IUPAP C13 COMMISSION REPORT

Prepared by Sekazi K. Mtingwa (C13 Chair) for the October 2018 Meeting of the IUPAP Executive Council and Commission Chairs

August 2018

Officers

***Chair*: Sekazi Mtingwa,** United States
***Vice-Chair*: Kuijuan Jin,** China
***Secretary*: Joseph Niemela,** Italy

Members

Carlo Saverio Iorio, Belgium
Mmantsae Diale, South Africa
Aba Bentil Andam, Ghana
Kevin McGuigan, Ireland
François Piuzzi, France
Dmitri Wiebe, Russia
Michael Steinitz, Canada
Samia Charfi Kaddour, Tunisia
Andreas Buchleitner, Germany
Ajith Kumar Parambath, India
Jose Daniel Muñoz Castaño, Colombia

Associate Members

Kennedy Reed, United States
Gorazd Planinsic, Slovenia
Claes Fahlander, Sweden
Lilia Mesa-Montes, Mexico

Observers

Fernando Quevedo, Director of Abdus Salam ICTP
Galileo Violini, Director Emeritus of Centro Internacional de Física, in Bogota, Colombia

Group Photo of C13 Commission at Annual Meeting, Trieste

(Left-to-right: Joe Niemela (Sec'y), Michael Steinitz, Mmantsae Diale, Sekazi Mtingwa (Chair), Carlo Iorio, Fernando Quevedo (ICTP Director, Observer), Kuijuan Jin (Vice-Chair), Andreas Buchleitner, François Piuzzi, Samia Charfi Kaddour, Ajith Kumar B.P.)

I. *LAAAMP* Midterm Workshop

The C13 Commission convened a half-day *LAAAMP* Midterm Workshop on 24 August 2018 at the Abdus Salam International Centre for Theoretical Physics (ICTP) in Trieste, Italy. Professor Fernando Quevedo, Director of ICTP, welcomed the participants to open the Workshop. Table I displays the Agenda. From the presentations and subsequent discussions came the following recommendations:

1. Pursue crowd funding in addition to standard sources of funding.

2. Utilize Facebook and other social media.

3. Translate the *LAAAMP* Brochure (already in English, French and Spanish) into Arabic.

4. Encourage *LAAAMP*'s advanced light source partners to begin training young researchers from the developing world in the same way that Leon Lederman did in the early days of Fermilab in Latin America, which was highly successful in growing the number of high energy accelerator users.

5. Partner with other Scientific Unions.

LAAAMP midterm workshop

Trieste, Italy, 24 August 2018

Location: **Abdus Salam International Centre for Theoretical Physics**
Giambagi Lecture Room, Adriatico Guesthouse

Moderator: Sekazi Mtingwa (Chair, *LAAAMP* Executive Committee)

Welcome **Fernando Quevedo** **Director, Abdus Salam ICTP**	**13:30**
Greetings from IUPAP C13 Commission **Sekazi Mtingwa** **Chair, IUPAP C13 Commission on Physics for Development**	**13:40**
***LAAAMP* Overview** **Sandro Scandolo** **Member and Former Chair, *LAAAMP* Executive Committee**	**13:50**
***LAAAMP* Brochure** **Ernie Malamud, Editor**	**14:10**
Elettra: Present Status and Future Plans **Alfonso Franciosi, President and CEO**	**14:30**
Visit to Dr. Heide Hackmann, Executive Director **International Science Council, Paris** **Ernie Malamud, Fermilab and University of Nevada-Reno**	**15:00**
SESAME: Present Status and Future Plans **Giorgio Paolucci, Scientific Director**	**15:20**
Group Photo	**15:50**
Coffee Break	
Siam Photon Source: Present Status and Future Plans **Prapong Klysubun, Deputy Director for Operations**	**16:20**

Mexican Synchrotron Radiation Project **Matías Moreno, Chair**	**16:50**
African Light Source Initiative **Sekazi Mtingwa, Member, AfLS Steering Committee**	**17:20**
Discussion/Recommendations	**17:50**
Closing Summary **Sekazi Mtingwa**	**18:20**
Dinner at Principe di Metternich	**19:30**

Agenda of the *LAAAMP* Midterm Workshop
TABLE I

II. Establishment of Group on Affordable Scientific Equipment

The C13 Commission considered the following proposal from François Piuzzi, and supported by Ajith Kumar B.P. and Michael Steinitz, on affordable scientific equipment:

The Case for Establishing a Scientific Instrumentation Group for the IUPAP C13 Commission

François Piuzzi, Chair of the Physique sans Frontières Commission of the French Physical Society

Introduction

Scientific instruments are the basic tools for characterizing developments in Health, Energy and the Environment. However, we face a serious problem in making them widely available since their costs are too high for most countries. Furthermore, research in instrumentation leads to increased sophistication, resulting in improved performance but also in additional costs, making democratization of instrumentation even more necessary.

The basic procedures of science – measuring and quantifying – are followed by modeling, simulation and theory. We can divide science into **high-level science,** dealing with fundamental issues and increase of knowledge, and **science close to everyday life**, taking into account the solution of societal problems. We need to give access to science to the biggest number of people and enable the sharing of scientific culture, requiring a democratisation of scientific instruments (among other things).

Until recently this could be seen as a **utopia** but now, due to the **digital revolution**, diverse tools, methods, technologies and digital workshops (Fab Labs) have emerged that make it possible to design, prototype and manufacture instruments at a sustainable cost. This has been accompanied by the emergence of **collaborative method**s**,** such as the **Open Source movement.** In parallel, the Open Access management of scientific literature has been developed, facilitating the sharing of information and expertise.

State of the Art

Experimental sciences need instruments, and there is a shortage of these in many countries, especially in Africa:

1. For high-school science teaching
2. For practical training at universities
3. For research
4. For measuring important parameters for addressing societal problems.

Development of ***in silico*** or ***in Internet (***including the MOOCS approach) experiments is important and necessary, but cannot replace the essential training taking into account:

1. Difficulties related to the local situation
2. Calibration and reproducibility
3. Comparison with well-defined standards
4. Sensitivity and selectivity
5. Design and construction of scientific instruments, leading to independence.

The Open Source, collaborative, and sustainable cost approach will bring solutions to this problem but will not cover the entire physics and science domain…

Recent Evolution and Breakthroughs

The following developments have been important steps forward for the development of sustainable cost instruments:

1. Arduino platform for "*simple*" electronics, making it possible to share programs (strong Open Source database of programs – e.g.: driving stepper motors, used by the micro-actuator imbedded on the board (UNO: 25 € - Nano: 5€)
2. The **Expeyes** (experimental eyes) system developed by Ajith Kumar at New Delhi is a very good alternative to Arduino.
3. Microcomputers such as **Raspberry Pi** (40 €) and Raspberry Zero (2016 5 €) using the Python language
4. **Recycling** and **reuse** of high-tech components (such as those in the photonics domain) that can be found in consumer devices such as computer peripheral, printers, scanners, CD and DVD drives, hard disks, cars, … This need to break the black box syndrome and the components and systems found may be used for other purposes.

5. **Technological shortcuts,** e.g. the web cam, making it possible to take an image with immediate transfer to the computer. Also**, LEDs and laser pointers** are valuable miniaturized sources of light, which can be used in new miniaturized instruments, enabling their use in the field. Use of **smartphones** in numerous types of measurement is also being developed.
6. Democratisation of **3D printing and** other digital tools, such as laser CNCs and 3D scanners, enables quick prototyping and an easy exchange of projects, leading to better instruments.
7. The development of **numerical modelling** tools
8. The rapid exchange and circulation of information through the **Internet** (such as Wikipedia) enables trans- and multidisciplinarity.
9. New **Open Source hardware patents** (CERN, creative commons)
10. Availability of **Open Source or Open Access software**, such as Image J (Image processing) and Linux.

Concurrent use of these breakthroughs helps to unleash creativity and to design scientific instruments with affordable cost. This is not applicable to all domains of science and requires first-rate scientific and technological experience.

Proposed Action Items for the C13 Commission

1. Create a study group on sustainable-cost scientific instrumentation and laboratory hardware. This would be the first opportunity to lobby together for sustainable-cost instrumentation and laboratory hardware.

2. Create a thematic repository for Open Source projects in instrumentation and associated tools.

3. Assemble the main experts in the field through dedicated Hackathons.

4. Investigate the possibility of rewarding some excellent projects on the IUPAP web site.

5. Launch collaborations between developing countries. Contests.

6. Create a "Cost action" within the EU framework, which could be very useful since it would enable funding travel costs for meetings.

ACTIONS OF THE C13 COMMISSION

To get the ball rolling, the C13 Commission made the following decisions:

1. C13 approved the establishment of new *Group on Affordable Scientific Equipment* and approved the following persons to serve on the Group:

Chair: **François Piuzzi**
Members: Samia Charfi Kaddour
Mmantsae Diale
Carlo Iorio
Ajith Kumar B.P.
Joseph Niemela
Michael Steinitz.

2. Each conference co-sponsored by C13 should invite one of the members of the new Group on Affordable Scientific Equipment, or another person approved by C13, to offer a Parallel Session at the conference that provides demonstrations of prototype low-cost equipment. Furthermore, part of the C13 funds to the conference should be allocated to pay for the travel costs of the person offering the Session.

III. Establishment of a Group on Physics in Africa

In order to identify programs and activities to promote and enhance physics on the continent of Africa, an ambitious new project has been launched called the Physics in Africa project. Those collaborating on the project include the American Physical Society, the U.K. Institute of Physics, European Physical Society, Abdus Salam International Centre for Theoretical Physics, and the South African Institute of Physics.

Joseph Niemela, who is Secretary of the C13 Commission, is one of the leaders of the Physics in Africa project.

ACTION OF THE C13 COMMISSION

To support the Physics in Africa project, the C13 Commission approved the establishment of a new *Group on Physics in Africa* and approved the following persons to serve on the Group:

Chair: **Joseph Niemela**
Members: Aba Andam
Andreas Buchleitner
Samia Charfi Kaddour
Mmantsae Diale
Fernando Quevedo
Michael Steinitz.

IV. Establishment of a Group on Doctoral Student Recruitment

The C13 Commission considered the following proposal from Sekazi Mtingwa on Doctoral Student Recruitment, starting with the Scuola Internazionale Superiore di Studi Avanzati (SISSA) located in Trieste:

Student Recruitment for SISSA (http://www.sissa.it)

The day before last year's (2017's) Annual C13 Meeting, we visited Scuola Internazionale Superiore di Studi Avanzati (SISSA), which translated into English is

International School for Advanced Studies. While there, we had a fruitful discussion with the Director, Professor Stefano Ruffo, and some of his colleagues. SISSA is an international state-supported, post-graduate teaching and research institute located in the City of Trieste. It offers training in mathematics, physics and neuroscience. SISSA has approximately 70 professors, 100 postdocs, and 300 PhD students. It admits approximately 70 PhD students annually, runs master programs in the same areas, and collaborates with Italian and other European universities.

During our discussions, we learned that a large fraction of their international students came from China, but there were few from developing regions of the world. It would be advantageous for C13 to launch an initiative to assist SISSA in recruiting students from Africa, the Middle East, Central America, and Southeast Asia. Aside from identifying outstanding students who are graduating from undergraduate programs in those regions, it may be possible to utilize existing programs from which to recruit students, such as the academic programs offered by the Abdus Salam ICTP and the African Institutes for Mathematical Sciences (AIMS) located in several African countries.

See https://www.ictp.it/programmes/degree-programmes.aspx
https://www.nexteinstein.org.

C13 should discuss whether this is a possible new initiative and if so, who should lead it.

ACTION OF THE C13 COMMISSION

To support the effort to recruit doctoral students, starting with SISSA and subsequently other universities, the C13 Commission approved the establishment of a new *Group on Doctoral Student Recruitment* and approved the following persons to serve on the Group:

Chair:	**Sekazi Mtingwa**
Members:	Aba Andam
	Andreas Buchleitner
	Mmantsae Diale
	Carlo Iorio
	Kuijuan Jin
	Samia Charfi Kaddour
	Sandro Scandolo.

V. Conference Sponsorships

The C13 Commission received fourteen (14) conference applications for funding, several of which were ineligible since they were not from Type D (developing) countries. According to IUPAP Guidelines, only Type D countries are eligible for funding by the C13 Commission. See http://iupap.org/sponsored-conferences/conference-policies/. Type D countries are defined by IUPAP as those in the World Bank's most recent list of "low income" and "lower middle income" countries. The two lists can be found at https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups.

At the urging of Buchleitner, C13 discussed at length and decided to request that the Council modify the template of the Conference Application to enhance the quality of the applicants' responses and make it clearer what is being requested. Buchleitner will suggest some changes for consideration, and they will be submitted to the Council for deliberation. *(Refer to Appendix 1)* **Also, applicants not from Type D countries should be made more aware of the fact that they are not eligible to apply.**

ACTIONS OF THE C13 COMMISSION

The C13 Commission made the following decisions:

1. The C13 Commission approved funding in the amount of 7,000 Euros for each of the following conferences:

   a. Conference title: Biophysical approaches to macromolecules and cells: integrated tools for life sciences and medicine
   Location: Kenyatta University, Nairobi
   Start date: 09/09/2019
   End Date: 20/09/2019
   Name of organizer/contact person: Loredana Casalis
   Phone number: +39 3930288458
   Email: loredana.casalis@elettra.eu

   b. Conference title: SECOND REGIONAL CONFERENCE ON WOMEN IN PHYSICS 2019
   Location: Nepal
   Start date: 27/03/2019
   End Date: 29/03/2019
   Name of organizer/contact person: NILAM SHRESTHA PRADHAN
   Phone number: ++977 9841221611
   Email: nilamspradhan@gmail.com

   c. Conference title: ICO & IUPAP-C17 Topical Meeting on OPTIcs and Applications to SUstainable Development (OPTISUD)
   Location: Carthage, Tunisia
   Start date: 01/09/2019
   End Date: 05/09/2019
   Name of organizer/contact person: Mourad Zghal
   Phone number: (+216) 71857000 / (+216) 98521757
   Email: mourad.zghal@supcom.tn.

2. As already noted above, each conference funded by C13 should invite one of the members of the new C13 Group on Affordable Scientific Equipment, or another person approved by C13, to offer a Parallel Session at the conference that provides demonstrations of prototype low-cost

equipment. Furthermore, part of the C13 funds to the conference should be allocated to pay for the travel costs of the person offering the Session.

3. Where possible, the person offering the Parallel Session on affordable equipment should also offer a presentation on *Ethics in Scholarly Communications*.

VI. Appointment of Selection Committee for the IUPAP Medal for Outstanding Contributions to the Enhancement of Physics in Developing Countries

The selection of the next awardee of the IUPAP Medal should occur during the next Annual Meeting of the C13 Commission. In preparation for that selection, the C13 Commission made the following decision:

ACTION OF THE C13 COMMISSION

The C13 Commission appoints the following persons to serve for the next year on the IUPAP Medal Selection Committee:

Chair: **Mmantsae Diale**
Members: Aba Andam
Carlo Iorio.

VII. Establishment of a new Group on the Ethics of Scholarly Communication

The C13 Commission discussed the following memorandum and proposal to C13 from Michael Steinitz:

…..I have just returned from a lecture tour in Canada, speaking on the subject of "The Ethics of Scholarly Communication," dealing especially with questions of plagiarism in publication. I have given short courses on this topic and aided graduate students in their work in Mexico and have lectured on the topic in Zambia. I have lectured in South Africa, as well.

Two items of interest have come up just recently.

1. A report of cheating on exams in an ethics class in Canada!

2. As Editor of the Canadian Journal of Physics, I have to deal with a large number of plagiarized submissions. Over 10% of the submissions we receive are either self-plagiarized (submission of a paper that has already been published elsewhere, in an attempt to pad one's resume), or blatantly "cut and paste" from work already published by others (this is just plain theft).

I recently received a letter from an author, from which I have extracted the following quote:

> *I am terribly embarrassed to be in connection with such a situation... Since I never had an adviser as it should be in my post graduate education, I had to learn*

*the scientific discipline on my own and it seems that I missed learning such a point on my own. So, I would be very grateful if I was given a chance to revise it. Assist. Prof. Dr.*_____.

This has motivated me to think about whether it would be appropriate for the C13 Commission to engage with this problem, perhaps with an educational campaign made available to students in developing countries, on a similar basis to that undertaken at the National University of Mexico (UNAM).

ACTION OF THE C13 COMMISSION

The C13 Commission approved the establishment of a new *Group on the Ethics of Scholarly Communication*, chaired by Michael Steinitz. Additional members are yet to be decided.

VIII. Contributions of C13 to IUPAP Centenary Celebrations and International Year of Basic Sciences for Development

The C13 Commission discussed the following memorandum and proposal to C13 from François Piuzzi:

…The C13 commission should discuss the IUPAP Centenary and the C13 contributions to it, especially as regards experimental science, since up to now, lobbying has essentially been on behalf of huge instrumental structures. We should be the voice of small labs from low resource countries that struggle in teaching physics and performing research. We should search for solutions in cooperation with the local scientists.

It would be interesting to discuss how to develop experimental physics (together with experimental science) knowing that physics is ubiquitous in the making and operation of scientific instruments.

First, I should express my concern that at the C13 meeting, we should have scientists from all continents present in order to have meaningful discussions. Tentatively, I think that Ajith Kumar from India, founder of the Expeyes system; Paul Woafo from Cameroun, founder of the Cameroon Physical Society and chair of the challenge for experimental sciences; and Jose Daniel Munoz Castano from Colombia should join us. …

As part of the Centenary celebrations, I propose the following:

1. We should promote the *LAAAMP* project.

2. We should highlight the IUCr-UNESCO-*LAAAMP* OpenLabs project in crystallography as an example to follow.

3. We should present actions done in humble basic physics to improve things such as the challenges in experimental science in developing regions of the world.

4. We should point out that training is mandatory for the making of instruments and the use of them and that more funds should be dedicated to them. This is essential for experimental physics development.

5. We should try to improve relationships between researchers from big labs and their counterparts in small labs in low resource countries in order to mitigate isolation felt by the latter. Why not consider an "Adopt-a-lab" approach?

6. We should publicize the new possibilities brought by the digital revolution and associated new technological developments, such as 3D printing, open source electronic platform Arduino, Rapsberry Py micro computer, etc. This could be a big opportunity for low resource countries but needs a strong development in associated trainings.

7. The creation of a web site acting as a repository for sustainable cost instruments, sustainable cost practicals and open access software, which could be of tremendous interest for many countries. The management of this web site could tentatively be localized in four or five low resource countries, each being responsible for a given domain. Information should be sent to them by every scientist interested in the "Physics for Development" domain.

8. Last but not least, we may suggest the organization of a new conference on "Physics for Development," which may tentatively convene in Brussels during the same year as the IUPAP centenary, but with less "politics" and more young PhDs.

C13 discussed Michael Steinitz's requests that the C13 Commission take an active role in preparing for the upcoming International Year of Basic Sciences for Development. Since it coincides with the IUPAP Centenary in 2022, C13 decided to combine the efforts.

ACTION OF THE C13 COMMISSION

C13 made the following decisions:

1. The C13 Commission approved the establishment of an Ad Hoc Committee to plan for the IUPAP Centenary celebrations and IUPAP's contributions to the UNESCO-designated International Year of Basic Sciences for Development celebrations, both of which will occur in the year 2022. The Ad Hoc Committee will consist of the following:

Chair:	**François Piuzzi**
Vice-Chair:	**Carlo Iorio (Centenary Celebrations)**
Vice-Chair:	**Michael Steinitz (IYBSD Celebrations)**
Members:	To be decided.

2. François Piuzzi and Carlo Iorio should join the IUPAP Working Group 16 (WG16) to assist with the plans for the IUPAP Centenary. Michael Steinitz should join any equivalent IUPAP effort for the IYBSD.

IX. Appointment of Associate Members to the C13 Commission

After careful deliberations, the C13 Commission decided to request that the following persons join as Associate Members starting 1 January 2019:

1. Sandro Scandolo, Abdus Salam ICTP, Italy
2. Lilia Meza-Montes, Benemérita Universidad Autónoma de Puebla, Mexico
3. Ernst van Groningen, International Science Program, Sweden
4. To be decided.

Each person will be contacted to confirm her/his willingness to serve as a C13 Associate Member.

X. Summary

To pursue the broad range of activities discussed at its Annual Meeting, the C13 Commission has established the following new entities:

1. *Group on Affordable Scientific Equipment*
2. *Group on Physics in Africa*
3. *Group on Doctoral Student Recruitment*
4. *Group on the Ethics of Scholarly Communication*
5. *Selection Committee for the IUPAP Medal for Outstanding Contributions to the Enhancement of Physics in Developing Countries*
6. *Ad Hoc Committee on the Year 2022 Celebrations of the IUPAP Centenary and the International Year of Basic Sciences for Development.*

C13 will continue its co-leadership of *LAAAMP* with its counterpart at the International Union of Crystallography.

The C13 Commission made decisions on three persons to request that they join as Associate Members, with a fourth person yet to be decided.

Finally, the C13 Commission decided to support three international conferences in Kenya, Nepal and Tunisia, with the stipulation that each conference funded by C13 invite one of the members of the new Group on Affordable Scientific Equipment, or another person approved by C13, to offer a Parallel Session at the conference that provides demonstrations of prototype low-cost equipment. Part of the C13 funds to the conference should be allocated to pay for the travel costs of the person offering the Session. Furthermore, where possible, the person offering the Parallel Session on affordable equipment should also offer a presentation on the *Ethics of Scholarly Communication*.

Appendix 1

Suggestion for reformulated application form as accessible under http://iupap.org/sponsored-conferences/application-for-conference-sponsorship/ - Andreas Buchleitner, 10 Sept 2018

colour code: **comments**,
Suggested amendments/additions of text

1. **Basic information**
   - Name of IUPAP Commission
   - Conference title
   - Location
   - Start date
   - End date
   - Name of organiser/contact person
   - Gender of organiser/contact person
   - Phone number
   - Email
   - Website
   - Address
   - Select a Choice [General - Topical - Special - Workshops in developing countries]

^^^***THESE "CHOICES" NEED A CLEAR DEFINITION EACH***
(Note that all workshops in developing countries must select IUPAP commission C13 above!)

   - Number of expected participants
   - Have you submitted information to the liaison committee of the host country?
   - Total estimated budget (in Euros)
   - Is there a registration fee?
   - Registration fee (in Euros - **please indicate whether there are reduced fees, if so, under which conditions**)
   - If the fee is not yet defined, can you make (...)
   - Is an IUPAP grant requested?
   - If so, how much is requested (in Euros)

Budget structure (Justify the requested IUPAP grant by listing the specific funding requirements, e.g. travel and/or accommodation support for participants/speakers, catering, conference equipment, etc. Also indicate whether and which other funds can be made available.)

2. **Scientific value of the conference and committees**

A) Ongoing series: (...) Elaborate on why there is a clear need for the proposed conference. Justify why the series should be continued. Provide a list of speakers of

the last two conference editions.
OR
New conference: (...)
In both cases: Provide a tentative program structure for the here proposed event, including tentative titles of the talks to be given by invited speakers, if applicable.

Conference scope - please state clearly the conference's specific purpose(s), and how the program structure and the selection of participants and invited speakers will help to accomplish this (these).

Scientific quality, international character and diversity

B) The composition (...)
Please provide a list of the targeted Advisory and/or Program Committee members, in the following format: Family name, first name, gender, home institution, country
BOX FOR INPUT HERE - DELETE "Scientific quality, international character and diversity" (SINCE REDUNDANT)

Indicate how the proceedings (...) published, if applicable

C. Acceptance (...)
DELETE REDUNDANT LINE "Please indicate ... issues."
Please indicate how (...)

Indicate how this conference adequately represents applied aspects

D. IUPAP (...)
Please indicate (...)

3. **Please indicate the number of:**
   - Number of expected female participants
   - Number of expected speakers
   - Number of expected female speakers
   - Number of expected members of the Advisory/Program Committee
   - Number of expected female members of the Advisory/Program Committee

4. **Conference Cycle**
   - What is the frequency of the conference?
   - Has this conference previously had IUPAP sponsorship?
   - If so, in which years?
   - Which country?

5. **International participation**

To qualify for IUPAP sponsorship:
1. The meeting must be open to scientists regardless of (...)

Please list (...)

At least (...) country. Please give plausible evidence that this requirement will be fulfilled. Please confirm that (...)

6. Organisation

If you know (...)

DELETE “Please note that all Type D... IUPAP Commission”.”, SINCE THIS INFO SHOULD COME AT THE TOP OF THE FORM (I PUT A SUGGESTION IN)