

Consolidated report of Commission on Nuclear Physics (C12) of the International Union of Pure and Applied Physics (IUPAP) on the triennium 2014-2017.

1. **Membership**

C12 officers

Chair: Alinka Lépine-Szily (2008) (2011) (2014), Brazil

Vice-chair: Weiping Liu (2008)(2011)(2014), China

Secretary: Joachim Stroth (2011)(2014), Germany

C12 members:

Ani Aprahamian (2014) USA

Mahananda Dasgupta (2014) Australia

Claes Fahlander (2011)(2014) Sweden

Dominique Guillemaud-Muller (2011)(2014) France

Reiner Krücken (2014) Canada

Eugenio Nappi (2014) Italy

Hirokazu Tamura (2014) (Japan)

Piet Van Duppen (2011)(2014) Belgium

Rauno Julin (2011)(2014) Finland

Milko Jaksic (2014) Croatia

Andrey Fomichev (2014) Russia

Associate members of C12 to other commissions:

C11-Eugenio Nappi

C13-Claes Fahlander

C19-Weiping Liu

Appic Working Group - Ani Aprahamian

In 2016 Dominique Guillemaud Mueller (IN2P3, France) has quit C12 and there was no replacement.

2) **Annual General Meetings of C12**

C12 had Annual General Meetings (AGM) every year, always together with the AGM of Working Group for "International Collaboration in Nuclear Physics" (WG9). Every two years (2015, 2017) WG9 organizes a Nuclear Science Symposium, which takes place together with C12 and WG9 AGM. It gives overviews of current forefront nuclear science research being addressed or intended to be addressed, together with the upgrading of current facilities and planned large new facilities, followed by discussion by representatives of funding agencies from Asia, Europe, and the Americas.

The members of WG9 and speakers of the Nuclear Science Symposium were welcomed as observers to attend the meeting of C12 and vice versa.

Every three years these meetings are held jointly with the main general nuclear physics conference "International Nuclear Physics Conference" (INPC).

2-a) AGM in 2015

The Annual General Meeting (AGM) of C12 was held in Washington at the Southern Universities Research Association (SURA) headquarters, on June 5, 2015 with 10 out of 14 commission members

present. The past-chair Hideyuki Sakai also participated the meeting. The major items of the agenda were:

IUPAP/IUPAC joint working party (JWP) in heavy elements

The IUPAP/IUPAC- JWP was established in 2012 to consider claims for the discovery of new elements with atomic numbers 113, 115, 117 and 118. Six members, three indicated by IUPAP and three by IUPAC, constitute the JWP. Recently the secretary of IUPAC sent communication noticing the completion of the works and communication of decisions for the near future.

IUPAP Interim Working Group on Accelerator Physics

The C12 members present to the meeting had a positive view on the creation of a new WG on Accelerator Science (AS). The general opinion was that the WG on AS would touch fields like nuclear sciences, condensed matter, biology (XFEL, Synchrotron radiation, neutron facilities....), medical isotopes, medical, imaging (PET, X-Rays etc.), plasma sciences, Space irradiation, computing simulation tools etc.. There are also about 12,000 accelerators used in industry as well. Thus the mandate of AS should be established based on the broad view to represent all related fields as well as to promote and gather all the potential practitioners and users to share their challenges and new developments. The C12 members have indicated three names to the IUPAP General Secretary as candidates to the new Working Group.

Presentations and requests for IUPAP sponsorship of conferences in 2016 and the result after Executive Council & Commission chairs (C&CC) meeting.

Category A support asked:

The 26th International Nuclear Physics Conference (INPC2016) Adelaide, (Australia) September 11- 16, 2016 with highest priority.

The INPC conference brings together some 700 participants from around the world. It is the only International conference covering all the subfields of nuclear physics both at the experimental and theoretical level. It has been rotating amongst the various continents (INPC2007 in Tokyo, INPC2010 in Vancouver, INPC 2013 in Firenze, and INPC2016 in Adelaide). The three IUPAP young investigator prizes in Nuclear Physics are awarded every three years at the venue.

The category A support was approved by C&CC.

Category B support asked:

The XIV International Conference on Nuclei in Cosmos (NIC2016) Niigata, Japan, June 19-24, 2016 with high priority.

The NIC Symposium covers a wide field of nuclear astrophysics, with the following topics: origin of the elements, stellar evolution and explosions, galactic chemical evolution as well as experimental and observational results and techniques.

The category B support was approved by C&CC.

IUPAP Young Scientist Prize in Nuclear Physics: Selection process

Three IUPAP Prizes of Young Scientist in Nuclear Physics are awarded every three years at the INPC, sponsored by IUPAP. The next conference to be held was in September 2016 and the call for nominations was sent out in early September of 2015. Details of the selection process and the deadlines were discussed at the meeting.

2-b AGM of 2016

The Annual General Meeting (AGM) of C12 took place in Australia, SA, at Adelaide Convention Centre, on 10 September 2016, before the International Nuclear Physics Conference (INPC2016), the main conference in the field. Ten commission members out of 13 were present. We also had the pleasure of the presence of Bruce McKellar, IUPAP president, at our meeting.

Selection procedure for IUPAP Young Scientist Prize Nomination: September-November 2015, deadline 1 December 2015. Twenty one valid nominations were submitted: nine from Europe, 7 from Asia, 3 from South America, 2 from US. The three nominees with highest score were chosen as winners. They are Dr. Andreas Ekström (Male) Nuclear Structure theory, Sweden, Dr. Kara Lynch (female) Nuclear Structure experimental, UK, Dr. Haozhao Liang Nuclear Structure theory, China-Beijing. The gender and geographical balance were respected (one female, 1 from China, 2 from Europe) but the field was not well balanced, all three are from Nuclear Structure, 2 theory and one experimental. Among 21 candidates, 15 were experimentalists and 5 theorists, 16 working in Nuclear Structure and Astrophysics, 4 in hadron physics and 1 in ultra-relativistic heavy ion collisions.

Confirmation of Super-heavy Elements discoveries and comments on the announcement and naming procedure

The IUPAP/IUPAC- Joint Working Party (JWP) was established in 2012 to consider claims for the discovery of new elements with atomic numbers 113, 115, 117 and 118. Six members, 3 indicated by IUPAP and 3 by IUPAC, constituted the JWP, but one member indicated by IUPAP renounced recently due to health problems. They are: Paul J. Karol (chemist, chair), Robert C. Barber (nuclear physicist), Bradley M. Sherrill (nuclear physicist), Emanuele Vardacci (nuclear physicist), Toshimitsu Yamazaki (nuclear physicist). Clearly, nuclear physicists form mainly the JWP, since only they could evaluate and validate the discoveries. The discoveries were made using characteristic nuclear physics methods: fusion reaction between a heavy target nucleus and a neutron rich projectile, accelerated in a heavy ion accelerator. The fusion product was identified by nuclear physics methods, detection of the alpha-decay chain, or/and identification of fission fragments e.g. The results of these experiments were published in physics journals as e.g. Physical Review Letters, Physical Review C etc. The JWP report, which validated and gave priorities of the discovery of the four new elements, was sent by the chair, only to the IUPAC direction, which announced the 4 new elements in a hurry, on 30th December 2015, before even IUPAP receiving the JWP report, counteracting previous agreements about joint announcements. The same happened for the naming: IUPAC announced it alone, without the participation of IUPAP.

All this created strong frustration in the C12 and IUPAP direction. The presidents of IUPAP and IUPAC are negotiating to change the procedure, involving the C12 and the Inorganic Chemistry committee and make the whole process more transparent and with more recognition of the Physics. At our AGM we made a significant contribution to the Terms of Reference in elaboration between IUPAP and IUPAC.

Presentations and requests for IUPAP sponsorship of conferences in 2016 and the result after Executive Council & Commission chairs (C&CC) meeting.

Category A support asked:

The XXVth International Conference on Ultra-relativistic Heavy-Ion Collisions (Quark Matter 2017) to be held in Chicago, USA, on February 5-11, 2017. This is the major international conference on ultra-relativistic heavy-ion collisions and this conference happens on a 1.5-year cycle and rotating amongst the continents (2014 in Darmstadt, Germany, 2015 in Kobe, Japan). This conference attracts 700-800 participants. The focus of the discussions is on fundamental understanding of strongly interacting matter at the extreme conditions formed in ultra-relativistic heavy-ion collisions, which relates to the state of the early universe.

The category A support was approved by C&CC.

Category B Support asked:

The III International Conference on Advances in Radioactive Isotope Science (ARIS2017) to be held in Keystone, Colorado, U.S.A. May 28- June 2, 2017.

ARIS is the flagship conference for rare isotope science that resulted from a merger a few years ago of the 'International Conference on Exotic Nuclei and Atomic Masses (ENAM)' and the 'International Conference on Radioactive Nuclear Beams (RNB)'. Following the tradition of the ARIS meetings in 2011 (Leuven) and 2014 (Tokyo), ARIS 2017 should facilitate vibrant and extensive information exchange and collaboration among all the researchers in the field. The scientific program will highlight the most recent experimental and theoretical work in the field.

The category B support was approved by C&CC.

XII Latin American Symposium on Nuclear Physics and Applications (LASNPA 2017) to be held in Havana, Cuba, October 23-27, 2017.

This regional conference brings together a large segment of the nuclear physics community from South America and has attracted participation from North America, Europe, and Asian communities as well. The invited speakers have a broad international distribution. It moves around South America with a 2 years cycle and it is for the first time it will be held in Havana (Cuba), with strong local support. It attracts ~300 participants from all over South America and is seen as a key promotional event for the rapidly developing countries on the continent. The program has a strong component of applications of nuclear techniques. It was supported as a category B topical conference in 2015. It is an important element for the growth of the nuclear physics community in South America.

The category B support was approved by C&CC.

The C12 commission received two bids for hosting the next International Nuclear Physics conference (INPC) in 2019

Glasgow, Scotland, United Kingdom presented by David Ireland

Whilst the conference venue is proposed to be Glasgow, the case was made on behalf of Universities in UK and Scotland. The proposed local organizing committee, consisting of four women and eight men, reflected this fact as well. Strong outreach program, careers fund to help members with caring responsibilities to attend the conference. IOP offers students and young researchers financial support up to £300. The whole nuclear physics community of UK manifests a great interest in hosting INPC2019, due to the visibility it can give to Nuclear Physics.

iThemba LABS, Cape Town, South Africa presented by Faïçal Azaiez, director of iThemba.

The progress of inter disciplinary research in iThemba laboratory was presented and the importance of the laboratory in training in accelerator-based science, and its international links were mentioned. The conference is proposed to be co-hosted by iThemba laboratory, six universities and the Nuclear Energy Corporation of South Africa. The conference is endorsed by South African Institute of Physics. The financial support to the conference through laboratory resources was mentioned. The organizers were also to approach other national institutions to seek financial support. Venue: Cape Town International Convention Centre.

The C12 commission evaluated these two bids and selected Glasgow as the host for INPC 2019 by an open voting procedure.

Following the recommendation by IUPAP president, the next chair of C12, for mandate 2017-2020, was elected by unanimity, Claes Fahlander experimentalist in the field on Nuclear Structure, from Lund University, Sweden.

2-c AGM of 2017

The Annual General Meeting (AGM) of C12 took place in Tokyo, Japan, at RIKEN Offices on 28 August 2017, before the Nuclear Science Symposium and the AGM of WG9. Nine commission members out of 13 were present.

Presentations and requests for IUPAP sponsorship of conferences in 2017

Category B support asked:

XIII International Conference on Nucleus-Nucleus Collisions (NN2018) will be held in Omiya Sonic City, Japan in December 2018

This conference brings together several subfields of heavy ions science, spanning a wide range of collision energies, moving across continents. The previous meeting in Catania, Italy attracted 360 participants. This conference has 3 years of periodicity and the last conferences held, respectively, in Catania, Italy in 2015 (B) and in San Antonio, USA in 2012 (C) Beijing, China in 2009 (C) and Rio de Janeiro, Brazil in 2006 (B) had IUPAP sponsorship.

XXII International Conference on Few-Body Problems in Physics (FB22) is to be held in Caen, France, from 9 to 13 July 2018.

Following tradition FB22 will cover a broad range of topics - both theoretical and experimental - with the aim of bringing together diverse communities to share and debate ideas in few-body physics. It has a periodicity of 3 years and the number of participants is around 300. It is supported by IUPAP at least since 1994, even being named as International IUPAP Conference on Few-Body Problems in Physics

The XVIII International Conference on Electromagnetic Isotope Separators and Related Topics (EMIS) will be held at CERN, the European Organization for Nuclear Research, in Geneva, Switzerland, from 16th to 21 September 2018.

The EMIS 2018 conference will be hosted by CERN-ISOLDE. It will celebrate the 50 years of radioactive ion beams (RIB) produced at CERN-ISOLDE. EMIS is the flagship conference series on techniques in the field of low-energy nuclear science. This international conference brings together technical experts in electromagnetic separation and ion sources from several disciplines. It meets every three years alternatively with the ARIS series of conferences as recommended by C12 in the past and moves across continents.

The XV International Symposium on Nuclei is Cosmos (NIC2018) at INFN National Laboratory of Gran Sasso, Italy in June 24-29, 2018.

The NIC Symposium covers a wide field of nuclear astrophysics, with the following topics: origin of the elements, stellar evolution and explosions, galactic chemical evolution as well as experimental and observational results and techniques. NIC is the most important and largest international meeting in the field of Nuclear Astrophysics. It brings together every two years nuclear physicists, astronomers, astrophysicists, cosmo-chemists, and others interested in the scientific questions at the interface between nuclear physics and astrophysics.

The 27th International Conference on Ultra-relativistic Nucleus-Nucleus Collisions (Quark Matter 2018) at 13-19 May 2018 in Venice, Italy.

Quark Matter 2018 (QM2018) brings together physicists from around the world to discuss new developments in high-energy heavy-ion physics. The focus is on the fundamental understanding of strongly interacting matter at extreme conditions of high temperature and density, as formed in ultra-relativistic nucleus-nucleus collisions.

Recommendations of C12 to C&CC for Nuclear Physics Conferences in 2018

C12 asks IUPAP to sponsor in category B, all four proposals, of NN2018, FB22, EMIS and NIC2018. C12 decided to ask endorsement for Quark Matter2018, which is a large and important, however topical conference. If IUPAP supports it with category A every year, other smaller but important conferences with larger periodicity, as the four we propose now for 2018, will not get the support.

Nominations for officers and new members for C12 for the next triennium 2017-2020

C12 has received 26 names nominated by member countries' liaisons. Decisions were made about which names to recommend and these names are still confidential.

Conclusions: The usual activities of C12 were the selection of conferences and their recommendation, including the choice of the next INPC venue. The discussion of new members and new officers. The evaluation and selection of three Young Scientists in Nuclear Physics, which represented a big work, which lasted almost a year.

However, there was another very important and not usual collaboration with the direction of IUPAP, contributing to the new Term of Reference, which describes the new rules and procedures between IUPAP and IUPAC related to the discovery of new super-heavy elements. These new rules will determine how the next Joint Working Party will be constituted, its operation, its chair, its reports, the announcement of new elements, their nomination, the publication of the JWP report etc. These new rules will put the IUPAP and the IUPAC on the same level and the contribution of physics, nuclear physics should be fully recognized. The recognition of C12 as an expert committee in the matter of Super Heavy Elements (SHE) gives a new visibility to C12, but also more responsibilities. C12 is prepared to correspond to these challenges.