

Reports from IUPAP Commissions

Collected for the November Meeting 2014, by Cecilia Jarlskog

The reports here below are from

- Commission on Symbols, Units, Nomenclature, Atomic Masses and Fundamental Constants (C2)
- Commission on Statistical Physics (C3)
- Commission on Astroparticle Physics (C4)
- Commission on Low Temperature Physics (C5)
- Commission on Biological Physics (C6)
- Commission on Semiconductors (C8)
- Commission on Magnetism (C9)
- Commission on the Structure and Dynamics of Condensed Matter (C10)
- Commission on Particles and Fields (C11)
- Commission on Nuclear Physics (C12)
- Commission on Physics for Development (C13)
- Commission on Physics Education (C14)
- Commission on Atomic, Molecular, and Optical Physics (C15)
- Commission on Plasma Physics (C16)
- Commission on Quantum Electronics (C17)
- Commission on Mathematical Physics (C18)
- Commission on Astrophysics (C19)
- Commission on Computational Physics (C20)

COMMISSION C2

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 (CIAWW).** C2 Associate Member Kumar Sharma (Canada) represents IUPAP at CIAWW. 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>.

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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.

COMMISSION C3

Activities of Commission C3 – Statistical Physics

The C3 Commission holds a full meeting once every three years, during the Statphys conference which is the premier IUPAP-sponsored conference on Statistical Physics. The next conference, and hence the next full meeting, will take place in 2016 in Lyon France, on the occasion of Statphys26 (July 22-26 2016; <http://statphys26.sciencesconf.org/>).

The main activities of the C3 commission are:

- The organization of the (triennial) Statphys Conference
- Selecting the recipient of the Boltzmann medal, the highest international recognition for outstanding research contributions to the field
- Selecting the recipient of the Young Scientist Award in Statistical Physics

In addition, the chair of the commission participates in the Commission Council and Chair meetings, where general issues concerning all IUPAP commissions are discussed. These are typically held once per year.

Conferences

Since the last CC&C meeting in Geneva, October 2013, two conferences held under the auspices of C3 and sponsored by IUPAP took place.

At the Galileo Galilei Institute in Florence, Italy, within the wider context of a workshop on non equilibrium statistical mechanics, a one week (Type C) conference took place on the same topics on May 26-30, 2014 (<http://www.ggi.fi.infn.it/index.php?p=events.inc&id=146>). About 70 participants from many different countries were present at the meeting and 48 (4 women) gave invited talks (<http://www.ggi.fi.infn.it/index.php?p=schedule.inc&idev=146>). Several PhD students and post-doctoral fellows participated in the meeting and had the chance of either giving an oral or a poster presentation.

On March 6th-9th 2014, the 5th International Conference on Nanostructures was held successfully in Kish Island, Iran (<http://www.nanosharif.ir/page.asp?id=301>). The conference was sponsored as a Type B one from IUPAP. The conference program consisted of 3 poster and 20 parallel oral presentation sessions. A total of 49 presentations and 588 posters were delivered. More than 720 participants from 25 different countries (50% were women) shared their views and thoughts.

As usual, half of the C3 commission will be renewed in the next term. I will retire from the commission both as a member and as a chairman, I wish the best for the future of IUPAP.

Officers and members of the C3 Commission:

Stefano Ruffo, Chair (Italy)
Yu Lu, Vice-Chair (China)
Hans Werner Diehl, Secretary (Germany)
Henk van Beijeren (The Netherlands)
Jean-Francois Joanny (France)
Hans Herrmann (Switzerland)
Rahul Pandit (India)
Itamar Procaccia (Israel)
Mohammad Reza Ejtehadi (Iran)
Maxi San Miguel (Spain)

Masaki Sano (Japan)
Beate Schmittmann (USA)
Paul Wofo (Cameroon)
Julia Yeomans (UK)

Associate members

Yu M. Romanovsky (Russia)
F. Alcaraz (Brazil)

Florence, october 11 2014

Stefano Ruffo
C3 Chair

COMMISSION C4

**Report to the IUPAP Council & Commission Chairs Meeting
Singapore, 3-4 November 2014**

**Commission C4 – Astroparticle Physics
Report on the period Nov 2013-Oct 2014**

1. History of Cosmic Rays:

In the aftermath of the centenary of the discovery of cosmic rays in 2012, and in conjunction with a IUPAP supported conferences on the topic, a special issue of the journal “Astroparticle Physics” has been published with 22 articles presenting the history and current status of astroparticle physics research:

Astroparticle Physics 53 (2014) 1-190

2. C4 Name Change:

At the last C&CC meeting (Oct 2013) the name of C4 was changed from “Cosmic Rays” to the more inclusive “Astroparticle Physics”. The name change was initiated at the last General Assembly (2011) and C4 was charged to make a proposal after consultation of the community. A poll at the ICRC 2013 showed a large majority of the community in favour of the change, and at the Oct 2013 C&CC meeting the IUPAP Council unanimously adopted the change. The name change has been largely welcomed in the wider community. However, a small but vocal group opposed the name change. Detailed explanations to each argument have been sent in reply, which seemingly have been accepted, as opposition ceased.

3. Establishment of ApPIC:

The new name of C4 fits well to the newly formed WG10: Astroparticle Physics International Committee (ApPIC), which is supposed to be an advisory committee to the Global Science Forum of OECD and complements the Astroparticle Physics International Forum (APIF) of funding agency representatives. Members of ApPIC have been appointed by the IUPAP President (C Jarlskog), in consultation with C4 and the chair of ApPIC (Michel Spiro). ApPic’s charge is to review on a regular basis the scientific status of the field, maintain a continuous dialogue with, and give scientific advice to, APIF, liaise with other national and international bodies on assessment and road-mapping activities to promote global coherence of plans, projects and priorities in Astroparticle physics. The current membership of ApPIC can be found on

<http://iupap.org/working-groups/wg10-astroparticle-physics-international-committee-appic/>

4. New IUPAP / C4 Webpages:

The improved system used for the IUPAP webpages allowed also cleaning and update of the C4 pages, which are now accurate and current.

5. Meetings supported by IUPAP during 2014:

Astroparticle Physics 2014, Amsterdam
23–28 June 2014

(Chair: Gianfranco Bertone, U of Amsterdam)

<https://indico.cern.ch/event/278032/>

This conference brought together two major international conference series in Astroparticle Physics: the TeVPA (TeV Particle Astrophysics) and the IDM (Identification of Dark Matter)

ISVHECRI 2014, Int. Symposium on Very High Energy Cosmic Ray Interactions, CERN, Geneva

18–22 August 2014

(Chair: Ralph Engel, KIT)

<https://indico.cern.ch/event/287474/>

This conference covered results and models of hadronic interactions at high energies from the cosmic ray physics and particle physics communities with considerable interest to both sides.

COSPAR 2014, COSPAR Scientific Assembly, Moscow, Russia

2–10 August 2014,

(subsession on the Origin of Cosmic Rays; chair Mikhail Malkov)

<https://www.cospas-assembly.org>

6. Upcoming Meetings supported by IUPAP in 2015:

34th International Cosmic Ray Conference (“The Astroparticle Conference”),
30 July–6 August 2015, The Hague, The Netherlands

(Chair of organising committee: Ad van den Berg, University of Groningen)

<http://icrc2015.nl>

TAUP 2015: XIV International Conference on Topics in Astroparticle and
Underground Physics

7–11 September 2015, Torino, Italy

(Chair: Nicolao Fornengo, University and INFN Torino, Italy)

<http://taup2015.to.infn.it>

Johannes Knapp
Chair, IUPAP C4 – Astroparticle Physics

COMMISSION C5

C5 Activity Report for the IUPAP General Assembly November 2014

(submitted by K. Kono, Chair C5, September 2014)

Officers/Members 2011-2014

Chair:	Kimitoshi Kono	Japan
Vice-Chair:	Karen Hallberg	Argentina
Secretary:	John Saunders	UK
Members:	John Beamish	Canada
	Nan Lin Wang	China
	Jukka Pekola	Finland
	Jean-Pascal Brison	France
	Christian Pfeiderer	Germany
	Srinivasan Ramakrishnan	India
	Hu-Jong Lee	Republic of Korea
	Hans Hilgenkamp	The Netherlands
	Alexander Smirnov	Russia
	Alexander Feher	Slovak Republic
	Robert Hallock	USA
Associate Members:		
	Jacek Kossut	Poland (from C8)
	YoshiChika Otani	Japan (from C9)
	Juhn-Jong Lin	Taiwan

Main Achievements

1. Commission Meeting

C5 holds its major triennial formal meeting in advance of the General Assembly on the occasion of the meeting of International Conference on Low Temperature Physics (LT), our major Type A conference held every three years. The previous meeting was in August of 2011 in Beijing at the time of LT26. We have conducted business effectively by e-mail in the interim.

Agenda and minute (C5 meeting on August 8, 2014 in Buenos Aires)

1. Reports on GA and C&CC meetings.
 - 27th General Assembly, November, 2011, London. (General Report 2012-2014, Resolutions).
 - C&CC meeting, Feb, 2012, Cape Town. (Minutes)
 - C&CC meeting, Oct, 2012, Rio de Janeiro. (Minutes)
 - C&CC meeting, Oct, 2013, Geneva. (Draft minutes)
2. Review of the sponsored Conferences in the last three years (Type B, C).
 - ULT 2011 (Type B)
 - 7th International Conference on Stripes and High TC Superconductivity (ICS 2011) (Type C), no report found.
 - QFS2012 (Type B)
 - QFS2013 (Type B)
3. Final report from the previous LT conference.
 - Final report from LT26 was circulated.
4. Preliminary report from LT27
 - The preliminary report was presented by Susana Hernández (Conference Chair).
5. Policy statement on the inclusion of women and underrepresented others on program committees and for invited talks. We urge this and IUPAP requires it. This item is here as a reminder.
6. Consideration of the Type B conference.
 - Proposal for QFS2015 was considered and it is decided to support.
7. Consideration of the proposals for LT28 in 2017.
 - We received proposals from Sweden (Gothenburg) and Russia (Kazan).
 - The proposal from Sweden was approved.

8. Consideration of C5 membership and officers for 2014-2017 term.
 - We discussed about the next term C5 structure and voted on the candidate list for submission to the IUPAP office.
9. Other business

2. Sponsored Conference (2012)

Type B

- **International Conference on Quantum Fluids and Solids 2012 (QFS2012)**
August 15-21, 2012, Lancaster, UK;
267 registered participants (26 women) from 25 countries;
9 keynote talks and 55 invited talks (3 by women), and approximately 210 posters;
Co-chairs: S.N. Fisher and G.R. Pickett

3. Sponsored Conference (2013)

Type B

- **International Conference on Quantum Fluids and Solids 2013 (QFS2013)**
August 1-6, 2013, Matsue, Japan;
220 participants (14 women) from 23 countries;
10 plenary talks and 47 invited talks (1 by woman), and 147 posters;
Chair: Y. Okuda, Co-Chair: K. Kono

4. Sponsored Conferences (2014)

Type A

- **27th International Conference on Low Temperature Physics (LT27)**
August 6-13, 2014, Buenos Aires, Argentina;
631 registered participants (101 women) from 32 countries;
14 plenary talks (1 by woman), 24 half-plenary talks (4 by women), and 165 oral contributions (a number of women is not yet available).

There were approximately 700 posters.
Chair: Susana Hernández, Co-Chair: Victoria Bekeris

Type B

- **International Conference on Ultralow Temperature Physics (ULT 2014)**

August 14-19, 2014, San Carlos de Bariloche, Argentina;
71 registered participants (7 women) from 12 countries;
33 invited talks (3 by women) and 15 posters.
Organizers: Henri Godfrin, Julio Guimpel, J. Luzuriaga, E. Osquiguil

5. Sponsored Conferences (anticipated for 2015 and beyond)

Type A

- **28th International Conference on Low Temperature Physics (LT28) to be aproved**

August 9-16, 2017, Gothenburg, Sweden;
about 1,200 participants
Chair: P. Delsing, Co-Chairs: M. Fogelström, J. Bylander, and F. Lombardi

Type B

- **International Symposium on Quantum Fluids and Solids 2015 (QFS2015)**

August 10-15, 2015, Niagara Falls, USA;
about 200 participants
Chair: F. Gasparini, Co-Chair: E. Krotscheck

6. IUPAP Young Scientist Prize in Low Temperature Physics

Following a successful solicitation and subsequent consideration of nominations, the third IUPAP Young Scientist Prize award ceremony in low temperature physics was held at the LT27 conference in August 2014. All prizewinners gave an invited talk. The recipients selected by the C5 commission in early 2014 (and presented with their award medal, certificate and cash award) were:

- **Cory R. Dean** [The City College of New York, USA]:
For his development of graphene on boron nitride and subsequent discovery of the Hofstadter's butterfly.
- **Leonardo DiCarlo** [Delft University of Technology, the Netherlands]:
For his outstanding low-temperature experiments on semiconducting and superconducting mesoscopic circuits, and for establishing an innovative research program on measurement and feedback control of superconducting qubits.
- **Mathieu Le Tacon** [MPI for Solid State Research, Germany]:
For his innovative photon scattering experiments elucidating spin and charge ordering phenomena and excitations in high-temperature superconductors and other correlated-electron materials.

7. Status of Low Temperature Physics – based on LT27

The LT series is the flagship international conference in low temperature physics, held triennially. LT27 was a landmark meeting: the first LT held in the southern hemisphere and the first in South America. Also notable was the fact that for the first time the Conference Chair was a woman, as was the Co-Chair.

Low temperature physics, the field which C5 represents, is a research area of extraordinary range, reach and impact. This was reflected in the topics covered at the meeting and the progress made, with research which cross-cut the traditional session topics of: Quantum Gases, Fluids and Solids; Superconductivity, Cryogenic Techniques and Applications; Magnetism and Quantum Phases; Electronic Quantum Transport in Condensed Matter. This breadth of activity was also reflected by the range of research reported by the IUPAP Young Scientist Prize winners, covering superconducting quantum devices, x-ray spectroscopy of high T_c superconductors, and the discovery of Hofstadter's butterfly in graphene systems.

The field of quantum mechanics in artificial, engineered systems (designed, nanofabricated and tuneable) is making dramatic progress. The remarkable developments in superconducting quantum circuits, operating quantum mechanically, formed the subject of the London Prize Lectures. The London Prize is an IUPAP sponsored award as well. The achievement of sufficiently long qubit lifetimes now seems enable the implementation of

quantum error correction, and realization of large scale fault- tolerant quantum computers. At the same time advances in quantum sensors are expected to deliver new capabilities in sensing technologies.

Furthermore, and not least, this research area contributes to advances in fundamental understanding. For example, it has been demonstrated that a man-made macroscopic objects (realised by nanofabrication techniques) can behave as Schrödinger's cat, existing in a superposition of quantum states! And new quantum systems are emerging, with fresh opportunities for quantum control. In particular non-linear nano-electromechanical resonators, engineered in a variety of ways, in some cases with very high quality factors, can be cooled into the quantum regime. The area of engineered quantum mechanical-resonators is expected to develop strongly in future.

The Superconducting Quantum Interference Device (SQUID) constitutes a more mature technology and the LT27 meeting celebrated the SQUID's 50th anniversary. The conference heard a review of the widespread applications, realised and potential, of SQUIDs: geophysics and the discovery of mineral deposits; magnetoencephalography; dark matter (axion) detectors; photon detectors for cosmic microwave background; high resolution x-ray spectroscopy; noise thermometry; MRI systems operating at magnetic fields four orders of magnitude lower than conventional MRI systems with several potential clinical applications, and many more. An important developing direction is SQUIDs for micro- and nanoscale detection. And in this context it was also interesting to hear a review of work over the past on the realisation of a SQUID in liquid 4He , the SHeQUID, of both fundamental interest and application as a sensitive detectors of rotation.

Nanophysics at low temperatures continues to be exploited to create novel devices with new functionalities (and acronyms), for example those based on hybrid metallic nanostructures such as the SQUIPT and HyQUID. In semiconductor-superconductor hybrid structures the focus is on the unambiguous detection, and potential manipulation of Majoranas. These particles, which are their own antiparticle, are yet to be discovered. Their quantum entanglement offers a route to topologically protected quantum computing. Developments in scanning tunnelling microscopy with superconducting tips have led to new insights into amorphous and homogeneous superconducting films, while scanning SQUID microscopy now provides a powerful technique to image complex oxide heterostructures, an important new class of materials.

These new systems and regimes of investigation challenge our fundamen-

tal understanding. A fascinating example concerns how thermodynamics applies on the nanoscale. Here it was reported that the investigation of work and dissipation in driven processes manipulating single electrons has led to an experimental realization of Maxwell's Demon!

A central theme of the conference was the discussion of a wide range of systems coming under the umbrella of quantum matter: topological insulators; graphene; unconventional superconductors, including their paradigm-superfluid ^3He ; quantum spin liquids. The pervasive importance of the topological classification of quantum matter has been widely recognised recently, and its experimental ramifications are an active area of study. This conceptual unification provides a strong feature of low temperature physics and this conference. Another key concept in strongly correlated quantum systems is that of quantum phase transitions and quantum criticality, where a control parameter such as pressure or magnetic field is used to tune a system between ground states. The breakdown of the standard model of interacting Fermi systems at a quantum critical point remains a major unresolved issue, being actively pursued experimentally and theoretically, with significantly divergent views being presented. Here heavy fermion metals are important prototypes. There is evidence that quantum critical fluctuations enhance superconductivity in the iron-pnictides, which feeds into the debate on high T_c cuprates, where Fermi surface reconstruction is also believed to play a key role. In related work there has also been significant progress in establishing the rich behaviour of organic charge transfer salts. These systems are highly tuneable by composition and pressure, and are models for the Mott metal-insulator transition and candidate quantum spin liquids.

Superfluid ^3He currently provides our only established example of a topological superfluid or superconductor. The ability to fingerprint the order parameter by NMR has led to striking discoveries on how superfluidity can be manipulated by disorder with controlled anisotropy, through the introduction of aerogel. Recently this has led to the stabilization and identification of a new phase, the polar phase, not found in usual bulk liquid. Of relevance to the upsurge of interest in topological quantum matter, the surface of $^3\text{He-B}$ is predicted to host Majorana fermions. Surface acoustic studies already provide indirect evidence of a Majorana cone of dispersing surface excitations.

Both superfluid ^3He and ^4He continue to be the focus of investigations of turbulence, one of the major unsolved problems in physics. In a superfluid, the quantization of vorticity simplifies the problem and permits the con-

frontation of experiment with detailed theoretical simulation. For the past ten years the experimental claims for a form of superfluidity in solid ^4He has attracted the attention of a significant segment of the quantum fluids and solids community. The pendulum has swung towards impressive detailed studies of the elastic properties of this quantum solid and its dislocations, and this is now probably the best understood material from this point of view. However the enigma of supersolidity, as it is sometimes referred to, remains just that. The community only now is beginning to fully understand how to eliminate elastic artifacts from attempts to detect superfluidity with torsional pendular. There are a number of new results using this technique, and the problem remains open. However intriguing new work was presented which seemed to provide possible evidence for quasi-one dimensional superfluidity (probably along dislocations or grain boundaries) in the bulk solid, and evidence for a new class of quasi-condensate in two-dimensional helium. The interplay of solid order and superfluidity in bose-solids remains a subject of active interest for both the cold-atom and condensed matter communities.

Finally we address the strategic issues that have been discussed in previous reports, and recently in the literature. There have been shifts in the demand for ^3He gas, a key ingredient in dilution refrigerator technology, which have results in a significant lowering in price relative to the recently experienced high. On the other hand, the price of liquid ^4He has continued to increase, as a result of a combination of global supply and US government policy. While it is anticipated that new sources will come on stream, from newly developed natural gas reserves, further price increases are inevitable. Wastage of this non-renewable resource by sectors where helium recovery is not practiced cannot be justified. However this is beyond the control of our community. The trend is for our community to mitigate the impact of these price increases by installing efficient helium liquifier/recovery plant or by single-cryostat based recycling schemes. The alternative is to adopt cryogen-free technology. Indeed, the development of cryogen-free dilution refrigerator technology by a number of suppliers, has led to a relative explosion of demand. The number of dilution refrigerators (the 50th anniversary of which is approaching) is increasing rapidly: an important driver is research on quantum technologies, which rely on millikelvin temperatures for their operation. The push-button operation of these dilution refrigerator systems is attractive to users, and also facilitates practical applications. Perhaps the advent of the desk-top dilution refrigerator is not far away. More recently even the feasibility of achieving microkelvin temperatures, by a booster nu-

clear demagnetisation stage attached to a cryogen-free dilution refrigerator, has been demonstrated. Thus the ever-widening accessibility of ever-lower temperatures seems to be an inevitable trend, opening up to new fields.

In that context we note that the European Microkelvin community is working, with the support of the European Commission, to establish a European Microkelvin Platform as a “virtual laboratory”, to promote accessibility, engage with interdisciplinary research directions, and promote discovery. The pooling of complementary expertise and collective approach to scientific challenges has been effective. Engagement and exchange of best practice with the wider international community is likely to contribute to the global development of low temperature physics, a field of established strategic importance.

LT27 conference summary respectfully submitted by
John Saunders, Secretary, C5
Kimitoshi Kono, Chair, C5

COMMISSION C6

Activity report of C6:

1) International Conference of Biological Physics, ICBP 2014 (Category A), was held at Beijing, China for the period of June 18-22, 2014.

Conference Background and Overview

The International Conferences on Biological Physics of the International Union of Pure and Applied Physics bring together physicists and scientists in related fields to report the latest breakthroughs and achievements in the frontiers of biological physics and exchange information about all aspects of living-systems studies. The conferences are also important and effective forums to enhance international collaboration among scientists from various parts of the world.

Following previous successful conferences in San Diego, USA (2011), Montevideo, Uruguay (2007), and Gothenburg, Sweden (2004), the 8th IUPAP International Conference on Biological Physics (ICBP2014) was held on the campus of the Institute of Physics, Chinese Academy of Sciences on June 18-22, 2014. The first two days (June 18-19) encompassed a training workshop; and the remaining three days (June 20-22) included 5 plenary lectures, 12 research symposia, one poster session, and one special session honoring the winners of the IUPAP C6 Young Scientist Prize. This conference also served as the general meeting of the IUPAP C6 [Biological Physics] Commission.

Conference Demographics

The conference was attended by over 500 researchers (registered and last-minute attendees from many local institutions) from 26 countries;

- 44% faculty
- 10% postdoctoral scholars
- 38% graduate students
- 8% undergraduate students

70% of all **attendees** were from **developing countries**

35% of all **attendees** were **women**

30% of all **invited speakers** were **women**

It is important to note that although “faculty” represented 44% of the total participants (by total head count) at the conference, almost 50% of the faculty were invited speakers, session chairs and/or organizers. If we exclude the “faculty presenters”, junior researchers (postdoctoral scholars, graduate and undergraduate students) accounted for almost 80% of all attendees. Over **50% of the junior researchers received** some kind **financial assistance** (full/partial travel awards, registration/housing waivers, etc.) from the conference.

Conference Program Summary

The conference was preceded by a workshop organized by Prof. Ming Li (University of Chinese Academy of Sciences), Xin Zhou (University of Chinese Academy of Sciences), Fangfu Ye (Institute of Physics, Chinese Academy of Sciences), and Jin Wang (Stony Brook University). The workshop included 16 one-hour faculty lectures, introducing to the attendees some important techniques used in biophysical studies and recent progresses and discoveries associated with these techniques. Over one hundred graduate students and postdoctoral scholars attended the workshop

The conference included five plenary talks and 12 conference symposia. The plenary talks were presented by scientific leaders in their respective fields, including **one Nobel Laureate:**

Anna Barker (Arizona State University),

Michael Sheetz (National University of Singapore),

Yigong Shi (Tsinghua University)

Sunney Xie (Harvard University), and

Ada Yonath (Weizmann Institute, 2009 Nobel Laureate in Chemistry).

The **12 conference symposia** included **84 invited talks**, by both junior and senior researchers, on topics encompassing the entire range of leading-edge biological physics research. The conference also included a half-day poster session in which around **150 posters** were presented.

2) C6 meeting at Beijing on June 21, 2014 on the occasion of ICBP2014

Attendee: K. Yoshikawa (Chair) , Aihua Xie (Vice-Chair)

Rita Maria Cunha de Almeida, Zhong-can Ou-Yang, David Bensimon, Imre Derenyi, Ramakrishna Ramaswamy, Silvia Morante, Galina Riznichenko,
Observer: Li Ming

Contents of Discussion:

- i) Nomination of Aihua Xie as the next Chair of C6 has been approved from all of the members attended.
- ii) Next place of ICBP after Beijing has been discussed. Exchange of the opinions have been made, including possible places such as Brazil, Italy, Hungary, and France.
- iii) Candidates for the positions of Vice-Chair and Secretary of C6 have been discussed.
- iv) As for the decision as the opinion of C6 commissions concerning the above items, 1) and 2), Aihua and Kenichi continue the discussion. Until the end of July, we may decide the opinion as C6.

3) Young Scientist Prize

We have selected three awardees from 31 nominations, for the winners for the prizes 2012, 2013 and 2014. We had a ceremony at the 8th IUPAP International Conference of Biological Physics (ICBP 2014), together with the special session on the lectures of the winners.

IUPAP C6 Young Scientist Prize 2012 - Dr Tuomas Knowles, University of Cambridge

... for his seminal contributions to the biophysics of macromolecular self-assembly into highly ordered bio-polymers in the context of both, fundamental biophysics and application in materials science and molecular medicine. This work represents a remarkable advance that has fundamentally changed the way we understand assemble and mis-assemble processes of proteins at the molecular level.

IUPAP C6 Young Scientist Prize 2013 - Dr Marina Kuimova, Imperial College London

... for her seminal contributions to elucidating the intracellular environment during normal cell function and photodynamic therapy using advanced imaging techniques. To this aim, Dr Marina Kuimova has developed highly innovative time-resolved optical techniques and has pioneered the use of novel fluorescent molecular rotors to map intracellular viscosity.

IUPAP C6 Young Scientist Prize 2014 - Prof Dr Yi Cao, Nanjing University

... for his seminal contributions to development and application of atomic force microscope based single molecule force spectroscopy to study the nanomechanics and mechanical unfolding dynamics of proteins. This work is a milestone for our current understanding of the mechanical design of mechanically stable elastomeric proteins, and opens tremendous new opportunities for tailoring the mechanical properties of biomaterials.

4) Cooperation with AC4 (Medical Physics)

Joint symposium between C6 and AC4 was held on June 20 at ICBP2014.

Symposium Title: 'The Physics of Cancer'

Session Organizers: Herbert Levine(Chair), Fridtjof Nüsslin, Kenichi Yoshikawa

Session Chair: Herbert Levine (Rice University, USA)

5) Connection with IUPAB

Prof. Silvia Morante is conducting the role as the representative of C6 for the connectivity with IUPAB, International Union of Pure and Applied Biophysics. Joint discussions with plural Bio-Unions are now under discussion.

COMMISSION C8

C8 - Commission on Semiconductors

by Michael Thewalt (secretary C8)

IUPAP C8 Commission met on 12 August 2014 during the 32'nd International Conference on the Physics of Semiconductors (ICPS) in Austin, Texas, USA

1. Young Scientist Prize in Semiconductor Physics (YSP-SP)

A report was made of the award procedure and outcome for the 2014 Young Scientist Prizes. The awards were advertised on the IUPAP website and by circulation to the mailing list of the ICPS conference, as well as individual national Physical associations through committee member contacts. The original closing date of January 31 attracted no nominations, so this was extended to March 31. With the help of another mailout to the ICPS mailing list, and further efforts by C8 members to publicize the prizes, a total of nine nominations were received. While there was continuing concern about the relatively small number of nominations, it was agreed that there were many very strong nominations amongst this group. Following ranking of the nominations by the whole committee it was clear that there were two particularly outstanding nominations and it was agreed that the Prizes for 2014 should be awarded to:

Rahul Raveendran Nair, School of Physics and Astronomy, University of Manchester, UK
and

Xiaodong Xu, Department of Physics, University of Washington, USA

The two prizewinners were nominated as invited speakers for the ICPS conference in Austin, where Dr. Xu presented his work and was presented with his IUPAP medal and certificate. Regrettably, Dr. Nair was unable to attend due to delays in obtaining a US visa to attend the conference.

2. Planning and Supervision of ICPS series of Conferences

A report was given on the organization ICPS 2014, Austin TX, Aug. 10-15/08/2014, which was warmly received. A further report was given on preparations for ICPS 2016 to be held in Beijing, China, 31/7/2016 to 5/8/2016 which were well in hand. Formal approval was given for the announcement of the 33'rd ICPS to be held in Beijing, which will also be recommended for support as an IUPAP type A conference.

Two excellent bids were presented for ICPS 2018, one from the Ioffe Institute, St. Petersburg, Russia, and the other proposal for Montpellier, France. Questions were raised regarding the venue/transportation/accommodations for the St. Petersburg bid, and the proposed time of the Montpellier bid, the first week of September. The Montpellier organizers subsequently changed the proposed time to either the last week of July or the first week of August. After further discussion at the meeting, and obtaining input from commission members who were not present at the meeting but were provided with both bids, it was decided to give tentative approval for the 2018 ICPS to be held at Montpellier, France.

A representative from Australia was present during the above presentations, as Australia is considering preparing a bid for the ICPS in 2020.

3. Supporting Other Conferences

Two bids were received for IUPAP conference support in 2015, including detailed information on earlier conferences in the two series. After careful discussion it was decided to support the 2015 EP2DS-MSS conference (21st International Conference on Electronic Properties of Two-Dimensional Systems and 17th International Conference on Modulated Semiconductor Structures), to be held in Sendai, Japan 26-31/7/2015 as a Type A conference. The 17th International conference on II-VI compounds and Related Materials, to be held in Paris, France, 13-18/9/2015 was recommended for support as a Type B conference.

4. Commission membership

Detailed consideration was given to the nominations made by the National Liaison Committees. Further discussion centered on the need for national and gender representation, and also the need for members who would be actively involved in the work of the Commission. After discussion, a slate of 14 nominees and 1 reserve was recommended by the Commission.

5. Next meeting:

During EP2DS-MSS meeting, Sendai, Japan, 26-31/7/2015.

Commission membership 2011-14.

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Vice Chair	S. J. Lee	Korea	leesj@dongguk.edu
Secretary	M. Thewalt	Canada	thewalt@sfu.ca

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J. Pekola	Finland	pekola@boojum.hut.fi

COMMISSION C9

C9. Commission on Magnetism (1957)

Officers 2011-2013

Chair: Ingrid Mertig (Germany)

Vice - Chair: Ching-Ray Chang (Taiwan)

Secretary: Manuel Vazquez (**Spain**)

Members:

Xiaofeng Jin (China)

Carlos Cabal-Mirabal (Cuba)

Nguyen van Dau Frederic (France)

Sharika Nandan Kaul (India)

Stefano Sanvitos (Ireland)

YoshiChika Otani (Japan)

Sung-Chul Shin (Republic of Korea)

Vladimir Ustinov (Russia)

Borje Johansson (Sweden)

Andrew Boothroyd (UK)

Julie Borchers (USA)

Associate Members 2009-2012:

Sergio Rezende (Brazil)

P.H. Kes (The Netherlands)

Abdelwaheb Cheikhrouhou (Tunisia)

Associate Members 2012-2014:

C. Pfeleiderer (Germany)

Activities

* One of the most important activities of C9 is to organize the International Conference on Magnetism (ICM), which is held every three years under the auspices of IUPAP. The last one, the 19th ICM, took place in July 2012 in Busan, Korea. The 20th ICM will be held in July 2015 in Barcelona, Spain. The preparation of the conference is ongoing ([20th International Conference on Magnetism](http://www.icm2015.org/barcelona.html) <http://www.icm2015.org/barcelona.html>). The venue of 21th ICM in 2018 has been decided to be in San Francisco, USA.

* The ICM Magnetism Award and Neel Medal, and the IUPAP Young Scientist Awards in the field of Magnetism are presented at ICM. The last call for nominations for these Awards was made in August 2011. The winners have been selected by the C9 Committee and have been presented at the 19th ICM in Korea. The ICM Magnetism Award and Neel Medal was dedicated to Prof. Sadamichi Maekawa (Japan) and to Prof. Yoshinori Tokura (Japan). The IUPAP Young Scientist Award was given to Dr. Suchitra Sebastian (UK). The call for the next ICM Magnetism Award and Neel Medal, and the IUPAP Young Scientist Awards was made in September 2014. The call is published on the ICM 2015 and IUPAP web site.

New Developments in Magnetism

Magnetism is a traditional and broad field of study in physics. It is also familiar in daily life. For example, magnets may be found stuck on the door of a kitchen refrigerator. Magnetic materials are valuable not only as magnets but as electronic materials. In the past, the electron's spin and charge mostly were studied separately. A revolution in magnetism has emerged from the combination of charge and spin properties.

* **Spintronics [1]:**

Nowadays information technology is based on semiconductor and ferromagnetic materials. Information processing and computation are performed using electron charge by semiconductor transistors and integrated circuits. On the other hand, the information is stored on magnetic high-density hard disks by electron spins. Recently, a new branch of physics and nanotechnology, called magneto-electronics, spintronics, or spin-electronics, has emerged, which aims to simultaneously exploit both the charge and the spin of electrons in the same device and describes the new physics raised. One of its tasks is to merge the

processing and storage of data in the same basic building blocks of integrated circuits, but a broader goal is to develop new functionality that does not exist separately in a ferromagnet or a semiconductor.

In the field of spintronics, the flow of electrical charges as well as the flow of electron spin, the so-called spin current, are manipulated and controlled together. Whereas charge current flows without decay (owing to the fundamental charge conservation), spin current decays on a length scale of less than a few micrometers. In other words, it exists only on a nanometer scale. Therefore, recent progress in the physics of magnetism and the application of spin current has progressed in tandem with the nanofabrication technology of magnets and the engineering of interfaces and thin films.

The basic effect of spintronics the giant magnetoresistance was awarded by the Nobel prize 2007 to Peter Grünberg and Albert Fert. The revolution in data storage that evolved from spintronics was awarded by the Millenium technology prize in 2014 to Stuart Parkin. All laureates have been awarded with the ICM Magnetism Award and Neel Medal before.

*** New quantum phases of matter:**

Discovery of new materials, and purification and microfabrication of materials provide opportunities to study new quantum phases of matter. In the following, some of them which have recently been developed are given.

a) Topological Insulators [2]: Topological insulators are insulating materials that conduct electricity on their surface via special surface electronic states. The surface states are topologically protected, which means that unlike ordinary surface states they cannot be destroyed by impurities or imperfections. Topological insulators are similar to the quantum Hall state in that they exhibit “topological order”. Unlike the quantum Hall state, which is only seen when a strong magnetic field is present, topological insulators occur in the absence of a magnetic field. In these materials the role of the magnetic field is played by spin-orbit coupling. This analogy between spin-orbit coupling and a spin-dependent magnetic field provides a way to understand the simplest two-dimensional topological insulator; quantum spin Hall state, which occurs when the spin-up and spin-down electrons, which feel equal and opposite spin-orbit “magnetic fields”, are each in quantum Hall states. Recent measurement of electrical transport in a quantum well structure made by sandwiching a thin layer of mercury telluride between layers of mercury cadmium telluride prove the existence of the topologically nontrivial edge state.

b) Skyrmions [3]: Magnetic skyrmions are particle-like magnetic solitons (“topologically protected” spin configurations), theoretically predicted two decades ago but observed only in 2009 in non-centrosymmetric magnetic lattices. An important breakthrough came in 2011 showing that skyrmions as small as 1 nm can be obtained in ultra-thin magnetic films and are due to the Dzyaloshinskii-Moriya interactions existing at the interface of a magnetic film with a metal of large spin-orbit coupling. Recently the huge potential of the skyrmions in thin films for technology was described. Individual skyrmions or groups of skyrmions can be moved by small electrical currents in magnetic nanocircuits for very promising applications in information storage or treatment. Most applications need the possibility of nucleating individual skyrmions in nanocircuits.

c) Multiferroics [4]: The well-established ferroic orderings, ferroelectricity, ferromagnetism, and ferroelasticity, can be switched by their conjugate electric, magnetic and stress fields, respectively. Cross coupling allows those ferroic orderings to also be tuned by fields other than their conjugates; in magnetoelectric multiferroics, a promising new toroidal ordering of toroidal moments, which should be switchable by crossed electric and magnetic fields. Spiral-antiferromagnetic ground state of Cr_2BeO_4 results in a small ferroelectric polarization. The oxide BiFeO_3 is another example of multiferroic materials, which shows an antiferromagnetic order and is ferroelectric. Multiferroics continue to reveal novel and unanticipated physics, and the potential applications now stretch far beyond electrical control of ferromagnetism.

d) Quantum Criticality [5]: The quantum critical point, where the transitions occur, is present only at absolute zero temperature, but its influence nevertheless is felt in a broad regime of

“quantum criticality” at nonzero temperatures, and it is the key to understanding a variety of experiments such as quantum spin systems and heavy fermions. The copper oxide compounds (the cuprates) such as $\text{La}_{2-x}\text{Sr}_x\text{CuO}_4$ which display high-temperature superconductivity are another example. In the stoichiometric limit, the cuprates are good insulators that display the antiferromagnetic order. By varying the relative concentration of elements, one can dope the materials with mobile charge carriers and turn them into good metals. Along the way, high-temperature superconductivity emerges. More recent examples are the iron-based pnictide compounds such as $\text{BaFe}_2(\text{As}_{1-x}\text{P}_x)$, which display a similar set of phases.

In the recent past magnetism, presented not only a wealth of studies of a variety of magnetic materials but also a new pathway towards the control of magnetism. This paradigm is epitomized by a flood of new concepts, which introduces a new front in the evolution of traditional research in magnetism.

Prefaces:

[1] S. Maekawa: *Nature Materials* 8, 777 (2009).

[2] C. Kane and J. Moore: *Phys. World*, Feb. 2011, page 32.

[3] Mühlbauer S, Binz B, Jonietz F, Pfleiderer C, Rosch A, Neubauer A, Georgii R, Böni P: *Science* 323, 915 (2009)

[4] N.A. Spaldin, S. W. Cheong and R. Ramesh: *Phys. Today*, Oct. 2010, page 38.

[5] S. Sachdev and B. Keimer: *Phys. Today*, Feb. 2011, page 29.

COMMISSION C10

C10 Report (the Structure and Dynamics of Condensed Matter)

at the IUPAP Council & Commission Chairs Meeting,

(Singapore, November 3-4, 2014)

reported by Yasuhiko Fujii, Chair

Officers (3) :

Chair	Yasuhiko Fujii	(Japan)
Vice Chair	Jiří Erhart	(Czech Republic)
Secretary	J. Raynien Kwo	(Taiwan)

Members (11) :

Rob Robinson	(Australia)
Philippe Lambin	(Belgium)
Mu Wang	(China)
Claude Lecomte	(France)
Hartmut S. Leipner	(Germany)
Istvan Groma	(Hungary)
Vitaly Kveder	(Russia)
Joaquin Garcia-Ruiz	(Spain)
Jonas Fransson	(Sweden)
Najeh Thabet Mliki	(Tunisia)
Laura H. Greene	(USA)

Associate Member (1) :

TaeWon Noh	(Korea)
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1. C10 Young Scientist Prize

2015 Dr. Keji Lai,

Assistant Professor, Department of Physics,
University of Texas at Austin, U.S.A.

“For his outstanding contribution in nanoscale impedance imaging of strongly correlated and low-dimensional quantum materials”

Dr. Lai received his B.S degree in Tsinghua University, China in 2001 and Ph.D in Department of Electrical Engineering, Princeton University, U.S.A. in 2006. He became a Post-Doctoral Research Fellow in Department of Applied Physics, Stanford University in 2006 and

Research Scientist in 2011. He has been at the present position since 2012.

2014 Dr. Clarina R. de la Cruz,

Lead Instrument Scientist, Neutron Sciences Directorate
Oak Ridge National Laboratory, U.S.A.

“For her outstanding achievements in the field of strongly correlated electron systems, specifically in multiferroic materials and unconventional superconductors.”

Dr. Cruz received her undergraduate and Master’s degrees in National Institute of Physics, University of the Philippines, Philippine in 1996-2003 and Ph.D in Department of Physics, University of Houston, U.S.A. and became a Post-Doctoral Fellow in Neutron Sciences Directorate, Oak Ridge National Laboratory and Department of Physics and Astronomy, University of Tennessee, U.S.A in 2007-2009. She became a Lead Instrument Scientist at the present position since 2010.

2013 Dr. Claudio Castelnovo

Lecturer and SEPnet Fellow, Department of Physics,
Royal Holloway College, University of London, UK

“For his contributions to understanding of new types of order, from the identification of emergent magnetic monopole excitations in spin-ice to the role of thermal fluctuations in topological computing.”

Dr. Castelnovo received his undergraduate and Masters degrees in Dipartimento di Fisica, Università degli Studi di Milano, Milan, Italy in 1995-2000 and Ph.D in Physics Department, Boston University, Boston, U.S.A. in 2001-2006. In 2006-2009 he was a Post-Doctoral Fellow in Rudolf Peierls Centre for Theoretical Physics, University of Oxford, UK and became Lecturer at the present position since 2010.

Venue for Winner’s Prize Lecture and Award Ceremony

C10 covers a wide range of condensed matter physics so that a research field of every year’s YSP winner is not predictable. Therefore, it is not practical to fix the venue for the annual C10 YSP Award Ceremony and Prize Lecture at any biennial or triennial international conference.

On the other hand, the American Physical Society has its Division of Condensed Matter Physics (DCMP) and Division of Materials Physics (DMP) which have covered most of C10’s research fields. Therefore, the annual *APS March Meeting* where several C10 members usually attend is a very good opportunity for C10 to cooperate DCMP and DMP organizers to celebrate a C10 YSP winner.

It's thanks to both DCMP and DMP for their generous offer and kind arrangements that C10 YSP winner's Prize Lecture is given at the Invited Session entitled "Buckley/McGroddy/Adler/IUPAP YSP/Nicholson Prize Session" and the Award Ceremony is held at the Evening Reception sponsored by both Divisions.

2. C10-Sponsored Conferences

2015 The 11th International Conference on Materials and Mechanisms of Superconductivity (M²S 2015, Geneva, Switzerland, August 23-28, 2015) nominated as Type A

2014 The 11th International Conference on the Structure of Surfaces (ICSOS-11, University of Warwick, UK, July 21-25, 2014) Type C

2013 No conferences nominated.

3. The Issue on "Soft Matter"

(1) The original assignment given at the IUPAP General Assembly (London, Nov. 2011)

German delegates' claim: There is a substantial overlap between the Commissions C5, C8, C9 and C10 all covering aspects of condensed matter physics. It is proposed to dedicate C10 specifically to the emerging field of soft matter physics. The name could be either "Commission on Soft Matter" or "Commission on the Structure and Dynamics of Condensed and Soft Matter".

(2) C10's Interim Report to the C&CC (Rio de Janeiro, Oct. 2012)

C10 has recognized the emerging soft matter physics as an important research field but has opposed such a proposal as C10 will be dedicated to soft matter because C10 has covered important research fields, which are NOT covered by any other Commissions.

C10 members, most, if not all, of whom are solid state physicists, currently favor (partial) inclusion of soft matter physics in C10 by a possible modification of its title and mandate.

(3) Formation of "Study Group on Soft Matter" at the C&CC (CERN/Geneva, Oct. 2013)

It was proposed to form the Study Group on Soft Matter chaired by C10 Chair (Fujii) to further discuss this issue by inviting 8 related Commission members (C3, C6, C8, C10, C20) and 6 soft matter scientists, totally 14 plus 2 observers. After their intensive discussion via e-mails for several months, it was unanimously recommended that a new "Commission on Soft Matter" shall be formed in IUPAP and so reported to the President in April 2014.

(4) In response to the report, a lead time will be required to formally process this issue toward the

recommendation by taking one more step through Working Group to be formed by soft matter scientists. This will be seriously discussed at the C&CC Meeting (Singapore, Nov. 2014).

4. Issues to be Recognized and Transferred to the Next Term

(1) C10's Home Page on the IUPAP Web Site

We have planned to establish it, but it's not completed yet.

(2) Continuous Cooperation on Soft Matter Issue

In the current term, C10 has taken an initiative in leading it as assigned by C&CC. Regardless of the framework to be formed in the next term, C10 will be a corporate Commission for that purpose.

(3) Continuous Endorsement of Conferences

There are two major conferences sponsored by C10 (M²S and ICSOS) so far. It will be favorable to encourage more conferences to be nominated in the field of condensed matter physics including even soft matter.

(4) C10 Young Scientist Prize

In the current term, all procedures for call-for nominations, selection, announcement, award & lecture etc. have been fully established.

COMMISSION C11

Activities of the Commission on Particles and Fields (C11)

October 2013 - September 2014

Hiroaki Aihara C11 Chair

1. Type A conference in past year

We had the International Conference for High Energy Physics (ICHEP2014, <http://ichep2014.es/>) in July in Valencia, Spain. The conference exceeded the original expectations for attendance with 995 total registrations as of July 4. 802 men, 193 women, 130 from the US, 203 from Spain. 76 partial or full grants were made from 96 applications - Accommodation, Travel, Registration partial or full.

2. Type B conference in past year

The Technology and Instrumentation in Particle Physics 2014 (TIPP 2014, <http://www.tipp2014.nl/>) was held in June in Amsterdam. 448 people attended of whom 77 were women. 53 were from the US, 79 from the Netherlands.

3. Commission meeting

C11 meeting was held during ICHEP2014. We confirmed/decided on venues for the future IUPAP supported conferences:

- August 2015 in Ljubljana, Slovenia: Lepton Photon Symposium
- August 2016 in Chicago: ICHEP
- Summer 2017 in Beijing, China: TIPP
- Summer 2018 in Seoul, Korea: ICHEP

The committee also made the following decision this October:

- Summer 2017 in Guangzhou, China: Lepton Photon Symposium

4. Young Scientist Prize

The 2014 Young Scientist Prizes were awarded to:

Claude Duhr (Lecturer at the Institute for Particle Physics Phenomenology,
University of Durham, UK), and

Kerstin Tackmann (Leader of a Helmholtz Young Investigators group at DESY).

COMMISSION C12

C12 Report to the IUPAP Council and Commission Chairs 2014

C12: Commission on Nuclear Physics (Hideyuki Sakai)

The annual meeting of C12 was held at the Hotel Johanneshof, Egelsbach, Germany near GSI on July 12, 2014.

The meeting followed the annual meeting of the IUPAP Working Group 9 on International Cooperation in Nuclear Physics which was held at GSI. The members of WG.9 were welcome as observers to attend the meeting of C12 and vice versa.

Attendees were:

Hideyuki Sakai(Japan), Jean-Michel Poutissou(Canada), Alinka Lepine-Szily(Brazil), Piet Van Duppen(Belgium), Claes Fahlander(Sweden), Donald Geesaman(USA), Dominique Guillemaud-Mueller(France), Rauno Julin(Finland), Wei-Ping Liu(China), Eugenio Nappi(Italy), Patrick Regan(UK), and Joachim Stroth(Germany).

Regrets had been presented by:

Undra Agvaanluvsan(Mongolia) and Alexei Korshennikov(Russia).
Observers(WG9 members) were:
Robert Tribble(W9 chair, USA), Willem T.H. van Oers(WG9 secretary, Canada), Angela Bracco(NuPECC, Italy), Hideto En'yo(RIKEN-Japan), Reiner Krucken(TRIUMF-Canada), Kobus Lowrie(iThemba- South Africa), Hugh Montgomery (Jefferson Lab.USA), Berndt Muller(BNL,USA), and Horst Stoecker(GSI, Germany).

The meeting started at 9 am and ended at 4 pm.

The major items on the agenda were the selection of the IUPAP support conference recommendation and the selection of executives and new members for the next C12. Those discussion and decisions were held in the Executive session in camera.

1. Election of new Officers and Members of C12

Hide Sakai explained the different aspects of the officer and member election, sub-field, geographical region, experience in officer charge, gender etc.

After a careful discussion, taking into account the various factors, the Commission agreed on a list of candidates to be presented to the Nomination Sub-Committee.

2. Conference recommendations

There were one pre-approval request for the Type-A and seven requests for the Type-B.

Prior to the oral presentations by the conference organizers of 2015, the report on the IUPAP sponsored(Type-B) conference, Advances in Radioactive Isotope Science - ARIS2014 held in Tokyo on June 1-6 2014 was given by Hideto En'yo (Chair of ARIS).

407 participants, 222 from 26 countries, 56 female participants; 7 poster awards, 15 students supported.

Conferences in 2015

Category A support:

[Request of pre-approval]

International Conference on Nuclear Physics (INPC 2016),
Adelaide, Australia, September 2016.

Category B support:

[1st priority]

Nucleus Nucleus collisions
(NN2015),
Catania, Italy, June 21-26, 2015.

[2nd priority]

Latin American Symposium on Nuclear Physics and Applications XI
(LASNPA 2015),
Medellin, Columbia, Nov 29th-Dec 4th 2015.

[3rd priority]

Electromagnetic Isotope Separators and related topics
(EMIS 2015),
May 11-15 2015 Grand Rapids, USA

[4th priority]

Few Body Problems in Physics
(FB 21)
May 18-22, Chicago, USA

[No support]

- Origin of Matter and Evolution of Galaxies (OMEG 2015).
June 24-27 2015, Beijing, China.
(Regional but not international conference character
and strong overlap with Nuclei in Cosmos(NIC) conference.
C12 will suggest to merge.)
- Symmetries in Subatomic Physics (SSSP 2015)
June 7-13 2015, Victoria, Canada
(Regional but not international conference character)
- Electromagnetic Interactions with Nucleons and Nuclei (EINN 2015).
Nov 1-7 2015. Paphos (Cyprus)
(Regional but not international conference character)

3. Some other subjects:

- IUPAP-IUPAC Joint Working Party
New IUPAP-IUPAC Joint Working Party (JWP) was established
in January 2011. The mission of this JWP is to judge the claims
for the discovery of elements with atomic numbers 113, 115, 117
and 118 or heavier. The deadline of claims was June 2012.
Since then, JWP is working on it. It is been already more than
two years and we are curiously waiting for the result.
We are informally informed through the JWP members who were
recommended by IUPAP that the work is progressing steadily.
- Next C12 meeting of 2015 with new members will be held in
Washington DC, USA.

COMMISSION C13

Report on the C13/IUPAP annual meeting, 30 August 2014, ICTP, Trieste, Italy

Present at this meeting were Paulo Murilo Castro de Oliveira (chair), Sandro Scandolo (vice-chair), Ahmadou Wague (secretary), the members Sekazi Mtingwa, Dénes Lajos Nagy, Ulrich Platt, Gui Lu Long and Anatoly Dvurechensky. By skype, member Mourad Telmini also participated. Discussions and decisions are described below.

A. Three subjects were proposed to be included in the agenda of next Council meeting and General Assembly.

1. African synchrotron light source

There is a growing movement to construct a synchrotron light source on the African continent. During summer 2014, an Interim Steering Committee (ISC) was elected, consisting of 15 scientists from various African countries and elsewhere. On August 16, 2014, during a Forum Day at the African School of Fundamental Physics and its Applications (held in Dakar, Senegal), the work of the ISC began. It will proceed to organise the "African Light Source Workshop". This is expected to take place 18 months after the ASP2014 Forum Day. Participants will be African researchers who have worked at synchrotrons around the world. They will present their work, and the Workshop will review the status of the African light source user base at the various international facilities. There will be another election for the final Steering Committee (SC), which will move the African Light Source initiative forward.

The C13 Commission will submit a proposal to ICSU to assist in this effort. That proposal will be prepared for endorsement by the IUPAP General Assembly in November and hopefully approved for submission to ICSU before its December 1, 2014 deadline.

See the article "[A Light Source for Africa](#)" at the end of this report.

2. IUPAP associated organisations

A proposal already made by C13, concerning the creation of these organisations, is now reinforced, taking into account the modifications discussed during the current year.

See the proposal on [IUPAP Associated Organizations](#) at the end of this report.

3. IUPAP/C13 prize

Differently of all other IUPAP commissions, C13 is not restricted to a specific physics subarea. It is dedicated to disseminate activities in physics research and teaching in poor countries. Naturally, these activities are normally performed by senior scientists. Therefore, the young scientist IUPAP prizes, awarded by many other IUPAP commissions to outstanding contributions in their specific field, is not adequate to C13. We propose to adopt the same budget, guaranteed by IUPAP for the young scientist prize of each IUPAP commission, to implement a different prize specific for outstanding activities concerning the dissemination of Physics and Development in poor countries.

See [Proposed C13 Prize 2nd Revision 8-28-13](#) at the end of this report.

B. Two applications for events in 2015.

We received only two applications for type-D conferences this year:

1. Spring School and Workshop on "Cold Atoms and Molecules & Applications in Metrology" CAMAM2015, in Tunis, Tunisia;
2. XIII Hadron Physics, in Rio de Janeiro, Brazil.

C13 decided to recommend both for IUPAP financial sponsorship, with the full share.

During the meeting, there was an idea of sponsoring a third event in 2015, because the C13 budget for type-D events is 21,000 euro, at most 7,000 euro each event. This third event would be the "CELEBRATION OF THE 2015 INTERNATIONAL YEAR OF LIGHT: OFFICIAL LAUNCHING OF THE AFRICAN OPTICS AND PHOTONICS SOCIETY, LAM 11 International Workshop on Light, Optics, Lasers, Photonics and Applications for Sustainable Development", to occur in Dakar, from 25 to 29 May 2015. It is described in the following document.

See [Request to IUPAP for International Year of Light](#) at the end of this report.

If the IUPAP council and administration agree with this late proposal, during their next meeting, the organizer would fill the traditional IUPAP application form.

C. C13 decided to accept the invitation by Tunisian Physical Society to send a member (probably Sandro) to its annual meeting in 20 December.

D. Two presentations by C13 members.

1. International Year of Light (UNESCO), by Ahmadou and Gui Lu.
2. African synchrotron, by Sekazi.

A SYNCHROTRON RADIATION RESEARCH FACILITY FOR AFRICA

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Triangle Science, Education & Economic Development, LLC

Massachusetts Institute of Technology

African Laser Centre

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SLAC National Accelerator Laboratory

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July 10, 2014

INTRODUCTION

Synchrotron radiation has revolutionized basic and applied research in many scientific and technological disciplines, leading to a proliferation of facilities around the world. The website lightsources.org has links to 47 synchrotron radiation research facilities based on electron storage rings in 23 countries in operation, construction or planning. Fig. 1 depicts the location of operating light sources worldwide. Several facilities operate more than one ring, so more than 47 rings are in operation. Also, the list of facilities in construction is not complete. For example, a 1.5 GeV facility nearing completion in Poland is not included. See tango-controls.org/Events/meetings/october-2010/polish-synchrotron-tango-2010.10.pdf.



Figure 1: Locations of Synchrotron Light Sources¹

More than 30,000 scientists and engineers (including thousands of students) conduct basic and applied research at synchrotron radiation facilities in many Asian countries, Australia, Brazil, Canada, many European countries, and the United States.

The lightsources.org website is a rich resource. As it says on the website “Lightsources.org contains news and science highlights from each facility, as well as photos and videos, education and outreach resources, a calendar of conferences and events, details about facility contacts and capabilities, and information on funding

¹ Source: lightsources.org/cms.

opportunities.” Much can be learned at this website, as well as the web sites of the facilities, and via the references provided in links enclosed in this note.

Africa is presently the only habitable continent without a synchrotron light source. Dozens of scientists from African countries now perform experiments at facilities in Europe and elsewhere. Their numbers are limited mostly by distance and travel cost. A light source in Africa would enable thousands of African scientists and engineers to gain access to this superb scientific and technological tool. Indeed, in order to be competitive socially, politically and economically in the years to come, access to a nearby synchrotron light source will be an absolute necessity.

Most present light sources are national facilities. Almost all are in over-demand, leading to construction of additional facilities to serve an increasing worldwide user community.

Two light source facilities are international. One is the 6 GeV, 850 m circumference, European Synchrotron Radiation Facility (ESRF) (esrf.eu) in Grenoble, France. This facility, a collaboration of 18 European governments, plus South Africa and Israel, has been in operation since 1992. The other is the 2.5 GeV, 130 m circumference, SESAME facility (sesame.org.jo) now in construction in the Middle East as a collaboration of 9 Middle East governments (Bahrain, Cyprus, Egypt, Iran, Israel, Jordan, Pakistan, Palestinian Authority, and Turkey). SESAME is scheduled to start research in 2016. It is closely modelled on CERN, and is being developed under the auspices of UNESCO.

SESAME and ESRF illustrate, in size and cost, the broad range of examples that might be followed for an African light source. See below for more about an intermediate energy African light source.

UNESCO became the umbrella organization for SESAME at its Executive Board 164th session, May 2002, as it did in the case of CERN in the 1950s. UNESCO’s Executive Board described SESAME as “a quintessential UNESCO project combining capacity building with vital peace-building through science” and “a model project for other regions”. It is likely that UNESCO, if asked, would play a similar role as a facilitator for an African light source.

SESAME is now well underway towards the start of research in 2016 as a fully independent intergovernmental organization. Other regions (e.g. Africa and Central Asia) are welcome to join SESAME as Members or Observers, as a first step to developing similar projects in their regions. Students and scientists from these regions are encouraged to attend SESAME Users' meetings, schools, workshops, etc., where they can learn about synchrotron radiation sources, beamlines, and science. They are welcome to join SESAME scientists in designing and commissioning accelerators and beamlines, thereby gaining experience while helping SESAME in the process. See the end of this note for links to websites about SESAME.

SYNCHROTRON RADIATION BASICS AND AN AFRICAN LIGHT SOURCE

Synchrotron radiation is the light (electromagnetic waves) emitted by electrons as they are caused to change direction by magnets while circulating in storage rings at nearly the speed of light. It is also called “dream light” because it can be used in leading-edge scientific research and technologies. This light is produced over a broad spectral range, from infrared to hard x-rays of tens of kilovolts, enabling the use of monochromators to select a narrow band of wavelengths of interest to a particular study.

In practical situations (for example, the number of x-rays per second, within a narrow wavelength/energy band, that impinge on a sub-millimeter protein crystal) this radiation is a million to a billion times more intense than that produced by more conventional sources, such as x-ray tubes.

These storage rings range from tens of meters to 2 kilometers in circumference. They circulate and store electrons with energies from several hundred MeV to 8 GeV for several hours. The emitted radiation (by the bending magnets of these rings, or by periodic magnet arrays called wigglers and undulators inserted between the bending magnets) enters tangential beamlines that conduct the light to experimental stations. Several experimental stations receive this light at the same time, enabling many experiments (up to about 70 in the largest facilities) to be performed simultaneously.

In addition to the storage ring and beamlines, another major piece of equipment required is an injection system (a linear or circular electron accelerator), which provides electrons to fill the storage ring. Fig. 2 shows the layout of this equipment, including the 7 Phase I beamlines, in the 2.5 GeV SESAME facility.

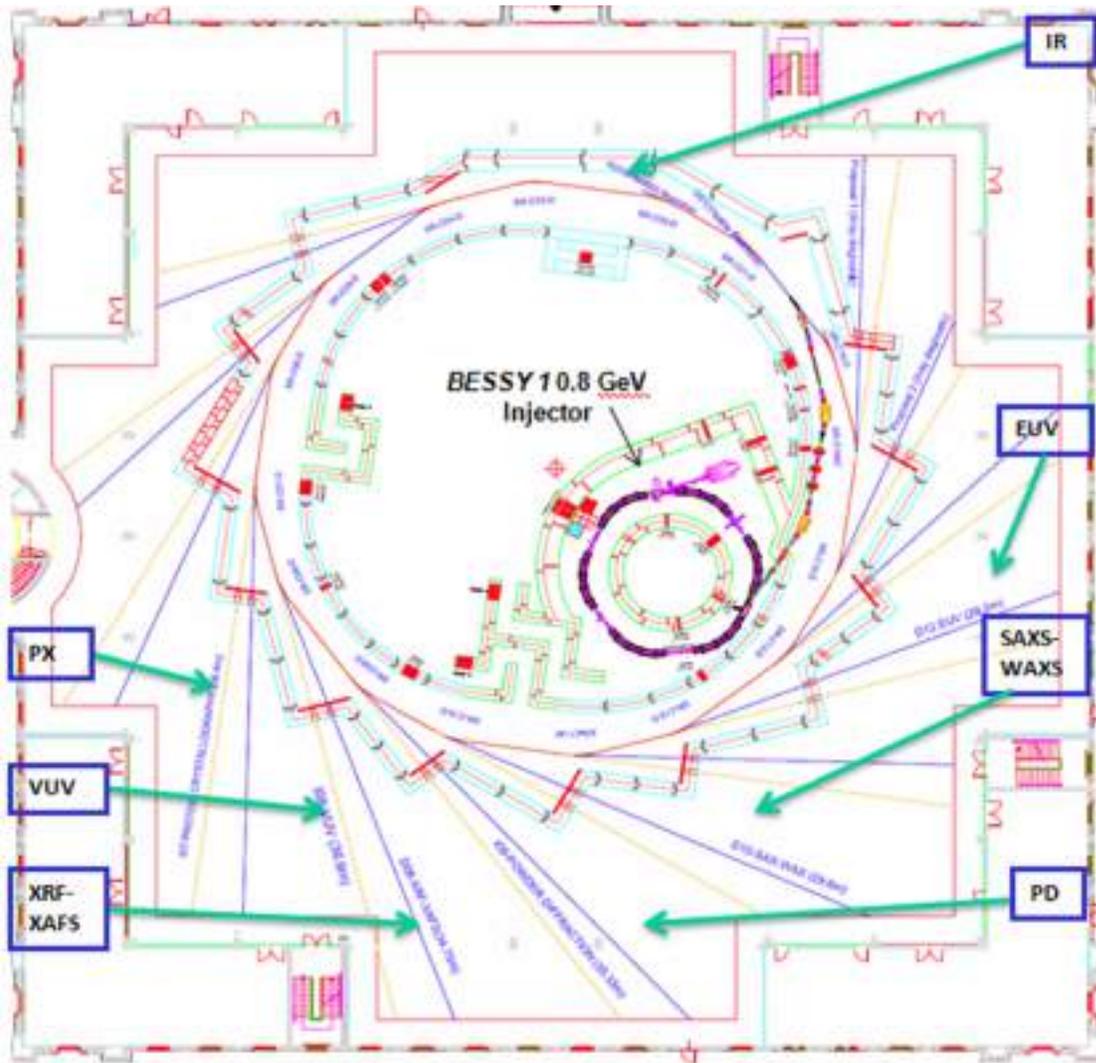


Figure 2: Layout of Injector, Storage Ring, and Beamlines in the 2.5 GeV SESAME Project

As is evident from experience around the world, in developing countries as well as technologically advanced countries, access to a nearby synchrotron light source brings many benefits, as follows:

- Conducting world-class basic and applied research
- Training graduate students without sending them abroad
- Attracting scientists conducting research abroad to return
- Addressing regional biomedical and environmental issues/concerns
- Promoting the development of high-tech industry.

Most recently completed facilities, and those now in construction, are largely based on so-called “Intermediate Energy” electron storage rings, with energies of 2.5-3.5 GeV and circumferences of 100 to several hundred meters. By exploiting recent developments in the technology of storage rings, and wiggler and undulator insertion devices, these facilities provide, at significantly lower cost, performance closely approaching, and in some cases exceeding, that of the larger, higher energy facilities. Recent examples of intermediate energy facilities can be seen at lightsources.org.

Particularly relevant to consideration of a light source in Africa is the experience with light sources in Brazil, Korea, and Taiwan. After sending scientists to use facilities abroad, funding for light source programs in each of these countries started in the mid 1980’s, when these countries were less technologically developed than they are now. These facilities began operations in the mid 1990’s. Since then they have each trained hundreds of graduate students locally, and attracted many mid-career scientists to return home. Having seen these benefits, governments in these three countries have recently approved funding, at about the \$300M level, for the construction of new, more advanced, intermediate energy (3 GeV) light sources to better serve their large and growing user communities. We are indebted to the Director of the Taiwan Light Source facility for the summary of their experience, included in the appendix to this report.

The above benefits can be realized in about a decade with aggressive planning for an African Light Source. This planning should include increasing funds available to expand the number of scientists conducting experiments abroad, and building expertise by training personnel in the latest relevant technology, including the design, construction and commissioning of storage rings, beamlines, and experimental equipment.

This approach has been successfully used in several countries, including Australia, Brazil, and Canada, which built beamlines at facilities abroad and supported their scientists to use these beamlines as a step leading to funding for their own national light sources.

We urge that training programs be initiated in Africa and partnerships be developed with light sources abroad. A particularly relevant example is the SESAME project. See:

sesame.org.jo
europa.eu/rapid/press-release_IP-13-468_en.htm?locale=en
sciencediplomacy.org/perspective/2012/synchrotron-light-and-middle-east
mag.digitalpc.co.uk/fvx/iop/esrf/sesamebrochure/
bbc.co.uk/news/world-middle-east-20492294
mag.digitalpc.co.uk/fvx/iop/esrf/sesamepeople/
europa.eu/rapid/press-release_IP-13-468_en.htm?locale=en
aps.anl.gov/News/APS_News/Content/APS_NEWS_20080916.php

For more details about properties, sources, and applications of synchrotron radiation see lectures and links from the African School on Fundamental Physics – 2012 in Ghana:
indico.cern.ch/event/145296/contribution/47.

A MODEL PROGRAM FOR AFRICAN SCIENTIFIC COLLABORATIONS

Several models already exist of African countries collaborating on scientific and technological projects. One such model is the African Laser Centre (ALC). It started as a joint effort of South Africa's National Laser Centre (NLC) and the Edward Bouchet-Abdus Salam Institute (EBASI), sponsored by the International Centre for Theoretical Physics (ICTP). From the South African side, the NLC inherited a large inventory of state-of-the-art laser equipment from a defunct uranium enrichment collaboration with France. To make full use of the laser equipment, the NLC started a loan program, whereby it granted use of the equipment to South African researchers. The program was so successful that it decided around the year 2000 to expand the program to the whole African continent. At the same time, the EBASI Council decided that it would seek ways to enhance laser research and training in Africa. Once the two efforts became known to one another, they decided to join forces and create what has become known as the African Laser Centre. It celebrated its 10th Anniversary during 2013, since the organization was officially launched on November 6, 2003, in Johannesburg, South Africa. The launching ceremony occurred during the Ministerial Segment of the New Partnership for Africa's Development (NEPAD) Conference on Science and Technology for Development. NEPAD declared the ALC to be one of its Centers of Excellence.

The ALC, which is a virtual center, was established as a nonprofit organization, based in Pretoria. The organizers designed it to consist of nodes, where the nodes are laser laboratories in various stages of development. The most developed nodes of the network are designated as User Facilities, and they consist of the following (along with their main areas of specialization):

1. **Centre de Développement des Technologies Avancées (CDTA)**, Algiers, Algeria
Laser spectroscopy, surface studies, laser welding
2. **CSIR National Laser Centre (ALC Headquarters)**, Pretoria, South Africa
Manufacturing, machining, materials processing
3. **National Institute of Laser Enhanced Sciences (NILES)**, Cairo University, Egypt
Medical and biological applications of lasers, femtosecond laser system
4. **Tunis el Manar University**, Tunis, Tunisia
Plant and environmental science, molecular spectroscopy
5. **Laser and Fibre Optics Centre (LAFOC)**, University of Cape Coast, Ghana
Agricultural and environmental science
6. **Laboratoire Atomes Lasers**, Université Cheikh Ante Diop, Dakar, Sénégal
Atomic and molecular physics, laser spectroscopy, medical physics.

The charge to these nodes is to assist other less developed laboratories to rise to the status of User Facilities. As of 2014, the ALC has more than 30 institutional members in the countries depicted in Fig. 3.

The ALC offers a variety of programs. It provides research grants to facilitate collaborations among member institutions. It continues the NLC's successful laser equipment loan program. It offers technical assistance to laser laboratories in order to mitigate the time loss due to equipment failures. Finally, it sponsors lectureships, postdocs, fellowships, doctoral sandwich programs, conferences, workshops, topical schools, and student internships.



Figure 3: Countries with ALC Member Institutions²

Since the ALC started receiving funding in 2006, mostly from the government of South Africa, its successes have included the following:

Output	Quantity
Projects supported	87
Publications in refereed journals	151
Popular journal articles	13
Publications in conference proceedings	210
Chapters in books	12
Theses completed	59
Masters scholarships awarded	38
PhD scholarships awarded	78
Training events (workshops/conferences/symposia, short courses)	33
Number of students trained at workshops, symposia and short courses	1249
Masters Students supported	141
PhD Students supported	165

Thus, Africa already has established a model for successful continental collaborations.

² Source: ALC Management Report to the Board of Directors Meeting, November 13, 2011.

SYNCHROTRON SCIENCE IN SOUTH AFRICA

A critical mass of synchrotron users already exists in South Africa. As early as 1994, South African researchers used the synchrotron facility at Daresbury and ESRF to study the surfaces of diamonds. As of 2011, there were approximately 40 synchrotron users in the country. That community, which is organized under the name of Synchrotron Research Roadmap Implementation Committee (SRRIC), held a workshop under the auspices of the South African Institute of Physics during December 2011 in Pretoria. Its purpose was to provide input into the writing of its Strategic Plan, which SRRIC subsequently submitted to the government in 2012. Fig. 4 shows the workshop attendees. It is notable that the Director of ESRF attended the workshop. Some important proposals that emanated from the workshop include the following:

1. Decide at what level South Africa should formalize its relationships with foreign light source facilities, especially with ESRF, which is the most heavily used by South African researchers.
2. Study the feasibility of constructing South African or multinational beamlines at foreign synchrotron facilities.
3. Promote a significant growth in the number of synchrotron users, with a heavy emphasis on increasing the number of students being trained, such as at ICTP's synchrotron radiation school.
4. Develop programs to preserve and expand the existing technical expertise, such as sending scientists and engineers abroad to join accelerator teams at foreign facilities.
5. Improve the local, critical feeder infrastructure that allows researchers to prepare and analyze samples before and after being shipped for studies at foreign synchrotron facilities.
6. Promote greater involvement of industrial users.
7. Study the feasibility for constructing a third generation light source.
8. Develop mechanisms to educate the public about the revolutions in science and technology, such as the discovery of new pharmaceuticals that synchrotrons afford.



Figure 4³ Attendees at the 2011 SRRIC/SAIP Synchrotron Science Workshop, Pretoria, 2011

³ Source: South African Institute of Physics.

After submitting the Strategic Plan to the government, two important developments occurred. First, the government requested that a more detailed Business Plan be prepared, which was done and submitted in 2014. Secondly, in May 2013, South Africa signed a dues-paying medium-term arrangement with the ESRF and, in doing so, became the 20th country to join the European synchrotron.

Hence, we see that in South Africa, there is a growing community of synchrotron light source users that could form the core of an African light source community.

Finally, given the rapid pace of scientific and technological breakthroughs, the time has come for African countries to pool their resources and construct a synchrotron light source on the African continent. It is imperative for Africa to be among the world leaders in contributing to these revolutionary high tech breakthroughs. In the end, their economies and social structures will benefit greatly.

APPENDIX:

National Synchrotron Radiation Research Center (NSRRC) Hsinchu, Taiwan nsrrc.org.tw
Shih-Lin Chang (Director) (slchang@nsrrc.org.tw)

A 1.5 GeV light source has been in operation since 1993. A total of 28 beamlines, 45 end stations, and 9 insertion device magnets are in operation. Also, two hard x-ray beamlines (one from a bending magnet and one from an undulator) have been constructed at SPring-8 in Japan for use by scientists from Taiwan. These have been in operation since 2001.

So far more than 423 students have received the PhD and 1678 Masters Degrees based on work done at the light source. More than 2000 users executed 1586 proposals in 2013. Among the proposals, 10% are conducted by user groups from abroad, and the remaining are executed by user groups from NSRRC as well as universities and national research institutes in Taiwan.

There have been significant benefits to companies in Taiwan that have collaborated with the light source to develop capabilities to design, fabricate, and measure many technical components. These include magnets, insertion devices (including superconducting devices), ultra-high vacuum chambers, survey and alignment technology, beamline components, x-ray energy analyzers, cryogenics technology, radio frequency components, digital electronics, and brazing technology.

As part of the international synchrotron radiation community, NSRRC has had many interactions with other facilities, including SPring-8, ANKA, ALS, SSRL, CHESS, SPS, the Australian light source, and SESAME. The Taiwan light source has provided full support for nine fellowships for scientists from the Middle East who worked at NSRRC for one year since 2004.

A new 3 GeV third generation light source (Taiwan Photon Source, TPS) is being constructed at the same site. The booster and storage ring will undergo commissioning in the third quarter of 2014 and the TPS is expected to be partially open to users in 2015. In Phase I, 7 beamlines have been constructed; more beamlines will be planned in Phase II.

COMMISSION C14

Report on the Activities of IUPAP Commission 14

ICPE – The International Commission on Physics Education

2013-2014

ICPE Website

ICPE has a new website <http://iupap-icpe.org/>. The servers for the new site are located in Prague where the site is being maintained by the ICPE Secretary Prof. Leos Dvorak. Links with the old site (based in Kansas) are being maintained for the moment but all relevant information has already been transferred and/or updated and the old site will be shut down in due course. The new site is based on the Drupal open-source content management system and has been designed to facilitate easy transfer in the future. The Commission thanks Prof. Dvorak for his valued work.

PHYSWARE

The sequence of ICPE-supported PHYSWARE Workshops (to promote low-cost hands-on physics teaching in developing countries) will be continued in January 2015 with a workshop at the Abdus Salam Centre for Theoretical Physics in Trieste. The workshop is the result of work by several individuals but ICPE particularly thanks Prof. Gorazd Planinšič who has led its efforts in this important area.

Annual ICPE conference

The Commission's annual conference, ICPE-2014 was held in Cordoba, Argentina, 18-22 August 2014. This was the first ICPE Conference to be held in South America, and it faced a number of challenges arising from the financial problems currently besetting the Argentine economy. The quality of the conference was very high, with an exceptionally rich plenary programme that gave roughly equal representation to university-level and high-school level physics education. There was some disappointment at the number of participants which was less than expected. However, a unique feature of this particular conference was the addition of a highly successful, externally funded, 'Satellite meeting' held in Spanish and specifically aimed at high school teachers who would not have been able to attend or follow the ICPE Conference itself (which was in English). The success of ICPE-2014 was thanks in no small part to the efforts of the Local Organizing Committee, led by Professor Zulma Gangoso. Their hard work on behalf of ICPE is gratefully acknowledged.

Events on the penultimate day of the Conference were dedicated to the memory of Prof Elena Sassi, a greatly valued former member of ICPE and highly regarded international physics educator, who died in the autumn of 2013.

ICPE Medal

As usual a highlight of the conference was the award of the ICPE Medal. In 2014 the ICPE Medal was awarded to Cedric Linder, Professor of Physics Education Research at the University of Uppsala, Sweden, in recognition of his outstanding contributions to Educational Physics. Professor Linder gave a presentation on his work immediately after the award ceremony and also made a much appreciated contribution to the Satellite meeting. A press release concerning the award was picked up by the EPS (European Physical Society) and the AAPT (American Association of Physics Teachers), amongst others.

Annual face-to-face meeting

ICPE held its annual face-to-face meeting immediately after the end of the annual Conference. Apart from responses to ICPE-2014, and other matters already mentioned above, the items discussed included:

- 1 Reports on other physics education conferences around the world.
- 2 Plans and priorities for future conferences, particularly the next ICPE Conference, which will be held in Beijing, China in August 2015. (Thanks to Prof. Nianle Wu for his work on this.)
- 3 Plans for the ICPE medal post-2015 (The last of the current stock of medals will be awarded in 2015.)
- 4 Plans for future issues of the ICPE Newsletter.
- 5 Working groups and action items, including a proposal for an international catalogue of physics education systems that might be added to the new website.
- 6 Relations with other bodies, including the International Association of Physics Students (IAPS) and the International Group for Research in Physics Education (GIREP), both of which have agreed to share publicity material and to explore other areas of mutual support with ICPE.
- 7 The 2014 IUPAP General Assembly and consequent changes to ICPE membership. It was noted that Profs. Sila NicChormaic, Michael Vollmer and Nianle Wu would all be leaving the Commission in November 2014. All were thanked for their contributions. Vice-Chair Prof Hideo Nitta thanked the current Chair who will also be retiring from the Commission.

Robert Lambourne

C14 Chair

COMMISSION C15



International Union of Pure and Applied Physics

To stimulate and facilitate international cooperation in physics and the worldwide development of science.

Commission C15: Atomic, Molecular and Optical Physics

- Chair: K. Gebbie, Physical Measurement Laboratory, NIST
Gaithersburg, MD, USA. gebbie@nist.gov
- Vice Chair: D. Mathur, Tata Institute of Fundamental Research,
Mumbai, India: atmol1@tifr.res.in
- Secretary: T. Azuma, Atomic, Molecular & Optical Physics
Laboratory, RIKEN, Hirosawa, Wako, Japan
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**Report for IUPAP
Council & Commission Chairs Meeting
3-4 November 2014
and
28th General Assembly Meeting
5-7 November 2014
Singapore**

The two large international conferences in Atomic, Molecular and Optical Physics—the International Conference on Atomic Physics (ICAP) and the International Conference on Photonic, Electronic and Atomic Collisions (ICPEAC)—are held biennially on alternating years. Accordingly, Commission C15 officers and members met over lunch on 5 August 2014 during the 24th ICAP meeting in Washington DC. Attendance included Commission representatives from Japan (Toshiyuki Azuma), China (Dajun Ding), Korea (Wonho Jhe), Austria (Rainer Blatt), and the United States (Katharine Gebbie). We regretted that the two previous C15 Chairs, Joachim Burgdörfer and Burkhard Fricke were not able to attend and give us the benefit of their experience.

Invitees to our meeting included: Amy Flatten, Director of International Affairs, American Physical Society; Philip Hammer, Associate Vice President, Physics Resources Center, American Institute of Physics, and Gretchen Campbell and Trey Porto, Co-Chairs of ICAP. In addition, following our tradition for the past two years, we invited those students to join us for lunch whose travel had been supported by IUPAP, which included five in all, from Brazil, China, India and Mexico.

The meeting continued the discussion from the previous year on how Commission 15 might best contribute to the mission of IUPAP to assist in the worldwide development of physics, to foster international cooperation in physics, and to help in the application of physics toward solving problems of concern to humanity. It had been suggested that one approach would be to work with Commission 13 on Physics Development to sponsor Type D Conferences: Workshops in Developing Countries. One model might be the Industrial Physics Forum 2012: Capacity Building for Industrial Physics in Developing and Emerging Economies, sponsored jointly by the American Institute of Physics (AIP) and the International Center for Theoretical Physics (ICTP) in Trieste, and its successor in October 2014 in São Paulo, Brazil. It was to speak about these forums that Philip

Hammer had been invited to join the meeting. The proposal for IUPAP to join with AIP and ICST in sponsoring such a forum was strongly supported, as was the proposal to hold the 2016 Forum in South Africa.

The soliciting and ranking of nominations for the Young Scientist Prize in AMO Physics is highly competitive and taken seriously by all members of the Commission. This year, thanks to our Secretary who ran the competition, we had 32 candidates from 17 countries. The winner was Jacob Taylor from the US National Institute of Standards and Technology “For groundbreaking advances in the design of compact, practical devices that bridge the classical world with the exotic quantum world“. Our celebration of the 2012 Young Scientist Prize winner, Yann Mairesse from the University of Bordeaux “For outstanding contributions to attosecond pulse characterization and the birth of attosecond molecular spectroscopy“ had to be postponed yet another year.

Amy Flatten described the variety of activities in which the American Physical Society interacts with colleagues internationally. Her tips for navigating the current US visa application process may be found at: <http://www.aps.org/programs/international/visa/>

The Commission Members voted to support the following conferences in 2015

29th International Conference on Photonic, Electronic and Atomic Collisions (ICPEAC XXIX)

Location: Toledo, Spain

Date: 22-28 July 2015

Chair: Roberto Rivarola, Universidad Nacional de Rosario and Instituto de Fisica
Rosario - Rosario, Argentina

Conference Type: A

22nd International Conference on Laser Spectroscopy (ICOLS 2015)

Location: Sentosa Island in Singapore

Date: 28 June – 3 July 2015

Chair: Kai Dieckmann, National University of Singapore

The 2015 Meeting of Commission 15 will take place during the 29th International Conference on Photonic, Electronic and Atomic Collisions in Toledo, Spain.

COMMISSION C16

IUPAP C16 report 2013-2014

Submitted by Robert Bingham (Chair)

I. IUPAP C16 Sponsored/Endorsed Conferences

The 17th International Congress on Plasma Physics (ICPP), Lisbon, Portugal. 15th-19th September, 2014. The Chair of the meeting was Professor Tito Mendonca of the Instituto Superior Tecnico.

This is a category A conference the scope of which is to discuss recent progress and to establish a view on future plasma physics topics. The conference covers a wide range of topics in plasma science including fundamental plasma physics, fusion plasmas, plasma accelerators, astrophysical plasmas and plasma applications. This is a bi-annual meeting that brings together scientists from around the world to present the latest scientific results. The subject matter of the meeting is mostly in the area of high temperature plasmas.

One of the important aspects of this meeting is that it covers a broad area of research within one meeting. The topics range from quantum plasmas to the very large astrophysical plasmas as well as bringing the normal plasma activities such as fusion and plasma accelerators together. Quantum plasmas are found in highly compressed matter such as the interior of stars where the equation of state determined by quantum is important in understanding formation processes. In astrophysics plasmas surrounding black holes or radio jets are increasingly being studied. The sister meeting is the International Conference on the Phenomenon on Ionised Gases held on alternate years. This conference concentrates on low temperature plasmas with strong industrial content such as plasmas used in lighting, medical applications, plasma processing of materials and more recently plasmas processes are being investigated as a possible carbon dioxide reduction method in the atmosphere.

The 7th international conference on the Physics of Dusty Plasmas, New Delhi, India. 3rd-7th march 2014. The Chair of the meeting was Professor Khare Avinash, University of Delhi.

This is a category B international meeting and takes place every three years. The topic is the physics of charged macro particle in a plasma environment. It has applications in both laboratory space and astrophysical plasmas.

II. C16 Young Scientist prize in Plasma Physics

PURPOSE: The IUPAP C16 Young Scientist Prize recognises exceptional achievement in the study of plasma physics by a scientist at a relatively junior stage of their career. The recipient is expected to have displayed

significant scientific ability in an area of plasma physics covered within the topics of ICPP.

The 2014 prize winner was Wei Lu of the Department of Engineering Physics, Tsinghua University, Beijing.

The citation reads:

For original contributions to high intensity laser and beam plasma interactions including a theory for nonlinear plasma wakefields and widely used scaling laws for Laser Wakefield Acceleration in the nonlinear regime.

He completed a PhD on plasma accelerators at UCLA. His research demonstrates the feasibility of plasma accelerators that may one day replace conventional accelerators in the quest for ever higher energy machines. Plasma accelerator research is a growth area in plasma physics which has seen impressive results in the last few years.

The prize medal and certificate were presented at the ICPP meeting in Lisbon where Wei Lu presented the IUPAP Prize talk.

III. IUPAP C16 committee meetings.

Held on September 19th 2014 at the 17th International Congress on Plasma Physics (ICPP) Lisbon, Portugal. The committee endorsed the next International Conference on the Phenomenon in Ionised Gases (ICPIG) to be held in Hungary 2015 as well as the Laser and Plasma Accelerator Workshop, May 2015 in Quadaloupe. As well as endorsing the future meetings the committee discussed the change-over in December to the new committee and suggested that old members should meet their new country representative to pass on ideas and information about IUPAP.

November 26th 2014, at the APS Division of Plasma Physics , New Orleans.

IV. Outreach.

Outreach is also a very important activity of IUPAP by promoting plasma physics. It is widely recognised that one of the important topics in plasma physics is net energy gain from fusion. Fusion has been demonstrated for some time but the elusive energy gain goal still remains elusive. At present two main approaches are being pursued namely magnetically confined fusion using machines such as ITER that is being constructed in Cadarache in southern France and inertial confinement fusion such as the NIF laser facility. In the NIF project although no net energy gain has been achieved so far, fusion alpha particles are responsible for heating the deuterium tritium plasma, this is a major result in the pursuit of harnessing fusion energy. Plasma accelerators are also demonstrating real promise in producing useful

beams of particles. These are used in experiments to produce x-rays and gamma rays for applications in material and medical sciences. Plasma accelerators are seen as possible replacements for conventional accelerators in achieving the energy frontier, they have accelerating gradients 1000 times larger than conventional accelerators making the machines more compact for the same energy gain. Laboratory astrophysics is also beginning to make important tests of astrophysical problems such as the origin of the primordial magnetic field and intense radio emission mechanisms and the physics of black hole accretion discs. One aspect that has made a difference to the subject is the very large 3 dimensional simulations in particular gyro kinetic and full particle in cell codes that are available. Plasmas have made an incredible difference in the modern world by being used in the manufacture of new materials and silicon chip manufacture.

COMMISSION C17

IUPAP C17: Commission on Quantum Electronics Report for the IUAP 2014 GA in Singapore

1. Commission Membership 2011-2014

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2. IUPAP Prize for Young Scientists

The IUPAP Commission on Quantum Electronics C17 ran the Young Scientist Prizes in Quantum Electronics in 2013 for outstanding contributions to quantum electronics and its applications. These are the two prizes awarded only once every two years, and recognize the very highest level of achievements in fundamental and applied research.

The 2013 winners of these prizes are listed below:

- The 2013 IUPAP Young Scientist Prize in Quantum Electronics (Applied Aspects) is awarded to Professor Nickolas Vamivakas, Professor at the Institute of Optics, University of Rochester, NY, USA. The Prize is awarded to Professor Vamivakas "For seminal contributions to extending the domain of experimental quantum optics from atomic to solid-state systems".
- The 2013 IUPAP Young Scientist Prize in Quantum Electronics (Fundamental Aspects) is awarded to Dr. Kin Fai Mak, Kavli Institute at Cornell for Nanoscale Science, Cornell University, NY, USA. The Prize is awarded to Dr. Mak "For ground-breaking contributions to the measurement and physical understanding of the novel optical properties of atomically thin 2D materials".

The award ceremony was hosted by the International Optics&Photonics Taiwan Conference in Zhongli, Taiwan, on December 5-7, 2013 (<http://optic2013.dop.ncu.edu.tw>).

This event was publicized in the EPS e-news in January 2014 and in May 2014 issue of the OSA Optics and Photonics News magazine.

Next call for the UPAP C17 Young Scientist Prizes in Quantum Electronics will be launched in the end of this 2014 year-beginning of 2015. Also, the agreement has been reached with

the European CLEO/EQEC 2015 in Munich, Germany, that the award ceremony for these prizes will be hosted at this meeting.



Backscatter

HONORS AND AWARDS

IUPAP C17 Young Scientist Prizes

The International Union of Pure and Applied Physics Commission on Quantum Electronics (IUPAP C17) awarded the 2013 Young Scientist Prizes in Quantum Electronics - Optics & Photonics Taiwan International Conference in Zhongli, Taiwan (OPTIC 2013). The prize for applied aspects was given to **Nickolas Vamivakas**, University of Rochester, U.S.A., for "seminal contributions to extending the domain of experimental quantum optics from atomic to solid-state systems," and the prize for fundamental aspects was awarded to **Kin Fai Mak**, Cornell University, U.S.A., for "ground-breaking contributions to the measurement and physical understanding of the novel optical properties of atomically thin 2-D materials."



3. Associated members of C17

At the IUPAP Executive Council and Committees Chairs meeting in October 2012 C17 made a proposal, which had been approved, for the European Physical Society (EPS) as an associated member of the commission. Two persons from the EPS were named as the representatives:

John Dudley, President of the EPS, former chair of the QEOD/EPS
David Lee, Secretary General, EPS

This associative membership will tighten the relationships between the IUPAP and the EPS in the scope of C17 via its communication through the QEOD/EPS.

4. Sponsored conferences by C17

The commission sponsored in 2011 the **V Rio De La Plata Workshop on Laser Dynamics and Nonlinear Photonics 2011**, organized in Uruguay.

The commission also supported an application for the next VI Rio De La Plata Workshop in 2013, but the application was not supported at the IUPAP Executive Council and Committees Chairs meeting in October 2012. We failed because of the rigid position of the IUPAP Executive Council who considers REGIONAL meetings as not eligible for the support. Word "regional" meeting means in the current IUPAP interpretation that series of events is organized always in the same region of the World, for instance in Latin America, which is the case for the Rio De La Plata Workshop. And it does not matter that these meetings are REALLY international. It is also worth to note that this rule, as a matter of fact, is not always followed when Executive Council makes a decision and among sponsored by the IUPAP meetings you may find examples that clearly do not fit this rule.

By and large, key problem with sponsoring conferences by C17 is that we do not have a major conference in our field that we regularly can sponsor and make plans in advance. This could be either IQEC, which is basically not very much interested in such small amount of money, or any other international conference on laser physics and photonics that travels around the world. It would be, for instance, Laser Physics conference, which has a wide scope, some 700+ attendees, and travels all over the World. This option has been already discussed with the organizers of this meetings, but so far they have not submitted any application.

5. Changing the name of the commission

The on-going efforts to align C17 with the research topics of modern optics and photonics were strongly supported at the previous GA of IUPAP in London in 2011. According to its recommendation a working group was set up who suggested to rename the present name of the commission "Quantum Electronics" with the more relevant name "**Laser Physics and Photonics**".

6. Commission Membership Nominations for the Future Term

Detailed consideration was given to the nominations made by the National Liaison Committees. Further discussion centered on the need for national and gender representation, and also the need for members who would be actively involved in the work of the Commission. After discussion and respective voting, a slate of 14 nominees and 1 reserve was recommended to the Selection Committee by the C17 commission.

COMMISSION C18

Below is the C18 report for the meeting in Singapore. Since I expect that all reports will be collected and formatted in a uniform way I send the report as plain text. As in the past years it is short; the activities of C18 have essentially been focused on the triennial ICMP conferences and on the Young Scientist Prize in Mathematical Physics. It would certainly be desirable to broaden these activities.

The relatively low profile of C18 in the community of mathematical physics has in my opinion two main reasons. One is that most conferences in mathematical physics are rather specialized and too small to fulfill the requirements for IUPAP support. The other is that the International Association of Mathematical Physics already satisfies to a large extent the need for a cohesive organ within this community, both through the organization of the ICMP and in particular through the News Bulletin of the IAMP that is published on the internet every three months. Let us hope that the next C18, that will have 11 new members, will develop new ideas for increasing the visibility of IUPAP in the mathematical physics community to the benefit of both!

At the IUPAP C&CC meeting in Geneva in October 2013 an application for endorsement of the “30th International Colloquium on Group Theoretical Methods in Physics“ as a Category C conference was approved. This event took place in Ghent July 14-18, 2014, and judging by the detailed report that IUPAP received shortly afterwards from the chair of the organization committee, Joris Van der Jeugt, it was a full success. See <http://www.group30.ugent.be/> .

One application to IUPAP for support of a category A conference in 2015 falls within the realm of C18. This is an application by Rafael Benguria for the International Congress in Mathematical Physics (ICMP) to be held in Santiago de Chile July 27 to August 1st, 2015. The organization of the triennial ICMP conferences, each time in a different location, is a major task of the International Association of Mathematical Physics (IAMP). A decision on the application to IUPAP will be taken at the upcoming C&CC meeting in Singapore in November.

A call for nominations for the Young Scientist Prize in Mathematical Physics was posted on the IUPAP website on June 8, 2014. It was also published in the April and July issues of the News Bulletin of the IAMP, which is an internet publication reaching all members of the IAMP. Besides, C18 members informed their colleagues about the prize and solicited for suitable candidates. The prize is traditionally handed out at the ICMP conferences, each time to three laureates. By the deadline of August 31, 12 nominations were received. A prize committee of five C18 members was appointed by the C18 chair, taking care to avoid possible conflicts of interest due to joint publications of nominees with members of C18. In particular, the C18 chair is not on the prize committee for this reason. It is expected that the prize winners have been selected by November 2014. They will receive their awards at the ICMP in Santiago de Chile in July next year.

At the next IUPAP General Assembly in November new commissions will be appointed. In the case of C18 considerable turnover will take place since only 3 of its present 14 members are nominees for the new committee. As retiring chair I wish IUPAP, and the the new C18 committee in particular, all the best for the future.

Jakob Yngvason, Chair of C18

COMMISSION C19

IUPAP C19 Astrophysics Activity report 2013.10 – 2014.10

1) IUPAP Young Scientist Medal in the field of Astrophysics

The IUPAP Young Scientist Medal in the field of Astrophysics of 2013 was awarded to Alicia Soderberg (Harvard University, USA) for discovering of new classes of explosions in the Universe across the electromagnetic spectrum, including the first X-ray flare associated with a shock breakout in a supernovae (SN 2008D), and the first luminous radio emission from a supernova (SN 2009bb) which requires a substantial relativistic outflow powered by a central engine without an observed gamma-ray burst.

Dr. Alicia Soderberg has presented her work at the 27th Texas Symposium on Relativistic Astrophysics (December 8–13, 2013 in Dallas, USA), where the IUPAP Medal was handed.

2) IUPAP support of international conferences

The IUPAP supported 27th Texas Symposium on Relativistic Astrophysics took place in Dallas on 8–13 December, 2013. Vice-chair of C19 Victoria Kaspi and the associated member Virginia Trimble gave to participants of the symposium a short presentation of C19 aims and activities and invited to join IUPAP.

Four members of C19 served at the Scientific Organising Committee of the 27th Texas Symposium on Relativistic Astrophysics held in Dallas on 8–13 December, 2013 (Thanu Padmanabhan, Victoria Kaspi, Grazina Tautvaisiene and assoc. member Virginia Trimble). See <http://nsm.utdallas.edu/texas2013/>

There were no symposia selected for the IUPAP support in 2014.

C19 reviewed and decided to support 28th Texas Symposium on Relativistic Astrophysics to be held on 14–18 December, 2015 in Geneva.

3) Preparations have been started for the International Year of Light 2015 activities. Presently we collect ideas of possible activities and spread the information.

Prepared by
Thanu Padmanabhan
Grazina Tautvaisiene

COMMISSION C20

IUPAP Commission on Computational Physics C20

Report on 2013-2014 activities

Conferences:

The Conferences on Computational Physics (CCP) form an international series of conferences which has served as a lively forum for computational physicists from around the world. Since 1998, the CCP conferences rotate yearly between the European/African continents, the Asian/Oceanian continents and the Americas. In 1997, the CCP conference series succeeded the EPS-APS Joint Conferences "Physics Computing" (PC) organized annually since 1989.

The XXVI IUPAP Conference on Computational Physics CCP2014 was held in Boston, USA and hosted by Boston University on August 11-14 (ccp2014.bu.edu). There were 365 participants, of these 140 from the greater Boston area, 15 plenary talks, 52 invited talks, 100 contributed talks and 100 poster contributions. It was chaired by Professor Anders Sandvik. The conference spans the entire field of computational physics, from astrophysics to nanoscience. *The XXVIII IUPAP Conference on Computational Physics CCP2015* will be chaired by Professor Purusattam Ray at the Institute of Mathematical Sciences, Chennai, India and Sitangshu Bikas Santra of the Indian Institute of Technology, Guwahati, India. The dates for the meeting are December 2-5, 2015. The venue is the IIT campus in Guwahati in the state of Assam, India. *CCP2016* will be held in Pretoria, South Africa. It will be chaired by Professor Nithaya Chetty of the University of Pretoria. *CCP2017* will be organized in Paris, France by Professor Rodolphe Vuilleumier of the Ecole Normale Supérieure (rue d'Ulm), Paris.

Young Scientist Prize:

The Young Scientist Prize in Computational Physics was awarded to Professor Mathieu Salanne of the Université Pierre et Marie Curie, Paris.

The number of candidates is very low. The commission has discussed this extensively.

Trondheim, October 17, 2014.



Alex Hansen

Chair, C20