

Commission C2 – SUNAMCO
Report to the IUPAP Council & Commission Chairs meeting and
IUPAP General Assembly, Singapore, 3 – 7 November 2014,
on the IUPAP term 2011 – 2014

Commission on Symbols, Units, Nomenclature, Fundamental Constants and Atomic Masses

13 October 2014

Membership: The Director of the BIPM is *ex-officio* a full Member of C2 without national affiliation. Michael Kuhne retired as Director on 31 December 2012 and was replaced as a Member of C2 by his successor as Director, Martin Milton. At this General Assembly, nine Members reach the end of their terms: Jens Dilling (Canada, Secretary) after three terms; Bodil Holst (Norway), Kazumoto Hosaka (Japan), Alexandr Ivanchik (Russia), Stephen Lea (UK, Chair), Amitava Sen Gupta (India), Jörn Stenger (Germany, Vice-Chair), and Zhiyi Wei (China) after two terms; and François Biraben (France) after one term. The Commission thanks these Members for their participation in its work.

Meetings: Owing to limited resources, it has not been possible to hold a full meeting of C2 during this three-year period. On Thursday 5 July 2012, those Members and Associate Members present met as a satellite meeting to CPEM in Washington DC, USA. A small number of commission members met on Monday 10 June 2013 at BIPM, Sèvres, in advance of a meeting of the CCU. The principal topic was succession planning.

Supported Conferences: C2 usually supports the biennial Conference on Precision Electromagnetic Measurement (CPEM) as a Type A conference. In this three-year term CPEM 2012, held in Washington DC, USA, 1–6 July 2012 and CPEM 2014, held in Rio de Janeiro, Brazil, 24–29 August 2014, have been supported. Despite their best efforts to identify suitable candidates, the organizers of CPEM 2012 were unable to allocate all of the funds for travel for physicists from developing countries and reimbursed IUPAP US\$5,000 of unused funds. Consequently, IUPAP Council resolved that CPEM 2014 should not be awarded a separate Travel Grant but a single sum with the intention that it be used preferentially to support the participation of physicists from low through to upper-middle income group countries.

C2 has also supported the International Conference on Precision Physics of Simple Atomic Systems (PSAS 2014), also held in Rio de Janeiro, Brazil, 25–30 May 2014, as an unfunded Type C conference.

Awards: C2 awards the IUPAP Young Scientist (Early Career) Prize in Fundamental Metrology biennially, on the occasion of CPEM, normally making two awards, and hence in this three-year term has made four awards:

Pierre Cladé (Laboratoire Kastler Brossel, Université Pierre et Marie Curie, Paris, France), “for his outstanding contribution to measurement of the fine structure constant” (2012);

Ryan Ringle (NSCL, Michigan State University, USA), “for his outstanding contribution to mass measurements of short-lived radioactive isotopes” (2012);

Samuel Lara-Avila (Chalmers University of Technology, Göteborg, Sweden), “for his contribution to the understanding of quantum electrical transport in epitaxial graphene,

leading to the development of a novel quantum resistance standard” (2014);

Stefan Ulmer (RIKEN, Japan and CERN, Geneva, Switzerland), “for his measurement of the magnetic moment of the proton and the preparation for the measurement of the antiproton” (2014).

In addition, in 2012 C2 awarded the SUNAMCO Medal to Ian M. Mills (University of Reading, UK), “for his outstanding contribution to the development of the International System of Units towards the adoption of a system based on fundamental physical constants”.

Representation: Members, Associate Members, and past Members of Commission C2 are appointed by IUPAP as representatives to other international organizations. The organizations, corresponding appointments, and activities are:

1. **CODATA.** Past C2 Chair Peter Mohr (USA) has the role of IUPAP liaison with CODATA, in addition to being a member of the CODATA Task Group on Fundamental Constants. Peter Mohr served as IUPAP panel nominee for ICSU’s recent review of CODATA’s activities.
2. **IUPAC Commission of Isotope Abundances and Atomic Weights (CIAAW).** C2 Associate Member Kumar Sharma (Canada) represents IUPAP at CIAAW. C2 continues to encourage the work of the Atomic Mass Data Centre, currently hosted by the Institute of Modern Physics of Chinese Academy of Sciences, Lanzhou, China. The work of the AMDC underpins the relative atomic weight recommendations of IUPAC-CIAAW and provides the atomic mass input to the CODATA evaluation of the fundamental constants.
3. **Joint Committee on the Guides to Metrology (JCGM).** Under the terms of the [JCGM Charter](#), IUPAP, along with other scientific unions and metrology and standards organizations, nominates one member who is assisted by a technical expert on each of the JCGM’s Working Groups. IUPAP is represented by Wolfgang Wöger (Germany), supported by Clemens Elster (Germany) on [WG1 – Guide to Uncertainty in Measurement](#) and Savely Karshenboim (Russia) on [WG2 – International Vocabulary of Metrology](#). See appendix for report on the JCGM meetings to Oct 2014. IUPAP is grateful to the Physikalisch-Technische Bundesanstalt (PTB) for the support it provides to enable Clemens Elster and Wolfgang Wöger to participate in the work of the JCGM.

The activities of JCGM-WG2 in 2014 have centred primarily on four key topics: (1) analysis of feedback from the JCGM Member Bodies on the “Proposed Modified JCGM-WG2 Plan of Work”; (2) finalizing the electronic product and developing annotations for inclusion in the Annotated VIM3 (now called “VIM Definitions with Informative Annotations”), for posting on the newly revised BIPM web site; (3) continuation of planning for the VIM4; and (4) analysis of work in ISO/REMCO and IUPAC/IFCC concerning terminology work on nominal properties.

Wolfgang Wöger raises the question of the extent to which IUPAP can or should contribute to terminology work on nominal properties: a nominal property, lacking magnitude, is not a physical quantity and cannot be the object of a physical measurement. (Examples of a nominal property could include the taxonomy of a biological organism, the colour of an object, or the blood group of a clinical patient.) Metrology no longer is restricted to the field of applied physics; IUPAP has to decide on its role within and support of the future projects of JCGM-WG2.

A report on the October 2014 meeting of JCGM-WG2 is appended.

4. **IUPAC Interdivisional Committee on Terminology, Nomenclature and Symbols (ICTNS).** C2 Chair Stephen Lea continues as IUPAP representative. ICTNS last met at the IUPAC General Assembly, 8–15 August 2013 in Istanbul; Stephen Lea submitted a written report on C2’s activities. Jeremy Frey (University of Southampton, UK), a titular member of ICTNS, acts as IUPAC’s representative to C2.
5. **Consultative Committee for Units (CCU)** of the International Bureau of Weights and Measures (BIPM). IUPAP is represented by C2 Member Bill Phillips (USA). Past C2 Chair Peter Mohr (USA). C2 Members Jörn Stenger (Germany) and Stephen Lea (UK) have also participated as national representatives and C2 Associate Member Savely Karshenboim (Russia) as an invitee of the President of the CCU, Ian Mills. The CCU met at BIPM, Sèvres, on 11–12 June 2013. Unfortunately Bill Phillips was unable to be present and his contribution was presented by past C2 Chair Peter Mohr (USA), present as representative of NIST. The meeting addressed issues associated with the eventual implementation of the “New SI”, including the *mis en pratique* of the new definition of the kelvin. There was also a discussion, led by Bill Phillips and Peter Mohr, of the way angle and count rate are treated in the current SI. This debate has been taken forward by the establishment of a CCU Working Group on Angles and Dimensionless Quantities in the SI (CCU WG-ADQ), chaired by C2 Vice-Chair Jörn Stenger (Germany) and with membership including C2 Member Bill Phillips and past C2 Chair Peter Mohr. Terms of Reference are at http://www.bipm.org/en/committees/cc/ccu/tor_wg-adq.html.
6. **ISO TC-12/IEC TC-25** (Joint Technical Committee on Quantities and Units of the International Standards Organisation and the International Electrotechnical Commission). C2 Associate Member Savely Karshenboim (Russia) represents IUPAP; this Committee is chaired by past C2 Chair Lesley Pendrill (Sweden). This committee is responsible for the ISO 80000 series of standards “Quantities and Units” which has considerable overlap with the IUPAP “Red Book”, taking the 1987 edition as one of its primary sources.

Red Book: Work on the informal project to update the SUNAMCO Red Book (IUPAP-25 “Symbols, Units, Nomenclature and Fundamental Constants in Physics”) has progressed very slowly owing to limited resources. However, a lightly revised reprint of the 1987 edition, prepared in 2010 by Peter Mohr and Stephen Lea, is now available for download from the IUPAP website at <http://iupap.org/wp-content/uploads/2014/05/A4.pdf>.

Stephen N. Lea MA. D.Phil
Chair, IUPAP C2 – SUNMACO
National Physical Laboratory
Teddington, Middlesex TW11 0LW, UK
Tel: +44 20 8943 6102
stephen.lea@npl.co.uk

REPORT

Meeting JCGM/WG1 held at BIPM on 29 Sep – 03 Oct, 2014

Clemens Elster and Wolfgang Wöger

IUPAP representatives at JCGM/WG 1

Revision of the GUM

During this meeting the first committee draft of the revised GUM was finalized. Following editorial changes, this version shall be circulated among the member organizations and NMIs later this year.

In addition to the two regular meetings of JCGM-WG1 two subgroup meetings were held in addition. IUPAP was represented in both meetings (March 27-28 Subgroup meeting at PTB Berlin (W. Wöger, C. Elster, M. G. Cox, W. Bich (via skype), August 26-28 Subgroup meeting at INRIM Torino (W. Wöger, M. G. Cox, P. H Harris, W. Bich, F. Pennechi)

Both IUPAP representatives made several proposals in the course of the revision of the GUM, both technically and with respect to presentation. Almost all of those suggestions have been accepted and were incorporated.

JCGM 103. Evaluation of measurement data — Supplement 3 to the “Guide to the expression of uncertainty in measurement” — Modelling

Work on this document has been postponed until the GUM is circulated.

JCGM 105. Evaluation of measurement data — Concepts, principles and methods for the evaluation of measurement uncertainty

Work on this document has been postponed until the GUM is circulated.

JCGM 110. Tentative title: Examples illustrating the GUM and its Supplements

This document aims at presenting worked out examples and ought to be released in parallel with the revised GUM. A first version of the document has been prepared by NPL, and it was also discussed at the meeting.

Further documents

The following documents should be developed at a later stage:

- *JCGM 107 – Evaluation of measurement data — Applications of the least-squares method*
- *JCGM 108 – Evaluation of measurement data — Supplement 4 to the “Guide to the expression of uncertainty in measurement” – Bayesian methods*

BIPM workshop on measurement uncertainty in 2015

A BIPM workshop on Measurement Uncertainty shall be held at the BIPM on 15-16 June 2015. The workshop is organized by the BIPM, and IUPAP is represented in the organizing committee (C. Elster). One focus of the workshop will be a discussion about the committee draft for the revised GUM, including the feedback obtained from the member organizations and NMIs.

Next meeting

17-20 June 2015 at the BIPM.