.

### **Meeting of the CIPM bureau with the RMO Chairs**

The President reported on this meeting, which had been held on 25 October 2016. The meeting had focused on how the RMOs were affected by the recommendations of the JCRB and the problems they encountered when interacting with the NMIs and the CCs. There was also an in-depth discussion on the “risk-based approach to CMC review”.

Mr Henson expanded on the President’s report, adding that there had been a request at the meeting to collate the experiences of using a risk-based approach to CMC review that is already used by the CCQM, CCT and CCEM. The CIPM was requested to ask the Presidents of these relevant CCs to provide short examples of the approach they had adopted and to challenge the other CCs and RMOs to consider how they could adopt a similar approach. The examples should be sent to Mr Henson for collation. The collated examples will be circulated among the CIPM, the JCRB and the CC Presidents in advance of the meeting of CC Presidents in June 2017.

The President continued by recalling that there had been a discussion of how the RMOs plan the dissemination of the kilogram after the redefinitions. The consensus was that they expect an existing artefact to be used, although the watt balances within the NMIs may also provide services to value assign artefacts for the NMIs within the RMOs.

He finished by commenting that the RMO Chairs consider that there is a need to continue with the meetings.

**Decision CIPM/105-11** The CIPM requested a short description of the “risk-based approach to CMC review” adopted by the CCQM, CCEM and CCT and to provide these examples for consideration to other Consultative Committees. The CIPM requested the Presidents of these relevant Consultative Committees to submit the examples in advance of the meeting of the Consultative Committee Presidents (12 and 13 June 2017).

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<sup>6</sup> CIPM/16-19 “Proposed revision to CIPM MRA 2005 Interpretive Document”.

## THE 105TH MEETING OF THE CIPM – SECOND DAY – 27 OCTOBER 2016

The President welcomed the CIPM to the second day of its meeting, which was also joined by Dr Arias, Dr Fang, Mr Henson, Dr Los Arcos, Dr Picard, Dr Quinn, Dr Stock and Dr Wielgosz.

### 12. REPORTS FROM THE BIPM PHYSICAL METROLOGY DEPARTMENT, CCEM, CCM AND CCPR

#### BIPM Physical Metrology Department

Dr Stock gave an overview of the comparison programme in electricity in 2016. Preparations have started for a CCEM-wide comparison of capacitance (CCEM-K4). The BIPM will be the pilot laboratory and the protocol has been finalized. It will start in early 2017 with the following participants: LNE; METAS; NIM; NIST; NMIA; NPL; PTB; and VNIIM. Two on-site comparisons of Josephson voltage standards (JVS) and quantum Hall resistance standards were carried out. The planned quantum Hall resistance comparison (BIPM.EM-K12) was prepared with METAS (Switzerland) for September 2016, but was postponed at their request. The following bilateral comparisons were carried out: Zener voltage calibrations (BIPM.EM-K11) with DEFNAT (Tunisia); resistance calibrations (BIPM.EM-K13) with SMD (Belgium); and capacitance calibrations (BIPM.EM-K14) with NMISA (South Africa), NIS (Egypt) and NSAI (Ireland). The first trial of the future new ac Josephson voltage comparison was carried out during 2016 at CENAM (Mexico). The results were encouraging with a difference of less than 1 ppm and an uncertainty of 0.3 ppm ( $U_{\text{CENAM}} - U_{\text{BIPM}} = (0.7 \pm 0.3)$  ppm at 7 V rms, 50 Hz). This will be developed into a future comparison.

Work with the calculable capacitor is ongoing. It will be used to measure the value of the von Klitzing constant by a direct electrical technique with the aim of achieving the lowest uncertainty ever. This value will be used in the future *mise en pratique* of electrical units. A new iodine-stabilized laser has been built during 2016 and good repeatability of 1 part in  $10^8$  has been achieved. The first series of measurements showed an offset of 0.26 ppm from the expected value due to imperfect electrode alignment. To overcome this offset, a highly-accurate alignment probe has been built which allows the main electrode bars to be aligned with sub- $\mu\text{m}$  accuracy. A new series of measurements are expected in the coming months, with a target uncertainty of  $1 \times 10^8$ .

In the mass area, the Pt-Ir prototype No. 110 for NIM (China) was completed in 2016 and fabrication of prototype No. 111 for KRISS (Republic of Korea) is underway. A stack of eight Pt-Ir disks has been fabricated for the NPL (UK), using material that it provided. Calibrations of Pt-Ir prototypes were completed for PTB (Germany) and SCL (Hong Kong). Stainless steel prototypes were calibrated for CESMEC (Chile), NMCI (Iran) and MIRS (Slovenia) and discussions are underway to calibrate a stainless steel prototype for UME (Turkey).

Two papers have been published in *Metrologia* on the extraordinary calibrations against the IPK during 2016<sup>7,8</sup>. A Consultative Committee for Mass and Related Quantities (CCM) Pilot Study is underway,

<sup>7</sup> de Mirandes E., Barat P., Stock M., Milton M.J.T., Calibration campaign against the international prototype of the kilogram in anticipation of the redefinition of the kilogram, part II: evolution of the BIPM as-maintained mass unit from the 3rd periodic verification to 2014, *Metrologia*, 2016, **53**(5), 1204-1214.

<sup>8</sup> Davis R., Barat P., Stock M., A brief history of the unit of mass: continuity of successive definitions of the kilogram, *Metrologia*, 2016, **53**(5), A12-A18.

which will test the uniformity of the future realizations of the kilogram traceable to different primary realizations (watt/Kibble balances, XRCD), test the continuity between present and future realizations of the kilogram, and validate the dissemination schemes. The pilot study is part of the joint CCM-Consultative Committee for Units (CCU) roadmap towards the redefinition and the BIPM is the pilot laboratory. The condition for participation was  $u_r(1 \text{ kg}) < 2 \times 10^{-7}$ ,  $u < 200 \text{ } \mu\text{g}$ . There are five participants: LNE, NIST and NRC with Kibble balances, and NMIJ and PTB with AVO28 spheres. The current status is that the BIPM has finished its measurements and the standards have been returned to the NMIs for a final stability check. The report is being prepared and the results have been satisfactory and are consistent with the results for the Planck constant ( $h$ ).

The current status of the ensemble of reference mass standards (ERMS) is that the storage systems in air, nitrogen and argon are fully operational. All standards are in their containers, regular mass monitoring is carried out and there is continuous analysis of the gas flow. The vacuum network is not yet operational but the standards are ready and have been calibrated in air. All standards were compared against the IPK in 2014 and have been compared with the travelling standards during the CCM Pilot Study.

The watt balance is now functioning and has a new open support structure that allows easier access for accurate alignments. A new interferometer has reduced the velocity noise and the new accurately aligned magnet has been installed. The present uncertainty is  $\sim 3 \times 10^{-6}$  and the target for mid-2017 is  $\sim 1 \times 10^{-7}$ . Further improvements will be achieved through enhanced alignment, a noise reduction on force measurement using a larger mass to improve the signal to noise ratio, and ultimately through operation under vacuum. Dr Stock finished his presentation by acknowledging the work carried out by the department's staff and the two secondees from NIM (China) on the watt balance.

The President thanked Dr Stock and invited questions. It was queried if the present uncertainty of the watt balance is due to its operation in air. Dr Stock confirmed that this is the case and that it has been tested under vacuum. The instrumentation worked well under vacuum but a few problems were found with the mechanical operation due to the pressure difference. Appropriate modifications have been made to the support structure and will be incorporated into the watt balance as it is being rebuilt. Dr Stock was asked to explain if there is a difference between the absorption of gases on the surfaces of Pt-Ir standards and Si spheres when they are compared in air rather than vacuum. Dr Stock confirmed that there is a difference but more importantly, the quality of the surface has an effect and this is being studied. The differences for Pt-Ir between air and vacuum are 3-5 mg and the difference on Si spheres will be greater, as they have a larger surface area, but the effect is still small. Dr Quinn posed the question of what will happen if the Si spheres are found to have a mass stability of parts in  $10^9$ ; they could effectively have a mass that is more stable than can have its absolute value measured and consequently will have a better mass stability than can be achieved with watt balances. Dr Stock commented that the situation is the same as with Pt-Ir standards which are more stable than watt balances and that this is not a new situation. He added that Pt-Ir standards have a better stability than the current reproducibility of watt balances which have average uncertainties of 4-5 parts in  $10^8$ , whereas Pt-Ir standards have a stability of parts in  $10^9$  over several years. The long-term stability of Si spheres remains to be proven. Dr Richard added that if Si spheres are found to be very stable, this could be an advantage in that it could be possible to have a pool of mass standards that are much better than those available today.

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

Dr Rietveld, President of the CCEM, summarized its activities in 2016. He commended the renaming of the watt balance as the Kibble balance and noted the hard work that has been carried out to obtain the new watt balance-based values of  $h$  before 1 July 2017. The CCEM Working Group on Proposed Modification to the SI (WGSI) has revised the *mise en pratique* and has formulated guidelines for the revised SI for NMIs and industry. The WGSI maintains a link with the CCU for promotion of the revised SI. The CCEM carried out a number of activities related to the review of the CIPM MRA including providing input for the review sub-committee and discussing the implementation of the CIPM MRA review recommendations. Dr Rietveld has specifically monitored the new “risk-based” approach to inter-RMO CMC review.

Three long-running CCEM comparisons have been finalized during 2016 and the status of the remaining comparisons has been reviewed. Preparations have started for the capacitance comparison (CCEM-K4) as described in the previous presentation.

The CCEM will include a one-day technical session on future challenges in electrical metrology at its next meeting in March 2017.

Dr Rietveld presented the findings of a consultation exercise carried out by the CCEM on the implementation date for the revised SI. There was no strong preference among the institutes that had been canvassed for immediate implementation at the time the CGPM passes a resolution. The CCEM therefore recommended an implementation date at some time after the resolution. He reminded the CIPM that the revised SI will affect electrical metrology: it will result in a step change since the “new SI” values of  $R_K$  ( $h/e^2$ ) and  $K_J$  ( $2e/h$ ) will be different from the present conventional 1990 values. He noted that delaying implementation will also avoid pre-empting the decision of the CGPM and briefly went through the options for the start date, including 1 January 2019, World Metrology Day 2019 (20 May) or having the start date on the day of the CGPM decision, with implementation for the electrical community following on 1 January 2019. The latter option takes into account the fact that electrical metrology does not follow the SI but uses the “1990 practical realization” of the units; so the CCEM implementation date is not necessarily tied to CGPM decision date. The start date will be discussed in §24.

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

Dr Richard, President of the CCM, gave an update on the joint CCM-CCU roadmap for the new SI. He recalled that Dr Stock had already spoken about the pilot study to test the uniformity of the future realizations of the kilogram traceable to different primary realizations. The *Metrologia* issue “*Focus on Realization, Maintenance and Dissemination of the Kilogram*” is underway and nine papers have been published on the website. He concluded by stating that the roadmap is on target and that the CCM will review the roadmap and the conditions for the redefinitions at its next meeting in May 2017 and that he had given a presentation on the revised SI, with particular reference to the kilogram, in Japan in February 2016 at the invitation of Dr Usuda. It was acknowledged by Dr Usuda that Dr Richard’s presentation had been highly appreciated and that 200 participants, mainly from industry, had attended the seminar.

The Director commented that if the start date for the new SI is agreed as World Metrology Day 2019, a new roadmap may be needed for promotional purposes.

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

Dr Usuda, President of the CCPR, said that Dr Viallon had been appointed as the Executive Secretary on 1 January 2016 and that the CCPR and its Working Groups had met at the BIPM on 19-23 September 2016. The next Working Group meetings are planned for 10-12 June 2017 in Tokyo

(Japan) in conjunction with the NEWRAD conference and the next CCPR meeting is planned for 2018. He reviewed the existing membership of the CCPR and noted that SCL (Hong Kong, China) had applied for observer status. A delegate from SASO (Saudi Arabia) had participated at the 23rd CCPR meeting as a guest and had provided a report of the work in their laboratory in the photometry and radiometry fields.

The CCPR Working Group on CMCs (WG-CMC) had held a workshop on CMC reviews at its meetings in September 2016, as part of its contribution towards the review of the CIPM MRA. The outcomes and the essential points have been forwarded to CIPM *ad hoc* Working Group on Implementing the Recommendations from the Review of the CIPM MRA. Two Task Groups have been established to review the evidence of CMC acceptance and for harmonization of the CMC review process. To ensure consistent and coherent review of CMCs, the term of office of the WG-CMC Chair has been extended to four years.

The work of the CCPR towards the revision of the SI has included commenting on the current draft of 9th edition of the SI brochure, with a particular recommendation that Appendix 3 (physiological quantities) is included.

Dr Usuda concluded by commenting that he had given a talk at the Asia-Pacific Economic Cooperation (APEC) Regional Workshop on “*Measurement Challenges in Renewable Energy and Climate Science*” in Beijing (China) on 29 October 2015.

### 13. REPORTS FROM THE BIPM CHEMISTRY DEPARTMENT, THE BIPM/WADA WORKSHOP, JCTLM AND CCQM

#### BIPM Chemistry Department

Dr Wielgosz began by recalling that the Chemistry Department has benefited from a significant number of secondments and strong support from the NMIs in 2016: it has hosted nine visiting scientists equivalent to 38 man-months of work. He thanked the NMIs that had provided these secondees. The department is running 12 Key Comparisons over the programme period and the CO<sub>2</sub> background/urban comparison (CCQM-K120) started in 2016 with 43 NMI participations. This is the largest comparison ever run by the department and includes participation from India for the first time.

Dr Wielgosz commented that in the area of primary organic calibrator comparisons, many NMIs were using qNMR techniques in the analysis of folic acid and valine. Since the BIPM opened its qNMR facility there have been many secondments from NMIs to work in this field. The BIPM and NMIJ (Japan) have been collaborating on a project to develop universal calibrators for qNMR. Six candidate materials were chosen and it is expected that the BIPM will publish the methods describing how the standards can be used as internal standards within a qNMR measurement.

The BIPM has also collaborated with NIM in the area of standards for large molecules. A joint workshop was organized in Chengdu (China) on 1-3 June 2016, which included 70 presentations and had more than 450 participants. The workshop included sessions on: advanced methods for peptide and protein drug characterization and quality assurance; standards and advances in peptide and protein drug diagnostics; and advances and challenges in IVD standards and research. The Chinese government plans to host the workshop again in 2018 as well as hosting all of the CCQM Working Groups. Dr Wielgosz gave an overview of C-peptide, one of the large molecules that is the subject of the department's work, and its role in insulin measurement. The BIPM and NIM (China) have been running the first comparison on

C-peptide, which had over 70 impurities to quantify. Secondees from the LNE (France) and HSA (Singapore) have been investigating calcitonin and hepcidin as candidates for future comparisons.

The work within the Chemistry Department led to discussions with the JCTLM community on the evolution of calibration hierarchies for C-peptide measurement. Pure materials and reference methods are now available that are SI-traceable. The department, in association with the University of Missouri School of Medicine (USA), NMIJ, NIM and NIBSC (UK), is looking into how to transition between calibration hierarchies for C-peptide and a paper will be published on the subject. This will have a direct impact on industry, with improvements in the compatibility of routine measurement results expected.

In the gases area, two papers have been published on ozone absorption cross-sections and a task group is being set up with the CCQM GAWG to agree on a value to be used for surface ozone measurements. As mentioned above, the department has started work on the CO<sub>2</sub> background/urban comparison (CCQM-K120) with 43 NMI participations. At the same time a new manometric system is being set up, based on pressure, volume and temperature (PVT), which has been developed with assistance from SP (Sweden) and NIST. This facility will be used as part of the CCQM-K120 comparison but will also be used in future CO<sub>2</sub> comparisons and for NMIs to send their CO<sub>2</sub> standards to the BIPM to compare them against its reference standard. When CO<sub>2</sub> is being measured accurately, it is important to know the isotope ratios because spectroscopic measure the individual CO<sub>2</sub> isotopologues. A Fourier Transform Infrared Spectroscopy (FTIR) and Isotope Ratio Infrared Spectroscopy (IRIS) calibration strategy has been developed for accurate measurement of  $\delta^{13}\text{C}$  and  $\delta^{18}\text{O}$  of CO<sub>2</sub> in air and a paper with the University of Wollongong (Australia) is in preparation. A CO<sub>2</sub> isotope ratio key comparison is anticipated in 2020 in collaboration with the International Atomic Energy Agency (IAEA). Reference samples will be prepared at the BIPM using the Stable Isotope Reference Mixture Generator (SIRM-GEN) facility. The collaboration with the IAEA is developing and Dr Wielgosz commented that he will co-chair several sessions at the IAEA Technical Meeting on the Development of Stable Isotope Reference Products on 21-25 November 2016. He gave a brief summary of the CCQM-K90 comparison on formaldehyde mole fractions. The stability of the standards requires continuous monitoring for two years to obtain results, which, so far, have been very encouraging.

Work on the Capacity Building and Knowledge Transfer (CB&KT) programme in the Chemistry Department began with a start-up meeting on 15 April 2016 to discuss mycotoxin metrology. The meeting was attended by eight NMIs and two International Organizations and looked at which mycotoxins to study and how to organize the programme. It was agreed that in order to measure mycotoxins accurately, calibrants will be required and this will be the responsibility of the BIPM with assistance from NIM, which has supplied experts to develop methodologies for the characterization of materials. In 2017, five NMIs will send scientists to the BIPM for capacity building and training. Their acquired knowledge will be used to disseminate services on returning to their home institutes. He noted that setting up a capacity building programme has changed the way that the work is done in the laboratories: we are helping NMIs develop their technical capacities in addition to running comparisons in which they can demonstrate their technical competencies.

In early 2016 the BIPM developed a Metrology for Clean Air CB&KT programme in line with the agreed objectives for the programme and in response to requirements presented by CENAM (Mexico) and the PTB. The focus was on the use of FTIR for the analysis and value assignment of air quality and greenhouse gases by using standards and FTIR. Dr Wielgosz commented that FTIR is a versatile and accurate technique, but required specialist knowledge on spectral fitting to be implemented. The BIPM has the necessary knowledge to train people in this area, and a secondee from CENAM spent six months in the department, training in the use of FTIR for gas metrology, and the knowledge gained will be used at CENAM as well as being transferred to other NMIs.

Dr Wielgosz finished by saying that the Chemistry Department will host 16 visiting scientists from NMIs

in 2017 giving a total of 69 man-months of time, and that an increasing number of these visits were being funded through external funds.

The Secretary thanked Dr Wielgosz and invited questions. It was asked if very-high resolutions are needed to distinguish between the different isotopes of CO<sub>2</sub>. Dr Wielgosz replied that it is possible to use mass spectroscopy or optical techniques such as high-resolution lasers and selecting a single line. By using FTIR it is possible to work at lower resolution, but to fit the absorption band with the high resolution spectra of the individual isotopologues.

The reason why the Chemistry Department is collaborating with the IAEA on the CO<sub>2</sub> isotope ratio key comparison was questioned, particularly when this appeared to be an ionizing radiation issue. Dr Wielgosz replied that the collaboration involves stable isotopes, which do not come under the umbrella of ionizing radiation. The IAEA has a long-standing programme in stable isotope reference materials and is a member of the CCQM. Measurements of carbon isotope ratios ( $\delta^{13}\text{C}$ ) are used for many purposes including CO<sub>2</sub> monitoring; the primary reference material (maintained by the IAEA) in this case is a carbonate and the CO<sub>2</sub> is liberated using phosphoric acid. BIPM and NMI involvement is connected with the use of optical measurements to measure low concentrations of CO<sub>2</sub> in air, for which standards of gases in air in high-pressure cylinders are required, for which the Chemistry Department has particular expertise.

It was asked if there are currently any matrix certified reference materials (CRMs) available for mycotoxins. Dr Wielgosz replied that they do exist, particularly in Europe. He added that the CB&KT programme is not concerned with producing materials; it is about transferring technical capacity and knowledge to developing countries. The programme under development by the BIPM will allow developing countries to produce their own reference materials using the technical expertise that they attain. He added that the CB&KT programme is aimed at measuring the mycotoxins and not preventing contamination, as this is handled by other agencies. Dr Liew added that the CB&KT programme in mycotoxins in relation to food safety has attracted much attention in the Asia-Pacific region. The Asia Pacific Metrology Programme (APMP) and APEC are collaborating on a workshop on the subject in November 2016 at which Dr Wielgosz will be a keynote speaker.

Dr Quinn recalled the original discussions with the WHO and the technical difficulties that had been raised on the use of SI units for the measurement of biologicals. He was pleased to see that progress was being made and added that it is a major advance for healthcare. Dr Wielgosz agreed and commented that a joint paper is being prepared with the NIBSC among others. He added that instrument manufacturers need to be convinced why they should change from calibrations using a WHO material to another material which is more expensive and which uses a more complicated calibration hierarchy, but with SI traceability. The advantage of the new serum-based C-peptide is that it can harmonize calibrations using kits, which the older system could not: in the past, using different kits gave different results.

Dr May commended the work of the Chemistry Department. He suggested that the role of the CIPM should be to evaluate the impact of the programmes, and that this would benefit from advisory groups to give guidance on future programmes and to study their technical merit and impact. The Director commented that the CCQM has this advisory role. Dr Wielgosz added that the range of subjects covered in the Chemistry Department is well defined and the focus is on maximizing the impact of its work. He recalled that each proposed topic is thoroughly researched and then debated by the CCQM before any work is undertaken and these activities are aligned to the CCQM Strategic Plan. Dr May added that he was only asking if the CIPM is happy for the CCQM to give direction to the chemistry work programme or if the CIPM wished to become further involved. The President summed up by saying that the measure of performance within the department is the success we are witnessing in the chemistry programme.

Dr Wielgosz mentioned that his responsibilities include BIPM IT Services and he advised the CIPM that the lifetime of the current IT system is scheduled to end in 2022. The development of the Strategic Plan

in 2017 should take this into account.

## **BIPM/WADA WORKSHOP**

Dr Wielgosz gave a presentation on the BIPM-World Anti-Doping Agency (WADA) workshop, which was held at the BIPM on 28-29 September 2016. He began by quoting the WADA mission: “A world where all athletes can compete in a doping-free sporting environment” and their mission, which is “to lead a collaborative worldwide movement for doping-free sport”. WADA was established in 1999 and is funded 50 % by the International Olympic Committee (IOC) and 50 % by government and public authorities. It oversees the application of the World Anti-Doping Code, which implements international standards for: testing and investigations; therapeutic use exemptions; the prohibited list; and laboratories. WADA understands the importance of accurate measurements and this is reflected in their international standards for laboratories.

The BIPM has interacted with WADA through the Laboratory Expert Group (LEG) for many years and Dr Westwood has been a member of the LEG since 2009. This collaboration resulted in WADA requesting the BIPM to host a joint workshop, which it funded. During the workshop, presentations from the NMIs highlighted their activities in support of anti-doping analysis. This work includes at: the NMIA (Australia) on CRMs for steroid doping and tests for gene doping; PTB on reference procedures for the assay of human growth hormone (hGH) isoforms; INMETRO (Brazil) on CRMs for isotope-ratio mass spectrometry (IRMS) and laboratory support for testing at the Rio Olympics; and at NIST on SRM for insulin-like growth factor-1 (IGF-1 - a marker for hGH).

A series of recommendations were made by the workshop, which have been published on the BIPM website.

## **Joint Committee for Traceability in Laboratory Medicine (JCTLM)**

Dr Wielgosz began by acknowledging the work of Dr Maniguet on the JCTLM database. The JCTLM has been reorganized so that there are now two Working Groups: the JCTLM Database Working Group and the JCTLM Traceability: Education and Promotion Working Group (WG-TEP). The latter was set up at the request of the International Federation of Clinical Chemistry and Laboratory Medicine (IFCC) to demonstrate the value of traceability in laboratory medicine as a means to reduce “between method variability” in order to promote improved clinical outcomes and patient safety. The WG-TEP has been set a number of tasks including a review of ‘definitions’ which will involve transformation of some formal metrological definitions into easy-to-understand definitions for the laboratory medicine community. The IFCC has secured external funding for a ‘traceability’ website that will link to the JCTLM database. This website will be maintained and funded by the IFCC. It is intended to provide information about traceability to users of the IFCC’s services. Dr Wielgosz added that the membership of the JCTLM has been reorganized into National and Regional Members and Stakeholders.

The JCTLM works towards compliance with a set of ISO standards (ISO 17511:2003, ISO 15193:2009, ISO 15194:2009, ISO 18152:2003 and ISO 15195:2003). Dr Wielgosz is leading the revision of ISO 15195<sup>9</sup>, which is linked to ISO/IEC 17025:2005. The current revision of ISO/IEC 17025:2005 has resulted in significant changes that will have an impact on ISO 15195, which is specifically written for calibration laboratories in laboratory medicine. The work to revise ISO 15195 is therefore waiting for the revision of ISO/IEC 17025:2005 to reach a stable state before it can be completed.

The JCTLM database is growing steadily and in October 2016 contained 293 CRMs, 180 methods and 146 services. Graphs showing growth of the database from 2010 to 2016 were presented.

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<sup>9</sup> ISO 15195 “*Reference Measurement Laboratories*”.

The President thanked Dr Wielgosz and invited questions. He was asked to reflect on the situation in the USA, as laboratories within the USA are not well represented on the JCTLM. He replied that reference measurement laboratories exist in the USA. Being accredited is a requirement for listing in the JCTLM. Different countries have different visions of the cost benefit of accreditation and many of the laboratories in the USA that carry out this work have not undertaken accreditation. Dr May further clarified the situation by adding that many laboratories in the USA serve domestic clients, who do not demand that they be accredited. As a result there is a business case not to make the necessary investment.

### **Consultative Committee for Amount of Substance: Metrology in Chemistry and Biology (CCQM)**

Dr May, President of the CCQM, presented the highlights since the 2015 report and gave an overview of its membership, meetings and Working Group organizational structure. He said that there were 6224 chemical and biological CMCs as of 14 October 2016. Of this total, 51 % underpin CRM services, 25 % underpin services delivered as calibrations, and 24 % underpin combinations of both. A total of 225 CCQM Key Comparisons have been registered in the BIPM key comparison database (KCDB) since 1999 as well as an additional 176 Pilot Studies. He commented that Pilot Studies are considered to be laboratory-based symposia where participants explore new measurement approaches and this is typically carried out before a Key Comparison is started. This allows critically evaluated methods to be used and has stimulated knowledge growth.

The CCQM uses Key Comparisons to assess the comparability of the capabilities maintained by NMIs to deliver their services. Dr May added that the aim is to be able to compare services between NMIs so that, for example, a NMI could determine where to obtain a comparable CRM. He described how the CCQM is developing its approach to Key Comparisons. It is continuing with implementation of Core Competency Approaches for Key Comparisons where a finite number of comparisons that do not test the techniques or methods, but rather test the institutional knowledge and core competencies required to deliver metrologically sound measurement services to customers, recognized under the CIPM MRA, are carried out.

He gave an example of early strategies in reducing the number of Key Comparisons. The Key Comparison CCQM-K25 “PCB congeners in sediment” presented a particular challenge as there are approximately 208 PCB congeners, of which 150 are found in the environment. From these 150, five congeners were selected (PCB 28, PCB 101, PCB 105, PCB 153 and PCB 170) because each presents a particular analytical challenge, such as problematic chromatographic separations and widely differing volatility and concentrations for individual congeners. This subset was used to formulate a “how far the light shines” strategy: the abilities demonstrated by the laboratories that provided measurements comparable to the KCRVs, for these five representative congeners, should be indicative of their ability to provide reference measurements for the typical suite of PCB congeners found in moderately contaminated sediments: individual congener amount of substance concentrations  $\sim$  5ng/g dry basis. As another example, Dr May commented that ideally, an internationally recognized reference system should be established for all important health status markers, but that this is not possible within any reasonable time frame. Every serum analyte of interest as a health status marker provides a unique set of challenges. To provide a measure of the capabilities of NMIs to deliver services for well-defined small organic analytes in serum, the CCQM OAWG conducted Pilot Studies and Key Comparisons for the determinations of serum cholesterol (CCQM-P6), glucose (CCQM-P8) and creatinine (CCQM-P9). The latter two analytes were chosen because they present very different challenges to cholesterol, thus providing a more complete picture of the capabilities of participating NMIs. The results of these three Key Comparisons provide a basis for evaluating the measurement capabilities of participating NMIs for other well-defined metabolites present in serum at  $\mu$ g/g levels or higher, without having to actually conduct a Key Comparison for all such analytes.

Dr May presented the four-track strategic approach for comparison studies adopted by the OAWG. The strategies are: Track A: Key Comparisons that test core competencies for the delivery of measurement services to customers; Track B: Key Comparisons that assess the equivalence of measurement services actually provided to customers; Track C: Key Comparison studies in emerging areas of global interest and importance with accompanying Pilot Study; and Track D: Capability Assessment studies of measurement capabilities being established in new areas for NMIs/DIs. He commented that the aim is for other CCQM Working Groups to use similar approaches.

The CCQM held a workshop on 20 April 2016 to address “broad-claim CMCs”. It discussed overlapping CMCs, in particular the case of document CIPM MRA-D-06<sup>10</sup>, which states that “*The metrological scope and responsibilities of the NMI and other DIs of the same State or Economy must always be clearly differentiated. DIs cannot claim calibration and measurement capabilities already declared under the CIPM MRA by other participating institutes (NMI or other DI) in the same State or Economy. It follows that the scope of the designation must be specified and CMCs offered by DIs must be complementary (in terms of measurands or ranges) and not overlapping with those of other DIs or the NMI in the country.*” The CCQM considered whether exceptions should be requested for special cases. It was agreed within the CCQM that the general rule for having non-overlapping CMCs stands, but that a paper would be drafted to consider whether “special cases” could exist under some circumstances.

The President thanked Dr May and invited questions and comments. Mr Henson commented that allowing “special cases” for overlapping CMCs is a departure from the approach that the CIPM has previously taken and there may be consequences for other CCs that will require careful analysis and reflection. Dr May commented that he will reflect on the issue and will make a provisional proposal to the CCQM in April 2017. The outcome will then be discussed at the meeting of CC Presidents. He added that he did not want to take any action in the CCQM that would have an adverse effect on the other CCs.

#### 14. REPORTS FROM THE BIPM IONIZING RADIATION DEPARTMENT, CCRI, CCAUV AND CCT

The meeting was joined by Dr Robertsson and Dr Panfilo.

##### **BIPM Ionizing Radiation Department**

Dr Los Arcos presented a summary of the department’s resources, standards, and staff working in the fields of dosimetry and radioactivity. He commented that the department is hosting a secondee from NIST, from September 2016 to February 2017, who will work on the extension of the *Système International de Référence* (SIR).

He gave an overview of the main achievements from the Programme of Work 2013-2015 in dosimetry and radionuclides. The main achievements in 2016 in dosimetry have been linked to the eight ongoing comparisons. There are six ongoing comparisons of national primary standards, on demand, at the BIPM and two that are carried out on-site at the NMI or DI. A total of five comparisons of primary standards and twelve calibrations of national secondary standards have been carried out and ten comparison reports published so far in 2016. A pilot study in collaboration with the PTB (Germany) to define a future new comparison (BIPM.RI(I)-K9) for x-rays up to 250 kV in terms of absorbed dose to water  $D_w$  is almost complete. The results will be presented to CCRI(I) in 2017. A new brachytherapy laboratory has been

<sup>10</sup> CIPM MRA-D-06 “*Designated Institutes participating in the CIPM MRA: Expectations and nomination form*”.

designed and installed during 2016 in accordance with the French ASN regulations. The handling of the  $^{137}\text{Cs}$  source in this new laboratory is carried out robotically. In the area of accelerator dosimetry, the BIPM is working to finalize an agreement for the BIPM.RI(I)-K6 comparison for high-energy photon beams that would give the BIPM access to the Doseo platform for research and development in radiotherapy technology, which is backed by the French Alternative Energies and Atomic Energy Commission (CEA) at the CEA-Saclay campus, France, for 6-8 weeks per year. The agreement would have the added advantage of being able to offer direct  $D_w$  traceability for national secondary standards.

The main achievements in 2016 in radionuclides included the design of a new holder for SIR ampoules, which has improved the safe handling of the ampoules and improved the efficiency of the SIR measurements. A total of four comparisons with the SIR and two with the SIRTII were carried out and six reports published so far in 2016. A project to extend the SIR to  $\beta$ -emitters is underway by liquid scintillation counting with assistance from a secondee from NIST (September 2016 to February 2017) and NIM (February 2017 to July 2017). A pilot study from September 2016 to July 2017 will look at  $^3\text{H}$ ,  $^{14}\text{C}$ ,  $^{55}\text{Fe}$  and  $^{63}\text{Ni}$ . The results will be presented to the CCRI(II) in 2017 to finalize the design of the extension. This will allow the extension of the BIPM.RI(II)-K1 comparison to include both  $\gamma$  and  $\beta$ -emitters.

Dr Los Arcos completed his presentation by recalling the international coordination activities of the department and its publications in 2016. In particular he mentioned the article "Evidence against solar influence on nuclear decay constants"<sup>11</sup>. He commented that this subject reoccurs occasionally and needs to be disproven, and as such he predicts that the article will be an obligatory reference in the future.

The President thanked Dr Los Arcos and invited comments and questions. The Director asked Dr Los Arcos to elaborate upon the contract with Doseo. He replied that the contract is in its third version and is expected to be finalized in November 2016. The Director added that Dr Ratel and Dr Los Arcos will retire from the BIPM in 2017. Dr Ratel has had a long and illustrious career at the BIPM and Dr Los Arcos has presided over the BIPM during a period of significant change and will retire in August 2017. This is his last CIPM meeting and the President thanked him for his hard work and dedication while working as the Director of the Ionizing Radiation Department.

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

Dr Louw, President of the CCRI, gave an overview of its work since the last meeting of the CIPM. As of 27 October 2016 there were 4097 ionizing radiation CMCs in the KCDB, compared to 4026 in 2015. He commented that there has been a substantial increase in RMO comparisons, from 35 to 80, and that this is an area that needs to be monitored, particularly in view of the recommendations from the review of the CIPM MRA.

The organization of the CCRI is changing. The three sections (CCRI(I), (II) and (III)) were created in the 1950s and Dr Louw commented that when he became President it had become clear that the sections were operating in a way similar to individual CCs. Each section had an individual Key Comparison Working Group (KCWG), *ad hoc* Working Groups, week-long meetings and separate convocations for each meeting. CIPM policies only make provision for CCs and Working Groups, thus the Section model is not governed properly. The solution has been to change the way that the Sections operate to mirror that of the Working Groups. They will continue to be known as Sections, but there will be a single convocation to the CCRI. Some of the KCWGs will be merged and the RMO Working Group will be streamlined. He identified a disconnect between the RMO Working Group and the JCRB/CIPM MRA that will be addressed by rotating the Chair among the ionizing radiation Chairs of the RMOs. The meetings of the three CCRI Sections will be held in parallel (as far as possible) at the BIPM and there

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<sup>11</sup> Pommé S. *et al* (Michotte C.), Evidence against solar influence on nuclear decay constants, *Physics Letters B*, 2016, **761**, 281-286.

will be joint sessions to allow presentations to be given to all three at the same time, thus avoiding duplication.

Membership of the CCRI will be changed to align with the agreed approach of the CC Presidents for the membership of CCs, as also approved by the CIPM. The countries with membership of all three Sections will be invited first to join the CCRI and its meeting in June 2017. Dr Louw commented that to keep the numbers manageable, each country will be asked to nominate one, or in exceptional circumstances such as where there is an important Designated Institute, two representatives. The CCRI meetings will be limited to 10 working days rather than the normal 20+ days for the CCRI and its Sections.

The work of the CCRI towards the review of the CIPM MRA has included a continuous improvement in the CMC review process. He commented that improvement is needed in communication between the CCRI Sections and the RMO TCs and Working Groups. There is currently a disconnect between the two groups: this is also true of other CCs, and efforts should be made to align and improve the situation.

He added that there are currently many issues within the Ionizing Radiation Department that need to be dealt with, including the retirement of the Department Director, security of sources, and the Doseo contract. To address this, Dr Louw plans to create an Advisory Strategy Committee with 6-8 experts, including the Section Chairs and key players such as the IAEA and the PTB. This committee will draft a document on the future strategy for ionizing radiation for discussion at the next meeting of the CCRI in June 2017. The outcomes will be presented to the next meeting of the CIPM and will be used to formulate a strategy for the Ionizing Radiation programme at the BIPM. He added that any CC Presidents or members of the CIPM are welcome to participate in the committee, and he invited them to send him their input.

The President thanked Dr Louw and invited questions. He was asked to clarify how the Advisory Strategy Committee will meet its tight deadline of June 2017 for reporting its findings on the future strategy in ionizing radiation, in view of the retirement of Dr Los Arcos. Dr Louw replied that there have already been considerable discussions regarding strategy, particularly with the BIPM Director, so the direction of the strategy is already known, it simply needs input from the major laboratories and refinement to reach an agreed strategy. He added that discussions had already started on the job description for the Director of the Ionizing Radiation and that it would not be necessary to wait for a replacement to be in place before finalizing the strategy; some items can be discussed before the retirement of Dr Los Arcos.

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

Dr Usuda, President of the CCAUV, gave a brief overview of its members and observers. He commented that the CCAUV held a meeting and workshop to celebrate the fact that it was its tenth meeting on 25-27 November 2015. The next meeting is scheduled for September 2017. Dr Usuda recalled that he had participated in the ISO/TC 108/SC 3 “Use and calibration of vibration and shock measuring instruments” meeting on 11-14 April 2016.

The three CCAUV Working Group Chairs have submitted their comments and findings on the review of the CIPM MRA. The findings were summarized into a document by the Executive Secretary and have since been submitted to the consultation on KCDB 2.0. The term of office for the Chair of the CCAUV Working Group for RMO Coordination (CCAUV-RMO) has been defined as four years, and the intention is that it will be rotated among the RMOs to ensure consistent and coherent review of CMCs. The CCAUV strategic planning document is being revised for approval at its next meeting.

The President thanked Dr Usuda and there were no questions.

### Consultative Committee for Thermometry (CCT)

Dr Duan, President of the CCT, commented that the CCT had not met since the last meeting of the CIPM. However, most of the CCT Working Groups and Task Groups had met in Zakopane (Poland) during the International Symposium on Temperature and Thermal Measurements in Industry and Science (TEMPMEKO) 2016, which was held from 26 June to 1 July. The output from these meetings confirmed that there has been progress on the work to determine the Boltzmann constant and the set conditions are expected to be fulfilled by June 2017. A document on the redefinition of the kelvin has been drafted and submitted to the Consultative Committee for Units (CCU) and has been published on the CCT webpages. The meetings also included discussions on the ongoing work and focus on high-temperature fixed point uncertainties and revisions of CMCs.

The CCT has completed the first comparison in thermophysical quantities (spectral normal emittance and emissivity, CCT-S1) and several chapters have been published for the “*Guide to the realization of the ITS-90*”. The next meeting of the CCT will take place on 1-2 June 2017, with the Working Group and Task Group meetings scheduled for 29-31 May 2017.

The President thanked Dr Duan and there were no questions.

## 15. REPORTS FROM THE BIPM TIME DEPARTMENT, CCTF AND CCL

### BIPM Time Department

Dr Arias presented the highlights of the first year of the Work Programme 2016-2019. She commented that ongoing work in the Time Department includes the calculation and dissemination of timescales (UTC, UTCr and TT(BIPM)) and calibration of time transfer equipment in contributing laboratories, in collaboration with the RMOs, to improve the uncertainty of [UTC-UTC(k)] and therefore to improve the accuracy of time dissemination. The department studies the strategies for the introduction of very accurate standards and appropriate transfer techniques which will contribute to TAI through the future inclusion of optical clocks, which are in the list of Secondary Representations of the Second (SRS). Work has been completed to better characterize their uncertainties. This has an impact on the CIPM through the requests to approve the lists of recommended frequencies. The Time Department also carries out international liaison and coordination activities through collective actions on timescale definition, dissemination and applications.

Dr Arias commented on the staff of the department and recalled that Ms Konaté retired on 31 October 2016. Two visitors have worked in the department during 2016: a secondee from NIM (China) to train for the International Comparison of Absolute Gravimeters (ICAG) 2017 and a consultant from USNO (USA) to work on uncertainties in key comparisons. A secondee from NIM will work on time transfer for UTC in 2017 and Ms Leute will be engaged in a post-doctoral position in the department from 1 February 2017 to 31 January 2019 to work on very accurate time/frequency transfer. The position will be co-financed by the CNRS and the BIPM.

Brief summaries of UTCr, UTC and TT(BIPM) were presented. Dr Arias commented that UTCr allows time laboratories to better synchronize their solutions to UTC without having to wait until the end of the month to obtain final validation to *Circular T*. It is very close to UTC, with a stability of  $5 \times 10^{-16}$ . She added that the yearly, long-term stable TT(BIPM) is used as a reference for astronomy and deep-space navigation and has an accuracy of  $<3 \times 10^{-16}$  and is based on Primary Frequency Standards (PFS).

The presentation of *Circular T* on the BIPM website has been improved during 2016. The distribution of data and results through *Circular T* is now an interactive HTML page rather than being a “static” PDF file. Full archives of *Circular T* are also available, along with an archive of the *BIPM Annual Report on Time Activities* and its predecessor, the *BIH Annual Report*, which was produced before the provision of TAI was transferred to the BIPM in 1987. A new Time Department Database was launched in September 2016. It is updated monthly with an inventory of laboratories that contribute to UTC and UTCr, their equipment and calibrations. This interactive tool, which also facilitates the preparation of data for contribution to the time scales, provides guidelines and tips for participation, and the options for making customized plots or obtaining the code for new clocks.

The department has started organizing the calibration of time transfer equipment with the RMOs to improve the accuracy of UTC-UTC(k) by implementing continuous calibration campaigns to reduce time link  $u_B$  from 5 ns to  $<2.5$  ns. The BIPM has a group of selected laboratories in the RMOs for which it calibrates the equipment, which are known as “G1 laboratories”. The first calibration campaign of G1 laboratories was completed in 2016 and the results have been implemented in *Circular T*. The second calibration campaign of G1 laboratories in EURAMET has started. The RMOs calibrate equipment in other laboratories (G2 laboratories) and in 2016 this was carried out for NMISA (South Africa).

Dr Arias recalled that in the previous CIPM meeting the evaluation of uncertainty of optical frequencies that are to be recommended as secondary definitions of the second was discussed. To ensure that this computation of uncertainties is correct, a new procedure was developed within the department, which is undergoing compatibility tests by the least squares method at the NPL (UK). The results have been published in *Metrologia*<sup>12</sup>. In order to answer criticism from the CIPM that there was not enough time to evaluate the list of [frequency ratios and absolute frequencies] the CCL-CCTF Frequency Standards Working Group (WGFS) has established a roadmap, which began in April 2016 and will finish in December 2017 to discuss and adopt the values and to publish the source data on the BIPM website. A list will be available for the CIPM meeting in October 2017 that will include two computations of the uncertainties.

The Time Department continues to cooperate with the International Telecommunication Union (ITU) in the areas of time scale definitions and dissemination. The World Radio Conference (WRC-15) recognized the roles of the BIPM and the ITU concerning time scale definition, maintenance and dissemination as being different and invited the various international organizations to cooperate to develop studies on the present and future reference time scales and to submit contributions to WRC-23. It was decided that the BIPM should take a leading role, so a CCTF Working Group on TAI (WGTAI) Task Group on Time Scale Definitions has been set up. The Group will review the present status of the definitions of time scales and their applications and will provide definitions, in a metrological context, of TAI and UTC. It will also discuss the optimum time scale adapted for reference use in metrology applications for adoption after 2023. Draft recommendations will be developed on these issues for proposal to the CCTF, which, if approved will be submitted to the CIPM in 2017 for adoption and will form the basis of draft resolutions to the 26th CGPM.

Future work in the department includes restructuring the staff responsibilities to account for changes and retirements. Development of new software for calculating *Circular T* will begin. This is a significant project that will benefit from the experience gained in the development of UTCr. Capacities for time transfer will be expanded to explore techniques for UTC, using microwave links on the Atomic Clock Ensemble in Space (ACES), for which the BIPM has an agreement with the CNRS.

The President thanked Dr Arias and invited questions. The content of the training for ICAG 2017 was

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<sup>12</sup> Robertsson L., On the evaluation of ultra-high-precision frequency ratio measurements: examining closed loops in a graph theory framework, *Metrologia*, 2016, **53**(6), 1272-1280.

queried, particularly if it included time comparisons or calibrations. Dr Arias replied that when the BIPM stopped organizing the ICAG campaigns it retained the know-how to support future campaigns. The NIM had asked if a staff member could visit the BIPM to train in the organization of a campaign and computation of the results. Details of the content are available.

It was asked if the Strategic Plan for the Time Department includes the future redefinition of the second, based on optical standards. Dr Arias replied that the BIPM has a role in the redefinition because, defining the second will require a decision on the transition that will best represent the redefinition, and also in implementing the necessary changes in the laboratories that will operate with the new definition.

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

Mr Énard, President of the CCTF, commented that it had not held a meeting since the last meeting of the CIPM, although some of the Working Groups had met. The CCTF Working Group on Strategic Planning (WGSP) had met during the European Frequency and Time Forum (EFTF) in York (UK) in April 2016. The WGSP discussed updating the strategy document, in particular new data from optical clock experiments and the comparison of clocks using optical fibres. It also discussed the redefinition of the second and finalized the roadmap, which includes a provision for the possible use of optical clocks. Thirdly, it discussed setting up the CCTF Working Group on TAI (WGTAI) Task Group on Time Scale Definitions, including the terms of reference and participants.

The CCTF Working Group on GNSS Time Transfer (WGGNSS) and CCL-CCTF Frequency Standards Working Group (WGFS) had also met since the last meeting of the CIPM. The latter discussed the timetable to submit the updated recommended values of standard frequencies for applications including the practical realization of the metre and secondary representations of the second for the next meeting of the CCTF in June 2017. He commented that the chairmanship of the WGFS will require the approval of both the CCL and the CCTF and this will require the appointment of a new CCL President.

The CCTF Working Group on the CIPM MRA (WGMRA) had not met but has worked with the BIPM to analyse the recommendations made by the Working Group on the Implementation and Operation of the CIPM MRA and answered the questions relating to the activities of the CCTF. It also issued a plan of action and will submit recommendations for improvements to practices and guidelines relating to the CMCs to the next meeting of the CCTF.

The President thanked Mr Énard and invited questions and comments. The Director commended the CCTF on producing the roadmap and suggested that it should be made available prominently on the CCTF web pages. He also commented that a resolution will be needed for the CGPM on time scale definitions. Dr Arias replied that work is progressing quickly on this issue because a resolution is needed from the CGPM in 2018. It would be too late to wait until the CGPM in 2022 as the deadline for the convocation for the WRC-23 would be missed. The Task Group met in September 2016 and has produced a first draft and is on schedule. Mr Énard added that the definitions of the time scales need to be improved first and then discussed with the international organizations to propose the recommendation for the WRC-23, however the first step is the resolution in 2018.

The Director said that when a new CCL President is appointed there will need to be an amicable arrangement for the transfer of much of the responsibility for the WGFS to the CCTF. Dr Robertsson asked for clarification on the responsibility for the frequency list, particularly if it will be under the CCTF and if so, will the CCTF also be responsible for frequencies that are used in length metrology. The Director confirmed that this is the case and that there will need to be coordination between the CCTF and CCL on the length activities. The majority of the work will be in the time and frequency area.

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

Dr Robertsson, Executive Secretary of the CCL, recalled that its last meeting was held in September 2015 and it has been operating without a President since the resignation of Prof. Inguscio from the CIPM. Extra work has been taken on by the Working Group chairs, particularly the CCL Working Group on the CIPM MRA (WG-MRA), to cover this gap.

The CCL Working Group on Dimensional Nanometrology (WG-N) and the WG-MRA met in Delft (the Netherlands) in October 2016 and the CCL-CCTF Frequency Standards Working Group (WGFS) met in York (UK) in April 2016, as previously mentioned by the CCTF President. Dr Robertsson added to the details given by the CCTF President on the timetable to submit the updated list of Recommended values of standard frequencies for applications, including the practical realization of the metre and secondary representations of the second. He commented that in future it may be preferable to refer to a recommended frequency ratio list, rather than an absolute frequency list.

The CCL has been actively pursuing its key comparison programme since the last meeting of the CIPM. In mid-2015, the CCL President wrote to the Directors of the CCL member institutes with an update on the status of ongoing length comparisons, in particular to remind them about any comparisons that were overdue.

A new CCL strategy document has been drafted and is available on its web pages. Dr Robertsson concluded by commenting that the CCL has been taking part in the discussions on the review of the CIPM MRA and KCDB 2.0.

The President thanked Dr Robertsson and invited comments and questions. It was questioned why the comparison CCL-K1.2011 appears to be taking a long time. Dr Robertsson said that he will look into the matter.

At the end of the session, Dr Arias, Dr Fang, Mr Henson, Dr Los Arcos, Dr Panfilo, Dr Picard, Dr Robertsson, Dr Stock and Dr Wielgosz left the meeting.

## **16. DEPOSITORY OF THE METRIC PROTOTYPES**

The visit to the depository of the metric prototypes at the Pavillon de Breteuil took place at 13:35 on 27 October 2016 in the presence of the President of the CIPM and the Director. (see Appendix 2).

## **17. REPORT FROM THE CCU**

The meeting was joined by Dr de Mirandés, Executive Secretary of the CCU.

Prof. Ullrich, President of the CCU, commented that membership issues will be dealt with later in the agenda.

Prof. Ullrich raised the issue of the implementation date for the redefinition of the SI and that a decision is needed from the CIPM. He added that the options proposed by the CCU are World Metrology Day 2019 (20 May) or 1 January 2019. The CCU's preferred option is World Metrology Day 2019 as this

would allow time for the implementation of changes and would not pre-empt the decision of the CGPM. The CIPM President initiated a round-table discussion on the issue to canvas the opinions of each CIPM member. A range of views was expressed with no overall majority in favour of either day. Dr Louw commented that he preferred 20 May 2019 for the practical reason that there were legal consequences associated with the change in South Africa and the country's parliament will be on its summer recess between November 2018 and February 2019. It would take approximately three months to change the appropriate legislation in South Africa, so implementation on World Metrology Day would be more practical. Dr Usuda added that parliamentary approval would be required in Japan although he favoured 1 January 2019 and Mr Énard reminded the CIPM that legislative changes would be required in the European Parliament. Dr Rietveld reiterated that the revised SI will affect electrical metrology, resulting in a step change since the "revised SI" values of  $R_K$  and  $K_J$  will be different from the present conventional 1990 values. He noted that delaying implementation will also avoid pre-empting the decision of the CGPM and that electrical metrology does not follow the SI but uses the "1990 practical realization" of the units; so the CCEM implementation date is not necessarily tied to CGPM decision date. Dr Richard preferred an implementation date on the day of the CGPM decision and Dr Quinn recalled that in 1983 the redefinition of the metre was implemented on the day of the CGPM decision and at the time there had been no discussions on the legal consequences. Dr Milton added that the redefinition of the metre had had much wider consequences than the latest proposed redefinitions and that most communities, such as the CCQM, will not be affected by the changes.

It was suggested that there will be a considerable amount of publicity for the redefinitions throughout 2018 and on the run up to the CGPM, with a particular focus on the day of the decision. The BIPM Director reminded the CIPM that the responsibility for World Metrology Day is shared with the International Organization of Legal Metrology (OIML) and that the theme for 2018 will focus on the SI and the redefinitions. Opinions were expressed that implementation on the day of the decision would allow the metrology community to take advantage of the publicity; however there was a majority in favour of delaying implementation to allow for legislative and practical issues to be dealt with before implementation. Dr May and Dr Bulygin commented that implementation on World Metrology Day 2019 would add value to the event and could give it some added historic perspective.

The CIPM President summed up the discussions and noted that there was a consensus among the CIPM that implementation of the redefinition of the SI should come into force on 20 May 2019 (World Metrology Day).

**Decision CIPM/105-13** The CIPM recommended that the date on which the redefinition of the SI shall come into force be 20 May 2019 (World Metrology Day).

Prof. Ullrich brought the concerns over the definition of the mole to the attention of the CIPM. He noted that the representative of the International Union of Pure and Applied Chemistry (IUPAC) at the CCU meeting had said that IUPAC may not agree to the present formulation of the proposed new definition of the mole. The CCU invited a suggestion by IUPAC to be discussed during the next CCU meeting. Accordingly, the relevant IUPAC committee will discuss the matter further at its meeting in November 2016. It will then send a proposal for revised wording to the CCQM for its meeting in April 2017, which will then make a proposal to the CCU for discussion at its meeting in 2017 and to the CIPM. The CCQM President acknowledged that he will put it on the agenda for the meeting in April 2017. Prof. Ullrich was asked to clarify why IUPAC has concerns. He replied that the new explicit unit definitions are aligned [with the other definitions] but are not always easy to understand. IUPAC has asked for a definition that is easier to understand for its community. Any revised definition will still be based on explicit unit definitions and will be in line with the other definitions.

**Decision CIPM/105-14** The CIPM took note of the intention of IUPAC to propose a revised wording for the new definition of the mole.

Prof. Ullrich referred to the §5.2 of the report of the 23rd meeting of the CCU “*Report on the status concerning the number of digits to be chosen for the defining constants*” on Dr Newell’s update on the choice of the number of digits for the numerical values of the defining constants in the revised SI.

The purpose of Dr Newell’s work has been to ensure that the quantities that are fixed in the present SI (the mass of the International Prototype of the Kilogram (IPK), the permeability of vacuum, the temperature of the triple point of water (TPW) and the molar mass of  $^{12}\text{C}$ ) will retain their present value in the revised SI within the uncertainty that will be assigned to them. There are different ways of achieving this requirement when choosing the number of digits for the defining constants. Each choice would lead to a slightly different consistency factor; this being the ratio between the value of a quantity in the revised SI and its value in the present SI.

The options proposed by Dr Newell ranged from consistency factors being exactly one (Case 1: most digits fixed) to consistency factors being one within the new uncertainty (Case 3: least digits). In his report Dr Newell advised that it is best to be flexible in choosing the number of digits since the final value of the defining constants is not yet known. He also mentioned additional possibilities that could be envisaged, that would expand uncertainties to  $k = 2$ , or the use of single digit uncertainties. Dr Newell reminded that the final values and uncertainties of these quantities will come from the special 2017 adjustment of the fundamental constants. Dr Newell’s report concluded by recommending that the minimum number of digits be chosen for simplicity (Case 3). This would be compliant with Appendix 2 of Draft Resolution 1 to be presented to the 26th CGPM, which states that “the mass of the international prototype of the kilogram  $m(\mathcal{K})$  will be 1 kg but within a relative uncertainty equal to that of the recommended value of  $h$  at the time this Resolution was adopted...”. A related issue raised in the CCU regarding the number of digits was a request that the value of the temperature of the triple point of water retains its well-known numerical value of 273.16 K in the revised SI just after the redefinition. Dr Newell calculated that for this,  $k$  would need 8 digits, and not the 7 as in Case 3. It was therefore decided by the CCU to choose Case 3 provided that the numerical value of the triple point of water will continue to be 273.16 K. Appendix 3 of the draft CGPM resolution should be revised accordingly.

The CIPM agreed with the proposal made by the CCU regarding the number of digits to be kept in the numerical values of the defining constants (Case 3 under the conditions mentioned in the CCU report).

**Decision CIPM/105-15** The CIPM agreed with the proposal made by the CCU regarding the number of digits to be kept in the numerical values of the defining constants (case 3 under the conditions mentioned in the CCU report).

Prof. Ullrich recalled that the draft of the 9th edition of the SI Brochure had been discussed at the 22nd meeting of the CCU. It was accepted with minor changes but two issues remained: dimensionless quantities and angles. As a result, the CCU Working Group on Angles and Dimensionless Quantities in the SI (CCU-WGADQ) had been re-established and was asked to solve these issues:

The treatment of the unit one for “dimensionless quantities” in chapter 2.2.3 of the 9th edition of the SI Brochure. Communities such as those working in biotechnology have requested that measurement results expressed in counts be recognized as being “traceable to the SI”, for which the quantity counts would need a unit.

The treatment of the radian in the 9th edition of the SI Brochure and the explanation of the relation between rad/s and Hz.

The CCU requested a single consensus version of the Brochure from the CCU-WGADQ that addressed both issues. No real consensus was reached within the group so a compromise was reached. The following suggestions were made to proceed with the different views on Hz and rad:

The draft shall be kept compliant with the CGPM resolutions in force,  $\text{Hz} = 1/\text{s}$  (Resolution 12 of the 11th CGPM (1960)), and  $\text{rad} = \text{m/m}$  (Resolution 8 of the 20th CGPM (1995)). Therefore the draft 9th edition of the Brochure (document CCU/16-02) treats the radian and the Hz like the 8th Brochure.

Chapter 2.2.4 addresses possible mistakes and “health warnings” to avoid confusion over quantities like frequency, angular frequency, angular velocity etc., and associating wrong units with these quantities, which may lead to erroneous factors of  $2\pi$ .

An additional chapter (5.3.8 “plane angles, solid angles and phase angles) has been added which defines these quantities and discusses their units.

It was suggested that the supporters of  $\text{Hz} = \text{cycle/s} = 2\pi \text{ rad/s}$  and of the treatment of the radian as an eighth base unit may be unsatisfied with the compromise version of the Brochure and may approach the CIPM to initiate corresponding CGPM resolutions.

For the unit one, the compromise made by the CCU-WGADQ had been to retain the explanation in the 8th edition of the SI Brochure with the proviso that the unit one, symbol 1, is not referred to as either a derived or base unit. In chapter 2.2.3 of the Brochure it is explained that “*The unit one, symbol 1 is the neutral element of any system of units – necessarily and present automatically. There is no requirement to introduce it formally by decision. Therefore, a formal traceability to the SI can be established through appropriate, validated measurement procedures.*” Additional information is given in chapter 5.3.7.

The CIPM agreed to treat the unit one, symbol 1, in the 9th edition of the SI Brochure as in the 8th edition as the neutral element of any system of units but avoid calling it a derived or a base unit and to treat the radian and the cycle in the 9th edition of the SI Brochure in compliance with the CGPM Resolutions in force (Resolution 12 of the 11th CGPM (1960) and Resolution 8 of the 20th CGPM (1995)).

**Decision CIPM/105-16** The CIPM agreed to treat the unit one, symbol 1, in the 9th edition of the SI Brochure as in the 8th edition as the neutral element of any system of units but avoid calling it a derived or a base unit.

**Decision CIPM/105-17** The CIPM agreed to treat the radian and the cycle in the 9th edition of the SI Brochure in compliance with the CGPM Resolutions in force (Resolution 12 of the 11th CGPM (1960) and Resolution 8 of the 20th CGPM (1995)).

Prof. Ullrich commented that he had received a request from the International Commission on Illumination (CIE) for Appendix 3 of the 8th edition of the SI Brochure on photobiological and photochemical quantities to be included in the 9th edition. The last CCU and CCPR meetings had heard from the CIE that there is a small but growing community that has started to create and use a set of new units and efficacy constants (similar to  $K_{\text{cd}}$ ) for quantities that could easily be expressed by SI units if the recommendations of Appendix 3 of the 8th edition of the SI Brochure are followed. He proposed that Appendix 3 of the 8th edition of the SI Brochure is maintained as an online version on the BIPM website so that occasional updates such as this can be incorporated more easily. He asked Dr Usuda to request the CCPR to provide a few concise sentences that can be incorporated into the main text of the SI Brochure, which provide clear references to Appendix 3. It was proposed that Appendix 1 of the 8th edition of the SI Brochure shall be updated by the BIPM and maintained online in the 9th edition of the SI Brochure.

**Decision CIPM/105-18** The CIPM requested the CCPR to prepare a few concise sentences to be added into the main text of the SI Brochure that clearly address the photochemical and photobiological quantities on a general level and refer to an online Appendix (corresponding to Appendix 3 in the 8th edition of the SI Brochure) for details. The sentences should be forwarded to the CCU Executive Secretary before 1 January 2017.

**Decision CIPM/105-19** Appendix 1 of the 8th SI Brochure shall be updated by the BIPM and maintained online in the 9th SI Brochure.

Prof. Ullrich recalled the timeline for the production of the 9th edition of the SI Brochure by the drafting team. The CCU-WGADQ delivered its conclusions on dimensionless quantities and angles on 26 September 2016 and the draft of the Brochure, including these conclusions, was sent to the CCU on 27 September for comment. He outlined the review process and gave a summary of the outcome. He noted that he had canvassed NIST to make proposals regarding the possibility of bringing the radian into the base units.

He then referred to Draft Resolution 1 “*The International System of Units (SI)*” to be presented to the 26th CGPM and explained some of the negative comments that had been received. The removal of “implicitly defined” from the definitions of the base units in Appendix 3 “*the base units of the SI*” had received criticism. This wording had been agreed during 22nd meeting of the CCU, but had subsequently been removed by the drafting team for the reason that a mathematical definition is never “implicit” but without proper explanation which was considered by some CCU members to potentially lead to a problem with the co-existence of two parallel concepts defining the SI. Prof. Ullrich commented that it is expressed very clearly in the draft of the 9th edition of the SI Brochure that the units are defined by fixing the numerical values of the defining constants. The “explicit” definitions had been moved to the Appendix 3 following a decision of the CCU in order to take care of the above concerns. Moreover, the drafting team has edited the first paragraph of Appendix 3 in order to make it clear that these are not parallel definitions. It reads: “*Starting from the definition of the SI adopted above in terms of fixed numerical values of the defining constants, definitions of each of the seven base units are deduced by taking, as appropriate, one or more of these defining constants to give the following set of definitions.*” The revised wording will be incorporated into the SI Brochure.

**Decision CIPM/105-20** The CIPM decided that the definitions in the draft of the 9th SI Brochure and in Draft Resolution 1 shall not contain the term “implicitly”.

Prof. Ullrich commented that he will discuss with Dr Rietveld the conventional values of  $R_K$  and  $K_J$ , which will need to be abrogated at a later date than the redefinition because of the implementation date for the electricity and magnetism area. Dr Rietveld commented that the CCEM will need to decide on the rounding of  $R_K$  and  $K_J$  and this will be included in the guidelines for the *mise en pratique*. With an implementation date of 20 May 2019, this is not expected to be a problem.

Prof. Ullrich requested the CIPM to endorse the draft of the 9th edition of the SI Brochure, as presented, as being the final version, in the sense that no more consultation rounds with the CCs and NMIs will be carried out. He also asked the CIPM to request that the Consultative Committees update all *mises en pratique* (currently online Appendix 2) by 31 July 2017. Following a brief discussion, the CC Presidents agreed that it should be possible to complete the task by this deadline. This Appendix will be maintained online in the context of the new brochure. He noted that the CCPR has already been requested to update Appendix 3. Finally he asked the CIPM to consider posting the draft 9th edition of the SI Brochure on the BIPM website with open access.

He presented the timetable for the next stages of producing the 9th edition of the SI Brochure. The draft will be edited by the BIPM, simply to correct style and typographical errors. These edits will be approved by Prof. Ullrich without the need to refer back to the CCU. If any matters of substance are discovered, these will be referred to the CIPM. The BIPM (the BIPM Director, Dr Davis, Mr Sitton and the CCU Executive Secretary) supported by Dr Quinn will produce a fully edited version by 30 June 2017. The edited document will be circulated to the CCU and the final version will be presented to the CIPM for approval.

Dr Bowsher complimented Prof. Ullrich, the CCU and the entire drafting team on the considerable amount of work that has been undertaken so far on the 9th edition of the SI Brochure. He noted that the current draft of section 5.3.8 “*Plane angles and solid angles*” may require some further work to clarify the wording, following discussions with his colleagues. Prof. Ullrich replied that the drafting team will look into such comments and the issue of “phase angles” and will be referred back to the CCU. There was a final question on the process for commenting on the draft SI Brochure and whether all of the comments have been addressed. Prof. Ullrich elaborated on the process and reassured the CIPM that all suggestions have been discussed by the CCU and the drafting committee and have been acted upon.

**Decision CIPM/105-21** The CIPM endorsed the latest draft of the 9th SI Brochure as the close-to-final one. The BIPM (the BIPM Director, Dr Davis, Mr Sitton and the CCU Executive Secretary) supported by Dr Quinn will produce a fully edited version by 30 June 2017. The edited version will be approved by the President of the CCU supported by Dr Quinn. The fully edited Brochure shall be brought to the CCU in September 2017 and to the CIPM in October 2017 for final approval. The CIPM considered that the consultation among the stakeholders has been completed. Nevertheless, if matters of substance are raised, the CCU President shall bring them to the CIPM.

**Decision CIPM/105-22** The CIPM requested from all Consultative Committees an update of the *mises en pratique* (current online Appendix 2) to be ready on 31 July 2017. This Appendix will continue to be an online Appendix in the context of the new Brochure.

Prof. Ullrich mentioned that he had attended the CODATA Task Group on Fundamental Constants (TGFC) meeting in October 2016. He commented that there was a potential issue over the implementation date for the new SI and another for CODATA’s closing date for “defining constants” and “non-defining” constants. He recalled the two closing dates that CODATA has established: the closing date for receipt of data for the defining constants, which is 1 July 2017 and the closing date for receipt of data to carry out the first adjustment under the new SI, which was originally 1 July 2018. However, CODATA has recently decided that if the implementation date for the new SI was chosen as 20 May 2019, the closing date for “non-defining” constants should be moved to 31 December 2018. With the implementation date having been chosen as 20 May 2019, CODATA will retain the deadline of 31 December 2018 as the closing date for input data.

After a brief discussion the CIPM acknowledged that it is the task of CODATA to decide on the closing date for the first adjustment under the revised SI. This is not an issue that requires comment by the CIPM.

Prof. Ullrich recalled that the CIPM Task Group for Promotion of the SI has received applications from the CCEM, CCM, CCT and CCQM to join the group. He commented that these applications will need the approval of the CIPM. He added that ILAC, ISO, OIML, IEC and CIE have applied to be observers. His advice to the CIPM was that membership should be restricted to Consultative Committees and Member State NMIs. Any other organizations should only be allowed to be observers. The President commented that the CIPM accepted this suggestion.

Prof. Ullrich added that he would like the CIPM to consider asking the Consultative Committees to work together to write a joint statement for all their stakeholders to address the changes to be expected under the revised SI. The CCU Executive Secretary will coordinate this action. The statement will be considered for inclusion in the final draft of the 9th edition of the SI Brochure, and he added that the statement should be sent to him before the end of July 2017.

Prof. Ullrich concluded his presentations by saying that the NMIs are carrying out a massive amount of work towards the redefinitions and have committed tremendous resources. The work of the Task Group was highly appreciated by the CIPM but based on the responses to the questionnaire, the CIPM recognised that the possibilities for its work are limited. The President thanked him and echoed the

earlier comment by Dr Bowsher by commending the work carried out by Prof. Ullrich and the entire team involved in drafting the 9th edition of the SI brochure.

The CIPM held a brief discussion on Draft Resolution 2 “*Consequences of the redefinition of the SI related to Article 8 (1921) of the Metre Convention and Article 18 (1921) of the Regulations*” as presented by Prof. Ullrich. Dr Quinn clarified that this resolution had been developed to “tie up loose ends” relating to the redefinitions: following the redefinition of the kilogram, there will be questions about retaining the formality associated with storage of the IPK. The CIPM decided that the issues raised in Draft Resolution 2 were not a high priority and should not be pursued for the 26th CGPM. The consequences of the redefinitions will be discussed in the future. Draft Resolution 2 will therefore be withdrawn. Dr Quinn suggested that as a compromise a sentence could be inserted into Draft Resolution 1 to say that the IPK will be retained. The Director added that the IPK will be retained under the same conditions so that it can continue to be used to obtain data.

The CIPM took three final decisions relating to the discussions on the redefinitions.

**Decision CIPM/105-23** The CIPM approved Draft Resolution 1, proposed by the CCU for the CGPM.

**Decision CIPM/105-24** The CIPM welcomed the CCEM, CCM, CCT and CCQM as new members of the Task Group for the Promotion of the SI. ILAC, ISO, OIML, IEC and CIE were welcomed as observers. The CIPM decided that only Member State NMIs and CCs can be members of the Task Group.

**Decision CIPM/105-25** The CIPM requested the Consultative Committees to work together to write a joint statement for all their stakeholders addressing the changes to be expected under the revised SI. The CCU Executive Secretary is designated as the coordinator for this action. The statement will be considered for inclusion in the final draft of the 9th edition of the SI Brochure. The statement should be sent to the CCU President by the end of July 2017.

## 18. AGREEMENT OF NEW RULES FOR MEMBERSHIP AND OBSERVERSHIP OF THE CONSULTATIVE COMMITTEES

The Director reminded the CIPM that the issue of membership and observership of the Consultative Committees (CCs) had been discussed thoroughly at the meeting of CC Presidents in June 2016, where there had been good agreement. It had also been tabled at the meeting of NMI Directors in October 2016 where there had been further agreement. He commented that a number of draft decisions arising from these discussions required approval by the CIPM.

The discussion on the first decision focused on whether the existing status of ‘observer’ has changed. The Director clarified that this will not change. The decision will allow ‘new’ Member States to request that they send an observer from its NMI to a CC meeting by writing to the Director with a request. It was agreed that Document CIPM-D-01<sup>13</sup> should be edited to explain the difference between ‘permanent’ observers and those that will be invited to attend a single meeting. The Director commented that the changes to document CIPM-D-01 will be made in consultation with the CC Executive Secretaries and will be presented to the CIPM at its next meeting for approval. The decision was approved.

**Decision CIPM/105-26** The CIPM decided 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 the field to be an observer at the applicable Consultative Committee,

<sup>13</sup> CIPM-D-01 “*Rules of procedure for the Consultative Committees (CCs), CC working groups and CC workshops*”.

and to send one person (only) and following their request for each meeting. Document CIPM-D-01 will be updated accordingly.

For the second decision, the Director commented that referring to international organizations as 'liaisons' will align the BIPM policy with that of most other international organizations. Liaisons attend and participate in meetings but do not have the right to take part in formal votes. The decision was approved.

**Decision CIPM/105-27** The CIPM decided 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.

Document CIPM-D-01 will be updated accordingly.

The remaining decisions were discussed briefly and were agreed by the CIPM.

**Decision CIPM/105-28** The CIPM decided that the CCU will adopt the same criteria for participation as the other CCs for all meetings in 2018 and beyond. Document CIPM-D-01 will be updated accordingly.

**Decision CIPM/105-29** The CIPM decided that all Consultative Committees will review whether their members and observers fully meet the criteria given in CIPM-D-01.

Dr Louw said that following the decisions regarding membership of the CCs he intended to align the membership of the CCRI with the rules that apply to other CCs. At present, the only members of the plenary CCRI are the Chairs of the Sections and Working Groups. This proposal is that Member States that have full membership of the existing CCRI Sections I, II and III will be offered full membership of the CCRI. Member States that have full membership of one or two Sections will be offered observership status. The Member States affected will be contacted by the CCRI President by letter to determine if they accept the proposal. Member States that will therefore be offered full membership are: China, France, Germany, Japan, Republic of Korea, Russia, the USA and the UK. Dr Louw noted that this proposal is from the CCRI President and had been discussed with the Section Chairs and Director of the Ionizing Radiation Department, but not with the CCRI plenary, as waiting for approval from the Plenary in June 2017 will delay the process by a year. He added that in line with the CC rules, the current observers in the individual sections can apply to be observers at the upcoming CCRI plenary meeting and can also apply for membership in the normal way. Observership and memberships in addition to the Member States already proposed will then be fully discussed at the 2017 meeting of the CCRI. The International Organizations that are currently members and observers will become 'liaisons'.

**Decision CIPM/105-30** The CIPM agreed on the proposal from the CCRI President to align the criteria for CCRI membership in order to align them with the Rules that apply to all Consultative Committees. In preparation for the next meeting in 2017 and to ensure a wide representation of the different CCRI Sections, the CIPM accepted the proposal from the President of CCRI to invite the countries with membership of all three Sections of CCRI as members of CCRI, and to inform all other institutes with membership of one or more of the Sections, that they can apply for membership of the CCRI. The CIPM provisionally approved the list of proposed members, subject to the acceptance by the prospective members.

## 19. APPLICATIONS FOR MEMBERSHIP AND OBSERVERSHIP OF THE CONSULTATIVE COMMITTEES

The Director presented the applications received for membership or observership of the Consultative Committees. The applications were discussed with the following outcomes.

**Decision CIPM/105-31** The CIPM accepted the following changes to the membership and observership of the Consultative Committees:

- CCAUV - METAS (Switzerland): Member, CMS/ITRI (Chinese Taipei): Observer.
- CCEM - CENAM (Mexico): Member, SCL (Hong Kong (China)): Observer.
- CCL - CMS/ITRI (Chinese Taipei): Observer.
- CCM - UME (Turkey): Observer, NIS (Egypt): Observer.
- CCPR - SCL (Hong Kong (China)): Observer.
- CCQM - KEBS (Kenya): Observer.
- CCTF - UME (Turkey): Member, GUM (Poland): Member, MIRS (Slovenia): Observer.
- CCU - NRC (Canada): Member, KRISS (Republic of Korea): Member, METAS (Switzerland): Member.

Dr Usuda suggested that similar discussions to those on membership and observership of the CCs should be had on the membership of the Joint Committees, particularly the Joint Committee for Guides in Metrology (JCGM) and its Working Groups (JCGM Working Group on the Expression of Uncertainty in Measurement (GUM) and JCGM Working Group on the International Vocabulary of Metrology (VIM)). He recalled that there had been hundreds of comments on the latest version of the GUM, and that the active members of the JCGM had not always followed the intentions of the member organizations that they represent. The Director commented that he will present this information to the JCGM and will make it clear that the CIPM does occasionally question whether the views expressed by participants at the JCGM are representative of the organizations that they represent. He added that this is a governance issue, and that it is highly desirable to find an efficient way for the JCGM to operate.

## THE 105TH MEETING OF THE CIPM – THIRD DAY – 27 OCTOBER 2016

The President welcomed the CIPM to the third day of its meeting.

### 20. BIPM LIAISON AND COMMUNICATION

Mr Henson reported an outstanding problem with the status of Lithuania's membership. Lithuania became a Member State in 2015 and official notification of their accession was received from the French Foreign Ministry. However, due to an internal issue in Lithuania, they have queried whether they have actually acceded. Indications are that Lithuania believes it is still an Associate State; the issue seems to be whether a national decision was properly taken before they contacted the French Foreign Ministry. The French Foreign Ministry has agreed to investigate the situation. The BIPM must abide by the *Note Verbale* issued by the French Foreign Ministry and, on the BIPM's books, the contribution for both 2015 and 2016 is outstanding. Paraguay, which is on the "escalator", has informally indicated that it intends to accede and it has paid most of the necessary contribution, however it has not yet completed the necessary diplomatic steps. Slovenia, which had been on the top tier of the "escalator", has acceded since the last meeting of the CIPM.

Mr Henson reported that the BIPM is considering a change in the advice given to States that intend to accede. In future, it is suggested that States should not only write a diplomatic note [to the French Foreign Ministry] stating that they have decided to accede, but they should also include the instrument of accession, such as a Presidential decree or parliamentary decision. This is not a requirement of the Metre Convention; however it is standard practice in other intergovernmental organizations. This approach would avoid the situation the BIPM is facing with Lithuania.

The current situation with Associates is encouraging. There is a general feeling that overall the escalator mechanism is working well and fears that its introduction may have resulted in States withdrawing have so far been unfounded. However, Mr Henson commented that if Jamaica, which is on the escalator, does not pay its subscription by the end of December 2016 it will not have paid for the last 3 years and will trigger the process for automatic exclusion.

The Plurinational State of Bolivia, Bosnia and Herzegovina, and Montenegro, which became Associates on 4 April 2008, 24 May 2011 and 1 August 2011 respectively, have met the criteria to be encouraged to become States Parties to the Metre Convention. The CIPM agreed to proceed to encourage these Associates to become Member States.

**Decision CIPM/105-32** The CIPM decided, on the basis of the criteria it has previously adopted, that it would be appropriate for the Plurinational State of Bolivia, for Bosnia and Herzegovina, and for Montenegro to become States Parties to the Metre Convention. The BIPM will convey the Decision, recalling Resolution 4 "On the status of Associate State of the General Conference" adopted by the CGPM at its 24th meeting, and the implications regarding the increase in subscriptions should any of the States choose to remain as an Associate of the CGPM.

Tanzania intends to become an Associate and claims to have transferred some money. It has completed the necessary diplomatic steps but its payment has not yet been received. The Tanzanian authorities are investigating the issue.

The Director presented the draft Notification of Contributions and Subscriptions for 2017. He commented that the calculations had been made using the new UN Scale of Assessment for 2016-2018,

which was issued in February 2016. Full details of the calculation of contributions and subscriptions are available in two explanatory notes available from the BIPM website. The values are now available for subscriptions and the base calculations have been done for contributions; however these can only be finalized when it is known whether a redistribution of the arrears from Venezuela will be required (it seems likely as there has been no indication that payment is pending). The next step is for the President and Secretary to sign off the Notification. Mr Henson commented that it is important to send the Notification as soon as possible because the adjustments to the UN Scale have resulted in a significant increase in the contributions for some Member States. There is also a retrospective adjustment for 2016 (as the UN Scale for 2016-2018 was not published until February 2016, and, as is normal practice, the 2016 Notification was prepared and sent out in December 2015 based on the old UN scale).

### **New Member States and Associates**

The State of Qatar and the Democratic Socialist Republic of Sri Lanka became Associates of the CGPM on 10 March 2016 and 17 August 2016 respectively. The Republic of Slovenia, which has been an Associate since 2003, became a Member State on 23 March 2016. There were 58 Member States and 41 Associates as of 26 October 2016.

### **Reviews of ISO/IEC 17025 and ISO Guide 34**

Mr Henson reported that the vote at the International Standards Organization (ISO) to approve the Final Draft International Standard (FDIS) of ISO 17034 in September 2016 was successful and it will now proceed to publication as ISO 17034:2016<sup>14</sup>. The development of ISO 17034, which was based on ISO Guide 34, had included input from Dr Westwood, Mr Henson and Dr McLaren as part of the ISO Working Group, and the core drafting group. Mr Henson noted that moving from the status of a guide to a formal standard is a significant step. The outcome has been favourable for the BIPM as metrology is better addressed in ISO 17034:2016 than in the previous ISO Guide 34.

ISO/IEC 17025 has been the subject of many meetings and it will be sent out as a Draft International Standard (DIS) for a three-month ballot on or around 29 December 2016, with a closing date of 22 March 2017 for comments. This marks the first time it has been sent out for external review. An FDIS stage is anticipated. Most of the objectives have been met, most importantly by preventing ISO/IEC 17025 from automatically becoming a conformity assessment document in its title. The ILAC implementation date for accreditation purposes for ISO/IEC 17025 is expected to be after a 3-year transition period.

### **Progress with the BIPM CB&KT programme**

Mr Henson commented that progress with the BIPM CB&KT programme has been very satisfactory, having started from nothing after the 25th CGPM. Significant sponsorship from the NIST allowed the BIPM to organize the two-week “Leaders of Tomorrow” training course on 7-18 November 2016. A second training course “Sound beginning in the CIPM MRA” will take place on 13-24 November 2017 and will be funded through the same sponsorship arrangement. The sponsorship has allowed the BIPM to generate core materials for the courses that can be reused in future activities. The NIM sponsored laboratory-based Safe Food and Feed project was also underway, and an Air Quality project was just being launched. A METAS sponsored project to fund three students to attend the 2016 Varenna metrology summer school, followed by short project-based placements at METAS, had been completed. Self-sponsored training for GULFMET was scheduled to take place in November 2016 and many other initiatives were in the pipeline.

<sup>14</sup> ISO 17034:2016 ‘General requirements for the competence of reference material producers’.

## World Metrology Day

The topic for World Metrology Day 2017 is ‘Metrology for Transport’ and the partner NMI is INM (Colombia).

## ISO General Assembly

The Director said that earlier in 2016 he had received a personal invitation from the ISO President to request BIPM involvement at the ISO General Assembly in Beijing (China) in September 2016. Dr Duan was invited to represent the BIPM at the meeting. Dr Duan commented that he participated as a panellist on the final day of the 3-day meeting. This had been an important session, which had been attended by the Chinese Premier, who gave a speech. The panel consisted of five speakers from international organizations, including the World Bank, the United Nations Industrial Development Organization (UNIDO), and the International Civil Aviation Organization (ICAO). Dr Duan had given a presentation on the BIPM and had introduced the concept of quality infrastructure during the panel discussion and he noted that his presentation had received a positive response. He added that it is important to participate in events such as this to promote the work of the metrology community and quality infrastructure to other communities. Mr Henson added that the BIPM gains significant benefits from being identified as part of the wider quality infrastructure community.

## World Customs Organization

The Director said that Dr Bock, the former Director of METAS, is now responsible for Customs in Switzerland and that he has identified new collaborative opportunities between the BIPM and the World Customs Organization (WCO). Dr Richard added that a mandate has been signed between METAS and the Customs authorities in Switzerland for a joint activity, which had resulted in a decision to move the Swiss Customs laboratory to METAS. It will be integrated in early 2018 and will result in a 10 % increase in staff at METAS. As a result, METAS will represent the Swiss Administration at the WCO. The Director added that Dr Bock has invited the BIPM Director and Dr Wielgosz to meet the Director General of the WCO in early December 2016. They will discuss whether there are areas in which the BIPM and the WCO could collaborate. Dr Bock has prepared a briefing paper (CIPM/16-21) that suggests possible areas for cooperation, which are mainly in the area of chemistry. The Director will provide feedback from the meeting to the CIPM.

Dr Liew and Dr Usuda both commented that regional APMP comparisons often face problems with Customs, such as delaying the transport of artefacts, and this potential collaboration could represent an opportunity to raise the issue with the WCO. Dr May suggested that the BIPM should investigate if any relationships already exist between NMIs and the WCO.

## Revision of document OIML D 1

The Director commented that he had attended the OIML Conference in Strasbourg (France) on 19-20 October 2016. He recalled that it had been decided at the conference that the core document OIML D 1<sup>15</sup> be reviewed. The CIML President has called for strong involvement from the BIPM in the review process because of the close collaboration between the BIPM and the OIML, and because of the nature of the issues in the document. The CIML has expressed a desire that the BIPM be even more involved in the review than its previous revision in 2012; for which Mr Henson was part of the core drafting team. The CIML President has suggested that the revised document may receive joint branding. Mr Henson added that the BIPM had been heavily involved in the 2012 revision, reflecting the fact that

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<sup>15</sup> OIML D 1 “*Considerations for a Law on Metrology*”.

legal metrology cannot be considered in isolation.

## 21. REVISION OF THE VISION, MISSION AND OBJECTIVES OF THE BIPM

The Director set the context for the revision of the Vision, Mission and Objectives of the BIPM by saying that the BIPM Strategic Plan needs to be refined in readiness for the 26th CGPM. He read the Executive Summary of the “*BIPM Strategic Plan (2014)*” and briefly reviewed the strategic priorities for the short term (2013-2015) and their progress, recalling the activities that have been undertaken to achieve the goals that were set. He moved on to the detailed strategic plans for the medium term (2016-2019) and aspirations for the long term and commented that the BIPM is on-track to achieve these goals. Some of the objectives for 2016-2019, such as providing open-access for BIPM and CC documents, have already been achieved. The Director said that it is now necessary to start the process again and produce the next strategic plan, and the starting point, as mentioned in the Executive Summary, is the Mission, Role and Objectives, which will require CIPM approval.

Dr Quinn suggested that the BIPM Strategic Plan could include a new section on the long-term vision. He proposed that the BIPM should consider taking up again comparisons in length, thermometry and photometry, with the associated economic benefits to the Member States and benefits to the CB&KT programme of adding these metrological areas. He said that resuming comparisons in these activities could be added as a long-term vision rather than a plan and that his proposal would fit with the mission of the Metre Convention to assure the international unification and continued development of the metric system. The President asked if Dr Quinn was proposing that there would be a need for laboratories specializing in these activities at the BIPM. Dr Quinn replied that this would be the case. Dr Usuda added that maintaining laboratories in mature subjects, such as length, thermometry and photometry is a burden for NMIs, even though maintaining these activities is vital for customers. He suggested that in future, the support for mature subjects should be considered, and this may include carrying out the work in common with the BIPM. The President thanked Dr Quinn and said that the suggestion will be noted for the planning process.

The Director returned to the issue of the Vision, Mission and Objectives of the BIPM, which provides the starting point and boundary conditions for the development of the Strategic Plan. The first draft of the revised “*Vision and Mission of the BIPM*” document (CIPM/16-15, version 4) was developed and discussed in close consultation with the BIPM Department Directors. The text of the document was presented to the CIPM. The document put emphasis on the BIPM’s vision and mission:

- Its vision is to be universally recognized as the world focus for the international system of measurement.
- Its mission is to work with the NMIs of its Member States, the RMOs and strategic partners worldwide and to use its international and impartial status to promote and advance the global comparability of measurements for:
  - Scientific discovery and innovation,
  - Industrial manufacturing and international trade,
  - Sustaining the quality of life and the global environment.

This document had been presented to the CIPM bureau, where it received approval, with the proviso that it should be “more ambitious”. As a consequence, a new version was developed (CIPM/16-16,

version 6c) with a reorganization of the objectives. This reorganization retained the vision and mission statements but acknowledged the underpinning role of capacity building and knowledge transfer in the work of the BIPM. There was a discussion on the vision and mission statements in the document. The President summed up by saying that there was universal support from the CIPM and it supported the revised vision and mission statements.

The Director continued by explaining the objectives of the BIPM as presented in document (CIPM/16-16, version 6c). He commented that the objectives put an emphasis on the fact that the laboratory work of the BIPM is shared with the Member States. It is supported on a shared-cost basis and provides capabilities for international measurement comparisons. They also highlight that the BIPM's liaison activities are carried out to maximize the uptake and impact of metrology and its coordination role is to ensure it gives comparable and internationally-accepted measurement results. This role is undertaken mainly through the CIPM MRA and the KCDB. The objectives are underpinned by capacity building and knowledge transfer.

It was asked if participation in the Consultative Committees is included in the objectives. The Director replied that participation in the CCs is included in the coordination activities. There was a discussion on whether the "*Vision and Mission of the BIPM*" should include text from the pre-amble to the Metre Convention "to assure the international unification and future development of the metric system". It was suggested that this could add value to the document. It was acknowledged that although this could be useful, the wording used in the document, particularly reference to the 'world-wide measurement system' is broad and inclusive. The President summed up the discussion by saying that there had been general agreement by the CIPM on the objectives and the document overall. He noted that the CIPM supports the Director in continuing with the document (Version 6c).

**Decision CIPM/105-33** The CIPM welcomed and approved the revision submitted by the Director of the BIPM of the Mission, Vision and Objectives of the BIPM.

The Director said that the next steps are to revise the strategy and then to draft a Work Programme for the next meeting of NMI Directors.

## 22. PLANS FOR THE 26TH CGPM

Ms Auty, NPL (UK) and Ms Arlen joined the meeting.

### Dates

The Director presented a draft timeline of the work required before the 26th CGPM, which is planned for October or November 2018.

The Director continued by presenting a detailed draft timetable for the CGPM meeting, which it is proposed will take place over 4 days, with a preparation day on the Monday. The preparation day will consist of an informal dotation meeting at the BIPM in the morning, followed by laboratory tours in the afternoon. He recalled that the 25th CGPM had been compressed into 3 days at the request of the *ad hoc* Working Group on Governance. It is not possible to do this for the 26th meeting because of the amount of extra work anticipated. There would be an open session on the Friday morning of the meeting to which the press and media would be invited. This session will include the discussion and vote on Resolution 1 "on the redefinition of the SI".

The value of scientific talks at the CGPM was questioned, particularly when the majority of the delegates are government representatives. The Director commented that because of the significance of the meeting, it represented an opportunity to attract “big-name” speakers. Prof. Ullrich proposed the Nobel Prize winner, Klaus von Klitzing as a speaker. Dr Bulygin asked if delegates will sign Resolution 1 “on the redefinition of the SI” separately or if it will be grouped with the other resolutions. The Director replied that this is under consideration. Dr Richard asked if there are detailed plans for the celebrations after the signing of Resolution 1 and the contact with the media, specifically if there will be enough time for this. The Director replied that this is being considered, but at the moment he anticipated that there will be sufficient time. He added that Ms Auty will elaborate on the plans for the publicity. The Director added that the details of the timetable, such as the topics of the presentations and the speakers are not yet fixed, and any further ideas would be welcomed.

Dr Liew commented that the CC talks should be outward looking and focus on the impact of their achievements. Dr Bowsher added that the final day of the General Conference represents an opportunity to demonstrate the value of measurements to the world. He suggested that examples should be given to demonstrate the successes and impact of metrology, giving a message that can be taken away by the media. Dr Liew added that the value and impact of the work of the BIPM is often better conveyed by our stakeholders than by ourselves as insiders.

### **Plans for draft resolutions**

The Director said that he had identified two resolutions that would certainly be necessary:

- A. On the revision of the International System of Units, the SI. This is being drafted by the CCU.
- B. The dotation of the BIPM. This will be drafted by the BIPM.

Additionally there may need to be resolutions on other topics including:

The definition of a continuous time scale. This is being considered by the CCTF.

The BIPM Pension Fund. This will be drafted by the PFAB.

The review of the CIPM MRA.

He said that specific draft resolutions on the Pension Fund and the review of the CIPM MRA may not be necessary as both will be discussed during the 26th CGPM. He added that a resolution on the future impact and opportunities in metrology could be considered; such resolutions are considered to be useful by NMIs and regions during the drafting of programme proposals.

It was suggested that the CIPM meeting in October 2017 should be split around the meeting of NMI Directors, so that two days would be held before the meeting of NMI Directors, and the final day of the CIPM meeting afterwards to discuss any outcomes. The President supported this suggestion and said that holding the final day after the meeting of NMI Directors would allow any outstanding issues to be addressed directly without the need of having to do so by correspondence. This was the consensus view of the CIPM.

### **Update on the SI awareness campaign**

Prof. Ullrich, Chairperson of the CIPM Task Group for Promotion of the SI, introduced Ms Fiona Auty (NPL), who is the rapporteur of the PR Expert Group. The other members of the PR Expert Group are Dr Valérie Morazzani (LNE), Ms Gail Porter (NIST) and Dr Jens Simon (PTB). He reminded the CIPM that the PR Expert Group reports to the Task Group, which then reports to the CIPM.

Ms Auty presented a summary of the objectives of the PR Expert Group, its work to date and the next

steps. Full details can be found in document CIPM/16-28<sup>16</sup>. She said that the Expert Group has developed three key messages for the awareness campaign:

- The SI is a world-wide endeavour and approach – it is a universal language of measurement.
- The revised SI will use the rules of nature to create the rules of measurement.
- The changes to the SI will provide a springboard for future innovation.

The timeline for the campaign was presented, with the main actions for 2017 being: sharing of the ‘Brand Book’; developing and sharing resources; and encouraging the NMIs to prepare engagement plans for the media, educators and end-users. The main actions for 2018 were listed as: providing a PR launch pack; encouraging NMIs to share plans and implement local campaigns; preparing for the ‘one-day’ celebration within the 26th CGPM; sharing and publishing PR from around the world; and preparing materials to mark the close of the campaign in 2019.

Ms Auty elaborated on the Expert Group’s development of an ‘SI Brand Book’, which is expected to be available in January 2017, after which it will be translated, published and circulated to all NMIs.

She gave a brief summary of the awareness campaigns that are underway in the NMIs. The NIST has made funding of \$500 K available to produce a documentary film on the subject of ‘Rebooting the International Measurement System’, which is aimed at the general public with an interest in science. The PTB has produced a series of booklets that are aimed at the higher education sector that give details of ‘Experiments for the new SI’. The NPL is developing instructions to build watt balances using Lego<sup>®</sup>, targeted at the higher education sector. It is also expanding its existing ‘Virtual Laboratory’ concept to encompass a ‘SI Virtual Laboratory’. This computer-based teaching resource will be made available to educators with the original source code, so that it can be translated into any language.

Ms Auty proposed that the main awareness campaign will begin on World Metrology Day (WMD), 20 May 2018, and will end on WMD 2019. EURAMET is working on the campaign and poster for WMD 2018, which will focus on the revised SI. Considerations for WMD 2018 will include how to engage the world’s press. Ms Auty presented a list of major international scientific conferences scheduled for 2016 and 2017, where selected speakers could attend to raise awareness of the proposed revisions. She encouraged the NMIs to inform the PR Expert Group of any national conference that they will attend. It was noted that the BIPM website includes dedicated pages, for the revised SI, and the work of the CIPM Task Group for Promotion of the SI.

Ms Auty finished her presentation by highlighting the next steps for the awareness campaign. In particular she proposed that a video that will feature contributions from every NMI is being pursued. Such a video could be shown at the opening of the final day of the 26th CGPM to demonstrate the world-wide nature of metrology. She commented that the NMIs had indicated that a video is preferred as a method of disseminating the messages of the awareness campaign to promote the SI.

The President thanked Ms Auty and invited questions and comments.

Dr Castelazo commented that CENAM (Mexico) has developed a brochure on the redefinition of the kilogram in Spanish that was written for the general public and which avoids technical terminology. Ms Auty asked him to send her a copy so that it can be made publicly available and added that reaching a wider audience through the use of non-technical material is very important. Dr Castelazo suggested that other functioning model watt balances could be developed using materials other than Lego<sup>®</sup>. Ms Auty replied that this had been considered, possibly by organizing a competition to design a model watt balance using other materials.

Dr Liew said that consideration should be given to engaging with young people. This may require a

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<sup>16</sup> CIPM/16-28 “Task Group for the Promotion of the new SI, PR Experts Group Update”.

different approach to engaging with other audiences. Ms Auty replied that engaging with young people will require developing an online presence and, in particular, getting involved with people who have a high-profile online. In particular she gave the example of the NPL's involvement with a well-known vlogger who made a short YouTube video on the redefinition of the kilogram. This video had almost 500,000 views in a very short time, and it did not cost anything to make. The video was shown to the CIPM. Dr Louw said that the NMISA has made a short animated video on the redefinitions that is aimed at 6-12 year olds. He said that he will share this after checking if any royalty issues apply. Ms Auty commented that animations are very expensive to produce, so any that can be shared with the Expert Group would be welcomed. Dr Louw added that AFRIMETS is planning to make a video, so it is worth checking with the RMOs as to what awareness campaigns they are working on to avoid duplication of effort.

Dr May suggested that the main talking point of the high-level message associated with the revision of the SI should be agreed. He said that there are conflicting and contradictory messages about the aftermath of the redefinition such as "nothing will change, but it will afford a lot of changes". He suggested that a unified message should be developed. Ms Auty replied that some "speaking notes" will be developed to encourage speakers to deliver a unified message. Dr Liew added that considering the amount of effort that has gone into the redefinitions, the metrology community should not be afraid of saying that there will be a change that will have a significant and positive impact in the future, but that the change is backward compatible. Mr Henson suggested that an analogy for the redefinition could be seen as a relay race: the first runner has run out of steam, but at the point when the baton is passed, they are both going at the same speed and the next runner accelerates into the future.

Dr Bowsher asked if it would be possible to steer the themes and agenda of the next NCSLI and *Metrologie* conferences to reflect some of the initiatives that are being taken. Dr Rietveld added that both conferences will be attended by participants from outside the NMI community, particularly industry and stakeholders. Dr McLaren said that the awareness campaign was focused mainly on the redefinition of the kilogram. He commented that there are other base units that will also be redefined and these seem to have been overlooked, with the danger that press interest will focus purely on the kilogram. Ms Auty replied that the reality is that the press will be primarily interested in the kilogram as this is the last artefact. The broader message and communications for educators and stakeholders will cover all of the changes.

The President summed up the discussions by noting that the unified message for speakers needs to be made available as soon as possible so that press enquiries can be dealt with as efficiently as possible and with a common message, especially if such requests are received at short notice. He also said that there is a vast resource of people in the RMOs who can disseminate the messages discussed today. This will ensure that as many people as possible are reached through the multiplier effect of stakeholders talking to other stakeholders. He thanked Ms Auty for her presentation and for the work that the PR Expert Group has already undertaken. He gave the opinion that we are all responsible for ensuring the success of the awareness campaign and that it will be a success.

## 23. INTERIM ELECTION OF THREE CIPM MEMBERS

The President initiated an *in camera* session for the interim election of three CIPM members by secret ballot. The election had become necessary following the resignations of Prof. Brandi and Prof. Inguscio since the last CIPM meeting, and Dr Bowsher at the end of the current meeting. The Secretary added that

the CIPM was required to recommend a slate of three candidates from the nine CVs that had been received to send to the Committee for CIPM Elections (CEC). He reminded the CIPM that the CEC may have a different opinion to the CIPM on the 'slate' of candidates. It was agreed that the three candidates who will be provisionally elected will take up their roles from 1 January 2017 (see §7).

The Secretary reminded the CIPM that there were vacancies for the Presidents of the CCPR and CCL and the Chair of the CIPM Sub-Committee on Finance. He added that some of these vacancies can be filled from existing CIPM members, however, any skills that would be useful for filling these vacancies should be considered when looking at the CVs. He further reminded the CIPM that they are not limited to selecting CIPM members as CC Presidents; the discussion on candidates for CC Presidencies could be open to people from outside the CIPM. It was suggested that the ballot for the three candidates to be recommended to the CEC for provisional election to the CIPM should be carried out before considering the other vacancies.

A list of nine candidates qualifying for CIPM membership was discussed by the CIPM and three candidates were subsequently selected by secret majority voting. The list of qualified candidates together with the 'slate' of the three selected candidates and all CVs will be forwarded to the CEC by the Secretary for their consideration.

**Decision CIPM/105-34** Following the resignation of Dr Bowsher, Dr Brandi and Prof. Inguscio from the CIPM, the CIPM voted to elect a "slate" of three candidates for provisional election. The CIPM asked the CIPM Secretary to submit the names to the Committee for Election of the CIPM (CEC) for their approval.

## 24. ELECTION OF A PRESIDENT FOR THE CCL

Following a discussion of the candidates from within and outside the CIPM, Dr Castelazo was appointed unanimously as President of the CCL.

**Decision CIPM/105-35** The CIPM appointed Dr Castelazo as President of the CCL.

Dr Liew recalled that Decision CIPM/104-21 mentioned the creation of a CIPM Sub-Committee on Awards, chaired by Prof. Inguscio, with Dr Kang, Prof. Brandi and Dr Bulygin as members. He added that Prof. Inguscio and Prof. Brandi have both left the CIPM and asked for clarification about the next steps for the Sub-Committee. The Director added that the CIPM Sub-Committee on Awards has not been added to the CIPM website because no Terms of Reference were developed. The President asked Dr Bulygin to prepare Terms of Reference and a scope for a suitable awards programme for presentation to the next meeting of the CIPM. Dr Bulygin agreed to the proposal.

**Decision CIPM/105-36** The CIPM appointed Dr Bulygin as Chair of the CIPM Sub-Committee on Awards and asked him to prepare Terms of Reference and a scope for a suitable awards programme for presentation to the next meeting of the CIPM.

Dr May gave a presentation on his proposal to establish Consultative Committee Vice-Presidents. He suggested that the Vice-Presidents would be external to the CIPM; ideally someone currently active on the respective CC. The potential benefits are that it would ensure that each CC President has support and assistance from a technical subject matter expert and it would be a tool for CIPM succession planning. There was a discussion with general support from the CIPM members for the proposal. Dr May was asked to re-form the CIPM *ad hoc* Working Group on Membership and to develop a proposal for

appointing Vice-Presidents to the Consultative Committees and to report its findings to the next meeting of the CIPM.

**Decision CIPM/105-37** The CIPM requested Dr May to re-form the CIPM *ad hoc* Working Group on Membership and to develop a proposal for appointing Vice-Presidents to the Consultative Committees.

## 25. DATES FOR MEETINGS IN 2017 AND 2018

9-10 March 2017 - CIPM bureau.

13-14 March 2017 - CIPM *ad hoc* Working Group on Implementing the Recommendations from the Review of the CIPM MRA.

12 June 2017 - CIPM Sub-Committee on Finance.

13-14 June 2017 - CC Presidents meeting.

13-15 October 2017 - CIPM bureau.

16-17 and 20 October 2017 - 106th meeting of the CIPM (One session).

18-19 October 2017 - NMI Directors meeting.

Sessions I and II of the 107th meeting of the CIPM will be held in March and June 2018, with the exact dates to be decided.

The Director said that the BIPM had provisionally reserved two potential weeks in November 2018 for the 26th CGPM at the *Palais des Congrès de Versailles*. It was agreed that the meeting will be held on the week beginning 12 November 2018, with a preparation day at the BIPM on the Monday.

**Decision CIPM/105-38** The CIPM agreed that the 26th meeting of the CGPM will be held at the *Palais des Congrès de Versailles* on 13-16 November 2018 with informal meetings planned on 12 November.

## 26. BIPM WORKSHOPS

### **BIPM-VAMAS Workshop: Emerging measurement challenges in Materials Metrology**

The Director said that Dr Liew has agreed to chair the Steering Committee for the workshop.

### **BIPM Workshop: The Quantum Revolution in Metrology**

The Director said that he had discussed this workshop with the CIPM bureau. The Steering Committee is: Dr Choi (KRISS), Dr Milton (BIPM), Dr Rastello (INRIM), Dr Siegner (PTB) and Dr Williams (NIST). The Executive Secretary is Dr Gournay (BIPM). The possible themes were presented and he said that dates in the third quarter of 2017 were being considered.

### **Other workshops for 2017 and 2018**

The Director said that although it was not standard practice to hold workshops in the same year as a General Conference, it may be a good idea to revisit “climate” in 2018 considering the expansion of work in this area in the NMIs since the last workshop in 2010, and the growing amount of climate-related work being undertaken by the CCT. He added that it would be a good idea to address this high-profile topic during the same year as the CGPM.

Other suggestions for future workshops included “precision medicine”, particularly the application of physical methods to the medical sector and life sciences, and metrology in IT, “big data” and cybersecurity. Prof. Ullrich commented that a workshop at the PTB recently heard that around 50 % of the data published in high-impact papers [in biomedicine] cannot be verified. There is, therefore, scope for the BIPM to organize a workshop that would provide leadership in how metrology can improve the production of high-quality, comparable and reliable data. Mr Henson added that these areas could be combined in a cross-cutting workshop entitled “Generating reliable data in complex environments”. This could also include a statistical element and data from the latest generation of sensors. This suggestion was well received as it would allow the workshop to stand out among the many other workshops in the areas of climate, precision medicine, and IT that are being organized around the world.

## **27. ANY OTHER BUSINESS**

Dr Liew asked for an agenda item to be added to the next meeting of the CC Presidents to discuss if it is possible to organize meetings between certain CCs to discuss cross-cutting issues.

Dr Bowsher said that this was his last meeting and that it had been a pleasure serving on the CIPM over the last four years. The President thanked Dr Bowsher on behalf of the CIPM for his input and said that it had been a great pleasure and privilege to have worked with him on the CIPM.

The President closed the meeting at 4:45 pm. He thanked the CIPM members for their input and wished everyone safe travel.

## Appendix 1

### REPORT OF THE SECRETARY AND ACTIVITIES OF THE BUREAU OF THE CIPM

(October 2015 - October 2016)

The CIPM bureau met at the BIPM on 10-11 March, 14 and 17 June and 22-23 October 2016.

The Secretary also attended the annual Management Review meetings for the BIPM Quality Management System and the Health and Safety System as well as the annual BIPM/ILAC bilateral meeting and the annual BIPM/ILAC/OIML/ISO quadrilateral meeting in March 2016 and the Secretary and other bureau members attended a meeting of Consultative Committee Presidents, a meeting of the CIPM Sub-Committee on Finance and a meeting of the CCU in June 2016. The bureau also met with representatives of the *Commission des conditions d'emploi* (CCE) on two occasions to discuss possible revisions to the BIPM Pension Plan.

The agenda of the bureau meetings included the usual administrative and financial matters; the following paragraphs summarize other agenda items.

#### Preparation for the CIPM MRA Review

This agenda item at the March 2016 meeting included a review of submissions from the MRA Review Working Group that was established in October 2015 and which met on 14-15 March 2016. The bureau reviewed the draft agenda for that meeting.

#### BIPM Pension Plan

Mr Énard, the Chair of the Pension Fund Advisory Board (PFAB), attended the parts of each bureau meeting devoted to this agenda item, as well as two meetings with CCE representatives. The PFAB continues to evaluate the long-term results of various modifications to the current defined benefit pension plan, including an increase of the minimum retirement age for full pension benefits, an increase in employee contributions and supplementary cash contributions from the BIPM. A proposal that will give current staff a choice between retention of all acquired pension rights, but with a higher contribution rate, and an alternative that will involve the loss of some rights, but with a smaller increase in the current contribution rate, was sent to the CCE on 1 April 2016. Shortly afterwards, the Director briefed the staff on the proposal, and requested the receipt of an advisory opinion from the CCE by the end of April 2016.

When the advisory opinion from the CCE was received, the pension proposal and the CCE response was sent to the CIPM for consideration, with an electronic vote on the final version of the proposal by 1 July 2016. The version of the proposal approved by the CIPM had been submitted to the staff on 1 July 2016, with a 1 December deadline for submissions by staff as to their choice of alternative.

Many CIPM members were present at the BIPM during the week of 13 June 2016 for the CC Presidents meeting and other meetings, so an optional information session about the proposed changes to the pension plan was held on 14 June.

The advisory opinion that had been received from the CCE before the June 2016 meeting of the Bureau indicated that the majority of staff were prepared to appeal the implementation of the currently proposed changes to the International Labour Organization Administrative Tribunal (ILOAT). While the staff agreed that changes to the pension plan are needed to ensure its sustainability, most felt that the single-step increases in the contribution are too large, and would prefer the required increases to be accomplished over several years (and, of course, be smaller). Many of the younger staff are unhappy with the elimination, in the post-2017 option, of the right to retire with an undiminished pension after 35 years of service, regardless of age. There was common agreement at both meetings with CCE representatives during the week that an appeal to the ILOAT is a very undesirable outcome for all concerned. Prior to the second meeting, the bureau met with the BIPM Department Directors to seek their views on how to engage staff with the proposals. Significant progress to that end was made during the second meeting.

At the October bureau meeting, it was reported that, on the advice of the consultants, new scenario analyses, in which the rate of return on investments was reduced to 1.75 % per annum, rather than the 4 % rate used in 2014, have been prepared. On the afternoon of 26 October 2016, the bureau members met with staff following a discussion by the CIPM of the proposed changes. On 1 November, draft revised rules were submitted to the CCE for its advisory opinion. The first increases to staff contributions are likely to enter into force on 1 January 2017.

The bureau agreed to recommend to the CIPM that an invitation be extended to M. Thomas Grenon, Director General of LNE, to join the PFAB as an external expert. He will succeed Dr Christian Bock in this capacity.

### **Response to Retired Employees Association**

At its March 2016 meeting, the bureau discussed the letter to the CIPM President from the Association of Retired BIPM Employees “*Association des Anciens*” in which representation on the PFAB and the CIPM *ad hoc* Working Group on Conditions of Employment was requested. The advice of the BIPM Director was that it would be premature for the CIPM to consider this request before negotiations with the staff about changes to the pension plan have progressed further and a consultant study on the health insurance plan (not anticipated until 2017) has been conducted. Accordingly, the President’s reply to Dr Witt indicated only that the request had been forwarded to the CIPM.

Prior to the bureau meeting (on 21 October 2016), the CIPM President and Secretary, along with the BIPM Director had an informal meeting with two representatives of the *Association des Anciens* to exchange information about possible changes to the BIPM pension plan that would affect retired employees. The representatives expressed the opinion that any changes to the pension plan that would affect the retirees should also be applicable to the current BIPM staff. They also requested observer status on the PFAB with the right to ask questions or make comments. The President replied that it was his intention to recommend observer status on the PFAB for a member of the *Association des Anciens* to the CIPM.

### **BIPM Staff**

The Director, at the March 2016 bureau meeting, reported progress on filling two new positions (a communications officer in the International Liaison and Communication Department, and a human

resources specialist) and the successful recruitment of a housekeeping assistant to replace the indefatigable M.-J. Fernandes, who will retire in 2017.

The Director reported on two recruitments in progress at the June 2016 bureau meeting: a human resources specialist and a stonemason.

At the October 2016 bureau meeting, the Director reported two retirements (one of the two gardeners and a member of the Time Department) and the impending arrival of a human resources professional who will report to the Director, and a liaison officer on a 2-year fixed-term appointment in the International Liaison and Coordination Department in the next few months. He also reported that a new JCRB Executive Secretary to succeed Dr Olson will arrive in early 2017. The Director also noted the need to recruit replacements for the Directors of the Time and Ionizing Radiation Departments, both of whom will retire in 2017.

### **BIPM Capacity Building and Knowledge Transfer Programme**

Dr Wielgosz and Mr Henson reported excellent progress on development of activities within the Capacity Building and Knowledge Transfer Programme.

Dr Wielgosz reported progress on the project *Safe Food and Feed*, designed to facilitate the development of capabilities for the determination of mycotoxins (toxic fungal metabolites) in food materials. Establishment of this capability is a high priority for a number of developing countries in the AFRIMETS region. Visiting scientists from NMIs seconded to the BIPM will work with BIPM staff to develop value-assigned calibration solution samples for five key mycotoxins, in the process they will acquire hands-on experience with the procedures needed to assess the purity of such samples. A final element of the project will be the BIPM coordination of an international comparison of mycotoxin calibration solutions. Commitments of 161 k€ and 3 person years have been made by three NMIs (NIM, NIMT and NMISA). An additional contribution from PTB has enabled the participation of three more NMIs (INTI, UME and INMETRO).

Mr Henson reported that a grant of \$213,000 secured with NIST assistance will enable the BIPM to implement two training activities aimed at countries with developing metrology infrastructure. The first of these, titled *Leaders of Tomorrow* and intended for future RMO TC and WG Chairs, will be held at the BIPM from 7-18 November 2016. The second, titled *A Sound Beginning* and aimed at countries that are developing their first CMC's, will be held in 2017.

Mr Henson reported at the June 2016 bureau meeting that 17 participants (out of more than 50 applicants) have been chosen for the *Leaders of Tomorrow* training to be held in November 2016. On behalf of Dr Wielgosz, he also reported good progress on the mycotoxin standards project. A proposal to develop a training package for time transfer calibration within the CB&KT Programme has been discussed with a possible sponsor.

### **CC Presidents Meeting – 13 June 2016**

The bureau discussed the agenda for the CC Presidents meeting scheduled for 13 June. Topics for discussion included rules for CC membership and observership.

### **Consultative Committee Membership Criteria**

The bureau reviewed the changes to the criteria for CC membership and observership that were recommended at the CC Presidents meeting. A resolution to formally approve these changes will be put forward at the October 2016 CIPM meeting.

### **CCPR Presidency**

The bureau discussed three nominations for the next President of the CCPR. A recommendation will be made to the CIPM at its October meeting.

### **“Revised SI” Awareness Campaign**

Prof. Ullrich briefed the bureau on the work of the Task Group for the Promotion of the SI and the associated Public Relations (PR) Expert Group. The Task Group met in January 2016, following a meeting of the PR Expert Group in November 2015. His report included a summary of the next steps, one of which is the distribution of a questionnaire to be sent to NMIs to gather information about their plans to communicate the redefinition of the SI units.

The Task Group specifically recommended against the use of the phrase “new SI” in communications regarding the redefinitions; the preferred phrase is “revised SI”.

### **ARAMET – A New RMO?**

The bureau discussed a letter to the Director announcing the formation of a new RMO named ARAMET comprising eleven members: Mauritania, Morocco, Tunisia, Libya, Algeria, Sudan, Egypt, Saudi Arabia, Lebanon, Palestine and Iraq. The letter noted that this group includes four Member States (Egypt, Iraq, Saudi Arabia and Tunisia) and concluded with a request for recognition as a RMO within the CIPM MRA.

The bureau noted that six members of ARAMET are members of AFRIMETS and that Saudi Arabia is a member of GULFMET, which has recently received provisional approval as an RMO within the CIPM MRA. Although there are already precedents for membership in two RMOs (e.g., PTB membership in both EURAMET and COOMET), the bureau expressed concern about the impact on AFRIMETS of the possible departure of six states, in particular Egypt. It was agreed that the BIPM Director or the ILC Director should contact the six AFRIMETS states to determine whether they intend to continue as members. A visit to Saudi Arabia in May 2016 by the Director and the ILC Director presented an opportunity for clarification.

The June 2016 bureau meeting heard that the communication to the BIPM earlier in 2016 about the formation of ARAMET had been made with limited contact with the appropriate authorities in many of the proposed Member States. This was confirmed by enquiries made both by the BIPM and by Dr Louw (on behalf of AFRIMETS). The BIPM Director and ILC Director will continue to monitor developments.

## **Preparation for the NMI Directors Meeting**

The bureau reviewed the draft agenda for the October 2016 NMI Directors Meeting and concluded that too much time had been allotted on the first day to discussion of the recommendations of the MRA Working Group. Dr Milton and Dr May will contact Dr Bowsler about some revisions to the agenda.

Mr Henson presented a short document and provided an update on preparations for development of the next generation of the KCDB (KCDB 2.0). The different formats used for the current data between different metrology areas and/or RMOs present a challenge moving forward. He stressed that it will be important to finalize the software specification for KCDB 2.0 in order to control the development cost.

## **Progress on the BIPM Work Programme 2016-2019**

The Director drew the bureau's attention to a detailed report of progress on the objectives in the Work Programme during the period January 2016 – 30 September 2016. The plan is to produce such a report each year in time for the October CIPM meeting, with an update at the end of the year for annual reporting purposes. These detailed progress reports are intended to complement the much less detailed Annual Reviews and will be posted to the BIPM website.

## **BIPM Vision, Mission and Objectives**

The bureau reviewed a new version of the BIPM Vision, Mission and Objectives that will be presented to the CIPM on 28 October 2016.

## **CIPM Provisional Elections**

The Secretary provided a brief report on preparations for the provisional election of new CIPM members to fill three vacancies created by resignations. As of 22 October 2016, nine nominations had been received. Nomination documents received two weeks or more before the CIPM meeting were posted to the CIPM website on 12 October 2016, with others added more recently.

## **Update from the CCU**

The bureau reviewed the presentation to be made to the CIPM by CCU President, Prof. Ullrich, as well as the latest draft of the 9th edition of the SI Brochure and the draft resolution on the changes to the SI to be presented at the 26th CGPM in 2018.

## **26th CGPM**

The bureau reviewed draft plans for the 26th CGPM, including the timelines for the planning process beginning in 2016. The current plan envisions a 4-day meeting, with a “preparation day” at the BIPM during which there will be an informal dotation meeting and laboratory tours.

## **Meeting with RMO Chairs/Presidents**

The bureau met with the Chairs/Presidents of AFRIMETS, APMP, COOMET, EURAMET and SIM on 25 October 2016 for an informal exchange of information and ideas about how the BIPM and CIPM could work most efficiently and effectively with the RMO’s. The President reported on this meeting later in the agenda.

## Appendix 2

## Visite du dépôt des prototypes métriques

## PROCÈS-VERBAL

Le 27 octobre 2016 à 13 heures 35 en présence du Président du Comité international des poids et mesures et du directeur du Bureau international des poids et mesures, il a été procédé à la visite du dépôt des prototypes métriques internationaux du Pavillon de Breteuil.

On avait réuni les trois clefs qui ouvrent le dépôt : celle qui est confiée au directeur du Bureau international, celle qui est habituellement déposée aux Archives nationales et actuellement confiée au directeur du Bureau international des poids et mesures pour la campagne extraordinaire d'étalonnage avec le prototype international du kilogramme, et celle enfin dont le Président du Comité international a la garde.

Les deux portes de fer du caveau ayant été ouvertes ainsi que le coffre-fort, on a constaté dans ce dernier la présence des prototypes et de leurs témoins.

On a relevé les indications suivantes sur les instruments de mesure placés dans le caveau :

température actuelle	:	21 °C
température maximale	:	22 °C
température minimale	:	19 °C
état hygrométrique	:	55 %

On a alors refermé le coffre-fort ainsi que les portes du caveau.

Le Directeur  
du BIPM

M.J.T. MILTON

Le Président  
du CIPM

B.D. INGLIS