IUPAP Working Group WG.9 (International Cooperation in Nuclear Physics)

Activity Report 2012 – 2014

Mandate:

1. **provide a current description of the landscape of key issues in Nuclear Science research**
2. **produce (maintain) a compendium of facilities existing or under development worldwide**
3. **establish a mapping of these facilities onto the scientific questions outlined above**
4. **identify missing components that would have to be developed to provide an optimized, comprehensive network of international facilities for Nuclear Science**
5. **explore mechanisms and opportunities for enhancing international collaboration in Nuclear Science**
6. **identify R&D projects that could benefit from international joint effort**
7. **serve as a source of expert advice for governmental or inter-governmental organizations in connection with efforts to coordinate and promote Nuclear Science at the international level**
8. **serve as a forum for the discussion of future directions of Nuclear Science in the broadest sense.**
9. **document the cross section disciplinary impact of Nuclear Science and of Nuclear Science facilities and identify mechanisms for expanding (fostering) cross disciplinary research**

Present membership of IUPAP WG.9:

Robert E. Tribble – Chair [Texas A&M University, USA]
Anthony W. Thomas – Past-Chair [University of Adelaide, Australia]
Willem T.H. van Oers – Secretary [TRIUMF/University of Manitoba, Canada]
Jonathan A. Bagger – Director TRIUMF [Canada]
Angela Bracco – Chair NuPECC [INFN-Milano, Italy]
NuPECC – Nuclear Physics European Collaboration Committee
Umberto Dosseli – Director Laboratori Nazionali di Frascati [Italy]
Hideto En'yo – Director RIKEN [Japan]
Donald F. Geesaman – Chair NSAC [ANL, USA]
NSAC – Nuclear Science Advisory Committee to the US DoE and US NSF
C. Konrad Gelbke – Director NSCL [USA]
Dominique Guillemaud-Mueller – Deputy-Director IN2P3/CNRS [France]
Kobus Lawrie – Acting-Director i'Themba Laboratories [Zuid-Afrika]
Alinka Lepine-Szily – Co-Chair ALAFNA [Universidade de Sao Paulo, Brazil]
ALAFNA Associacao Latino Americana de Fisica Nuclear e Aplicacoes
Victor A. Matveev – Director JINR-Dubna [Russia]
Dong-Pil Min – Chair ANPhA [Seoul National University, Korea]
ANPhA Asia Nuclear Physics Association
Hugh Montgomery – Director Jefferson Laboratory [USA]
Berndt Mueller – Associate-Director BNL [USA]
Guenther Rosner – Past-Chair NuPECC [FAIR, Germany]
Naohito Saito – Deputy-Director J-PARC [Japan]

Hideyuki Sakai – Chair IUPAP C12 [RIKEN, Japan]
Susan J. Seestrom – Past-Chair NSAC [LANL, USA]
Dinesh Srivastava – Director VECC [India]
Horst Stoecker – Director GSI [Germany]
Yanlin Ye – Past-Chair ANPhA [Beijing University, China]
Wenlong Zhan – Vice-President Chinese Academy of Sciences [IMP-Lanzhou, China]

Meetings of IUPAP WG.9:

The Annual General Meetings are held to discuss the various long range plans in terms of the nuclear science priorities, their implementation, and the major nuclear physics facilities, existing, under construction, and being planned. The long range plans are those for NSAC in the US, for NSERC and TRIUMF in Canada, for NuPECC in the European Union. Also discussed are the nuclear physics collaboration efforts in Latin-America by ALAFNA and in the Asia-Pacific region by ANPhA. The Annual General Meetings of IUPAP WG.9 are preceding those of IUPAP C12 (the Commission on Nuclear Physics).
The meetings in the period 2012-2014 took place at:

- **Nishina Research Center (RIKEN), Japan, August 17-18, 2012**
- **Laboratori Nazionali di Frascati INFN, Frascati, Italy, June 1, 2013**
- **GSI Helmholtzzentrum fuer Schwerionen Forschung GmbH, Darmstadt, Germany, July 11-12, 2014**

In addition IUPAP WG.9 organizes the triennial Nuclear Science Symposia which focus on the seven main topics of nuclear physics to date:

- **Can the structure and interactions of baryons/hadrons be understood in terms of QCD?**
- **What is the structure of nuclear matter?**
- **What are the phases of nuclear matter?**
- **What is the role of nuclei in shaping the evolution of the universe, with the known forms of nuclear matter only comprising a meager 5%, the rest being dark matter 27% and dark energy 68% ?**
- **What is the physics beyond the Standard Model?**
- **What is the role of nuclear physics serving society?**
- **What is the role of nuclear energy in the global energy question?**

The first Nuclear Science Symposium was held at TRIUMF, July 2-3, 2010, while the second was held at Laboratori Nazionali di Frascati INFN, May 31 – June 1, 2013.
The next Nuclear Science Symposium will take place in 2015 in Washington, DC.
The Nuclear Science Symposia are public meetings attended by the proponents of nuclear science, long range planning committee members, directors of the various large nuclear physics facilities, and funding agency/government representatives.

Major Nuclear Physics Facility Construction:

Paramount in the discussions during the meetings of IUPAP WG.9 appeared the large nuclear physics facilities required to advance the field. In the three year period 2012-2014, much of the upgrade of CEBAF (Continuous Electron Beam Accelerator Facility) to 12 GeV at Jefferson laboratory in Newport News, VA, was completed. Simultaneous experimentation in three of the four experimental halls is to commence in 2015. The construction of FRIB (Facility for Rare Isotope Beams) at Michigan State University in

East-Lansing, MI, has started. J-PARC (Japan Proton Accelerator Research Complex) in Tokai, Japan, is moving forward through its phased approach of reaching the design objectives of 50 GeV and beam power of 1.7 MW. Construction has also started of FAIR (Facility for Antiproton and Ion Research) at GSI (Helmholtzzentrum fuer Schwerionenforschung, GmbH) in Darmstadt, Germany. All four are very large nuclear physics facilities; the latter three each with price tags well in access of one billion dollars. To advance in knowledge about the structure of the nucleon in terms of its constituents (quarks and gluons and their QCD interactions) a high energy electron-ion collider is being discussed for construction. Its priority will be established through Long Range Plan exercises.

IUPAP Report 41:

This report is a handbook of the nuclear physics facilities world-wide, together with a concise outline of the current nuclear physics challenges, and is produced, maintained, and updated in response to one of the mandates given to IUPAP WG.9 (among other by the OECD Global Science Forum).
IUPAP Report 41 was first published as a hard copy on April 12, 2007.
The first electronic version was posted on the IUPAP WG.9 website
http://www.triumf.info/hosted/iupap/icnp/index.html
on July 9, 2007 with an update posted on January 1, 2011.
Following the Nuclear Science Symposium held at Laboratori Nazionali di Frascati on May 31, 2013, the introduction of the report (the roadmap for nuclear science for the next five to ten years) has been rewritten with the aid of proponents of nuclear physics. Furthermore, requests were send for updates of the individual nuclear science laboratory entries in the report. A total of 52 out of the 88 individual laboratory descriptions were revised. Also the report now contains descriptions of the large deep-underground science laboratories and nuclear theory institutes. The updated version of IUPAP Report 41 has been posted on the above mentioned website on January 1, 2014.

Further tasks of IUPAP WG.9:

It has started the planning of the third Nuclear Science Symposium to be held in June/July 2015 in Washington, DC, following the suggestion by Timothy J. Hallman, Associate Director for Nuclear Physics, of the Office of Science, US Department of Energy. The Symposium will be organized through IUPAP WG.9 by the funding agency/government representatives, the long range plan committees' representatives and the nuclear science community at large.
It is giving an enhanced profile to the Association of Latin-America Nuclear Physics and Applications, ALAFNA, [website : http://www.alafna.net] and Asia Nuclear Physics Association, ANPhA, [website : http://ribf.riken.jp/ANPhA]
It is discussing the publication of a report on 'Nuclear Physics and Medicine' as was done by NuPECC for the European Union community.

Willem T.H. van Oers
Secretary of IUPAP WG.9
TRIUMF, September 10, 2014