

IUPAP Commission on Nuclear Physics C12

Report to IUPAP Executive Committee and Commission Chairs August 2019

Claes Fahlander, Chair of C12

Annual general meeting of C12 July 2019

The general meeting of C12 is held once per year. It is always followed the day after with the annual meeting of IUPAP's Working Group 9 (WG9). The members of WG9 are welcomed as observers to attend the meeting of C12, and vice versa. The Chair of WG9, Robert Tribble, reports on WG9 activities to C12, and I report to the WG9 members on C12 activities. This close relation between C12 and WG9 is important for the work of both groups of physicists. When the International Conference on Nuclear Physics (INPC), the most prestigious conference for nuclear physicists, takes place, which it does every third year, the meetings of C12 and WG9 are being held in connection to that conference. INPC is a conference which since long time is being sponsored by IUPAP as category A conference.

This year the annual meeting of C12 was held in connection to INPC2019 with location at the Scottish Event Campus in Glasgow on July 31 2019. The WG9 meeting, however, took place two days later, at the University of Notre Dame Global Gateway in London, followed by a third day devoted to a Nuclear Science Symposium. Matters of forefront nuclear science research were addressed at our meetings in Glasgow and London. We had discussions and status reports on the large-scale accelerator facilities for nuclear physics around the world, and exchanged information on up-grades and planning of new such accelerator facilities.

The major activities of C12 during the past year follows below together with information on the discussions at the meeting in Glasgow and on the decisions that were taken there.

IUPAP Young Scientist Prize in Nuclear Physics

One of the most pleasant activities of C12 is the work with finding the winners of the IUPAP Young Scientist Prize in Nuclear Physics. It is also one of the more demanding activities involving all members of C12. And, it is one of the most important activities. It is a prize that is awarded every third year, and the award ceremony takes place at the INPC conferences.

The whole process of finding this years prize winners took more than a year. The call for nominations was sent out in March 2018. At the nomination deadline by September 1 2018 we had 31 nominations. Five of the nominees were women, 25 were men representing most fields of nuclear physics: nuclear reactions, nuclear structure, nuclear astrophysics, nuclear instrumentation, hadron physics and QCD matter physics. The geographical distribution of the nominees were: 6 from Asia, 6 from North America, and 18 from Europe.

The evaluation process was done between September and December 2018, and the three prize winners suggested by C12, one woman and two men, were approved by the IUPAP Secretary-General in March 2019. See the following link with information on the prize winners: <http://iupap.org/commissions/c12-nuclear-physics/news/>. The prize ceremony took place at INPC2019

in Glasgow on 31 July 2019. All three winners were invited to give plenary talks, and they were all three excellent talks.

Issues related to the discovery of new superheavy elements

The new document "*On the Discovery of New Elements*" by the 2017 Joint Working Group of IUPAC and IUPAP has been published in the journal Pure and Applied Chemistry; <https://doi.org/10.1515/pac-2018-0918>. It is a provisional report, and IUPAP and IUPAC are presently receiving comments from scientists interested in the topic. In one of the appendices to the report one can find the new document "*IUPAC and IUPAP Procedures for Validating Claims for the Discovery of New Elements and Naming those Elements*". It is a document that overlooks the whole validation process. The process will from now on involve the C12 Commission to a much larger extent than before, as an expert commission to IUPAP on issues related to new elements of the Periodic Table. Similarly, the process will involve the IUPAC Division of Inorganic Chemistry as an expert division to IUPAC on these matters.

IUPAC Division of Inorganic Chemistry

Thus, there are common interests within C12 and the IUPAC Division of Inorganic Chemistry. I was therefore invited by the chair of that division, Lars Öhrström, to take part in their annual meeting in Paris, via Skype. He wanted me to present the activities of C12, and he wanted to find out about possibilities to have a closer contact in the future. In particular we have common interests when it comes to validating claims for new elements of the periodic table. Similarly, I invited him to present the chemistry division to our C12 meeting in Glasgow, also via Skype. It was two very interesting encounters which hopefully will bare fruit in the long term. At least we have now established contact, and we have started a discussion on these matters.

International Year of the Periodic Table

Continuing on the issue of new elements, this year is the International Year of the Periodic Table, IYPT. C12 members have been involved, and continues to be so, in various activities related to the IYPT in 2019. We try to increase the visibility of nuclear physics when it comes to superheavy elements; to clarify the notion of these, the very heaviest elements of the universe, and the production and identification of them, that the discovery of them mainly relays on nuclear physics methods and techniques.

We make public lectures in our respective countries. We set up activities, such as e.g. exhibitions, sometimes jointly with chemists. This has been very successful in Japan, as an example, which was reported by Hirokazu Tamura, the present C12 member from Japan. There were public lectures at the IYPT opening ceremony in Tokyo on February 23 2019 given by seven chemists and physicists including Professor Morita, discoverer of element 113, Nihonium. The audience of about 200 people included many school teachers and high school students. They have invited students all over Japan to write essays on the periodic table, from which the most excellent will be selected and published later. Also they have set up an exhibition on the periodic table, which includes element samples, various types of periodic tables, its historical background, applications of the elements, etc. It is an exhibition that is moving around at various science museums all over Japan. The IYPT closing ceremony will be held on Decemebr 5 2019 in Tokyo.

The activities are planned by the IYPT2019 committee of the Science Council of Japan, and it is organised by the Japanese IUPAP and IUPAC commission members, and executed by a joint team of the Chemical Society of Japan, the Physical Society of Japan, and the RIKEN National Accelerator Laboratory in Tokyo. This is another very good example of collaboration between chemists and physicists. See <http://www.iypt2019.jp/eng/index.html> for further information.

We also try to link other suitable nuclear physics events in 2019 to the IYPT, in particular advertising the IYPT at nuclear physics conference webpages, and organizing public lectures at nuclear physics conferences. This was particularly successful at INPC2019 in Glasgow, where Professor Jim Al-Khalili gave a public lecture with the title: "Nuclear Physics and the Making of the Modern Periodic Table". Professor Al-Khalili is a British theoretical physicist at the University of Surrey. He is a regular broadcaster and presenter of science programmes on BBC radio and television, and is a frequent commentator about science in other British media. His lecture was extremely well received.

Another important conference when it comes to new elements of the periodic table is the 6th International Conference on the Chemistry and Physics of the Transactinide Elements, TAN19, which is coming up in Wilhemshafen in Germany by the end of August 2019. It is a conference that is endorsed both by IUPAP and IUPAC. TAN19 brings together nuclear physicists and nuclear chemists involved in the search of new superheavy elements. It is the main conference series in the field of superheavy element research. During this conference there will be a special focus on the periodic table, a public lecture by Professor Gisela Boeck from the University of Rostock on the history of the Periodic Table, and there will be talks by living discoverers on the discoveries of elements 112, 113, 114, 115, 116, 117, 118.

Both the presidents of IUPAC and IUPAP will attend TAN19 to give welcome addresses, which again signals that physicists and chemists are friends and work together to foster science.

Nuclear physicists also write popular science articles on the subject. There was recently a special issue on the Periodic Table in the journal Nuclear Physics News, <http://www.nupec.org/npn/npn291.pdf>, in which I have written the editorial: "Discovery of Superheavy Elements".

IUPAP Neutrino Panel

On the initiative of the President of IUPAP the IUPAP Neutrino Panel was recently set up. It involves three commissions, C4, C11 and C12 and three working groups, WG1, WG9 and WG10. A report of the status of the panel was delivered by its co-Chair, Nigel Smith, at the WG9 meeting in London. I presume that a report of the first activities of the Neutrino Panel has been sent in to the present C&CC meeting, and can be found here.

Recommendations for IUPAP sponsorship of nuclear physics conferences in 2020

Requests for IUPAP sponsorship were reviewed within C12 from three conferences. They were:

- **ARIS2020**: 27th International Nuclear Physics Conference, to be held in Glasgow in Scotland.
- **Hadron Physics 2020**: International Nuclear Physics Conference, to be held in Brazil.
- **NIC2020**: Nuclei in Cosmos 2020 to be held in Chengdu in China.

A separate report has been sent in by C12 on the suggested support of these three conferences.

International Nuclear Physics Conference, INPC, 2022

The INPC brings together some 700 participants from around the world on a three year cycle. It is the only international conference covering all the subfields of nuclear physics both at the experimental and theoretical level. It is the main conference in the field of nuclear physics and has been rotating amongst the various continents, INPC2007 in Tokyo, INPC2010 in Vancouver, INPC 2013 in Firenze, INPC2016 in Adelaide, INPC2019 in Glasgow. It is the venue at which the three IUPAP young scientist prizes in Nuclear Physics are awarded every three years.

At the annual C12 meeting held during INPC21019 in Glasgow we had two bids for holding the next INPC meeting, the one in 2022. The two bids were from Cape Town in South Africa and Lanzhou in China. The C12 commission reviewed the plans and budgets as presented by the organising committees and were very satisfied that in particular the South African proposal met the IUPA requirements very well, in particular with regards to open access, participation of women on committees, targets for female invited speakers and participation of young investigators and students. C12 decided that INPC2022 will be held in Cape Town.

New Chair of C12 from January 2021

From January 2012 C12 will need a new Chair. This issue was discussed at the C12 meeting in Glasgow, and it was unanimously decided to suggest to IUPAP that the next chair should be Professor Ani Aprahamian of Notre Dame University, USA. A separate report will be sent to IUPAP by September 15 2019 with this recommendation.

Associate members to other commissions and working groups

C12's commitment to other commissions and working groups were discussed. The engagement of C12 commission members in other commissions is at the moment only in the C11 Commission on Particle Physics, where Professor Eugenio Nappi is the C12 associate member.

We do not have any associate member from another commission in C12. And never has had, as far as I can remember, going back to 2012. In the discussion in Glasgow the C12 members very clearly expressed the opinion that it would be most valuable, and very natural, for C12 to have, in addition to C11, also close ties with the C4 Commission on Astrophysics and the C14 Commission on Physics Education, as well as with WG14 on Accelerator Science. It was decided that we should invite members of these commissions to send one of their members as an associate to C12, and also to ask the Chairs of these commissions if they would be interested in receiving a member from C12 as associate member to their commissions.

Members of C12

The C12 commission consists of 14 members, seven women and seven men. We cover, both in experiment and theory, most fields of nuclear physics such as nuclear reactions, nuclear structure, nuclear astrophysics, nuclear instrumentation, hadron physics, QCD matter physics.

The C12 members are:

Chair: Claes Fahlander (2011)(2014) (2017) Sweden
Vice-chair: Joachim Stroth (2011)(2014) (2017) Germany
Secretary: Ani Aprahamian (2014) (2017) USA

Mahananda Dasgupta (2014) (2017) Australia
Andrey Fomichev (2014) (2017) Russia
Eugenio Nappi (2014) (2017) Italy
Hirokazu Tamura (2014) (2017) Japan

Anna Mackova (2017) Czech Republic
Debora Peres Menezes (2017) Brazil
Eberhard Widmann (2017) Austria
Fanny Farget (2017) France
Iris Dillmann (2017) Canada
Maria Jose Garcia Borge (2017) Spain
Yanlin Ye (2017) China