Cooperation Between AAPPS-DNP (ANPhA) and NuPECC: Efforts Toward Long-range Plans for Nuclear Physics

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The Nuclear Physics European Collaboration Committee (NuPECC) is an Expert Committee of the European Science Foundation (ESF). The objective of NuPECC is (1) to develop a strategy for European Collaboration in nuclear science by supporting collaborative ventures between research groups within Europe, and (2) to promote nuclear physics and its trans-disciplinary use in applications for the benefit of society. Immediately after the establishment of the Asian Nuclear Physics Association (ANPhA) in 2009, which now also holds a dual role as the Division of Nuclear Physics (DNP) of AAPPS (Association of Asia Pacific Physical Societies), ANPhA and NuPECC agreed to exchange observers at their meetings. Presently, the chair of ANPhA is invited to attend all NuPECC meetings (which take place three times per year), and the chair and the scientific secretary of NuPECC are invited to attend the annual ANPhA board meetings.

Membership in NuPECC is based on national institutions in Europe (funding agencies) and national research facilities in Europe that are involved in nuclear science. At present, there are members from 20 countries (listed in alphabetical order: Austria, Belgium, Croatia, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, the Netherlands, and the United Kingdom). In addition, NuPECC has included representatives from major European facilities and organizations related to nuclear physics, i.e., the Facility for Antiproton and Ion Rings (FAIR, Darmstadt, Germany), the European Centre for Theoretical Studies in Nuclear Physics and Related Areas (ECT*, Trento, Italy), the Joint Institute for Nuclear Reactions (JINR, Dubna, Russia) and the European Science Foundation (ESF, Strasbourg, France). As stated above, ANPhA is one of the observers of NuPECC. Other observers are from the United States, Canada, and the Associacion Latino-Americana de Fisica Nuclear y Aplicaciones (ALAFNA). The Nuclear Physics Branch of the European Physics Society (NPB-EPS) and the European Committee for Future Accelerators (ECFA) also send observers to NuPECC.

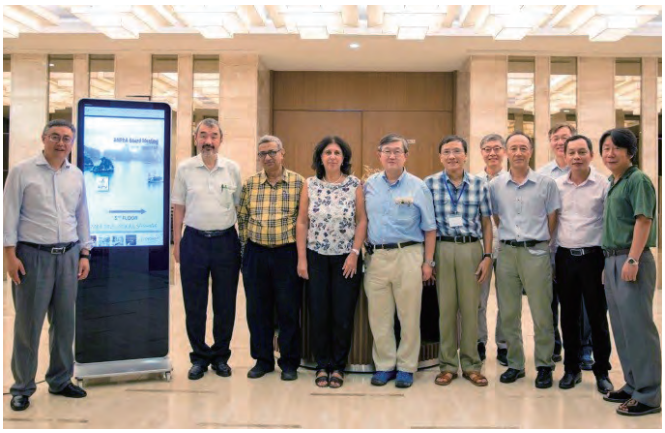

Fig. 1: Photograph taken at the 12th ANPhA Board meeting in Halong Bay, Vietnam on Sept. 24, 2017, held during the ISPUN17 Symposium. Prof. Angela Bracco, chair of NuPECC, is in the center of the photograph.

The most important task of NuPECC is to establish a long-range plan (LRP) for nuclear physics in Europe. The plan is renewed every five to six years. This long-range plan indicates the priority of projects at nuclear physics facilities in Europe, and the science budget from the European Science Foundation is distributed accordingly. Therefore, the process to finalize this long-range plan is subject to serious competition between countries and facilities in Europe. This is in contrast to our situation, where we do not experience competition for the distribution of scientific funding that covers the entire

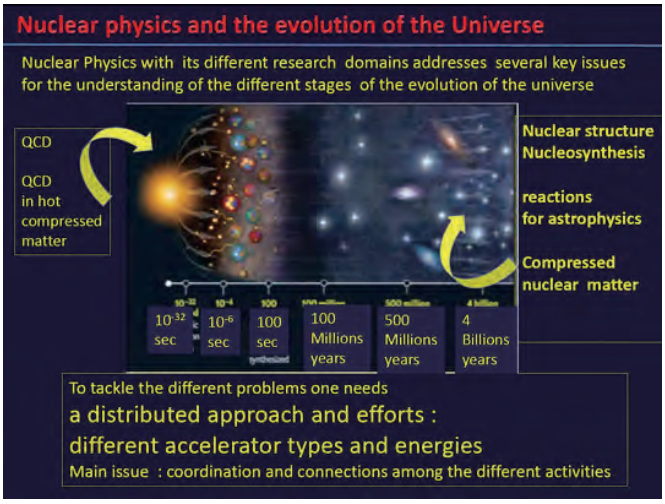

Fig. 2: Part of the first page of the official presentation of the NuPECC long-range plan given by Angela Bracco in Brussels on Nov. 27, 2017. The necessity for various types of accelerators in nuclear physics is clearly shown.

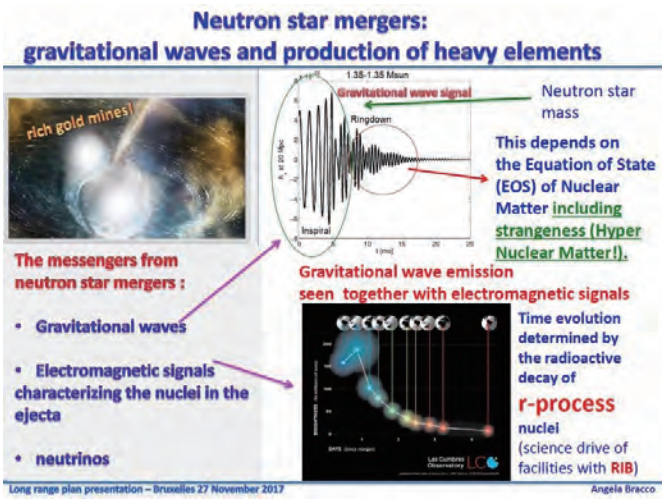

Fig. 3: Part of the second page of the official presentation of NuPECC's long range plan. The importance of using both RI (rare isotope) beams and Hadron beams in the study of nuclear physics is dramatically shown in connection with the Universe's recent and spectacular event - the observed neutron star merger. NuPECC's impressive and timely presentation of our field's basic studies for the public is a practice that we at AAPPS-DNP (ANPhA) should incorporate.

Asia Pacific region. NuPECC's latest LRP became public in November 2017, and this LRP was revealed at an official presentation ceremony.

I had the opportunity, as the ANPhA chair, to observe NuPECC's discussions in forming the new LRP, starting from January 2017. I attended NuPECC meetings three times (March 2017, at CERN, Geneva; June 2017, in Lisbon, Portugal; and in October 2017 in Sacley, France), attended one town meeting (January 2017, in Darmstadt, Germany) and attended the official presentation (November 2017, in Brussels, Belgium). I was impressed by every important step toward the LRP, i.e. the presentations, discussions, negotiations and the intense writing process that underwent modifications and improvements.

At this time, one of the main objectives of the LRP of NuPECC is to find a way for European nuclear and hadron physics to grow while awaiting the completion of FAIR (Facility for Antiproton and Ion Rings, under construction at Darmstadt, Germany), which is expected in 2023. FAIR is a little delayed from its initial schedule. Another main objective of NuPECC's LRP is to connect European research in nuclear physics on unstable nuclei to the forthcoming EURISOL facility.

Currently, nuclear physics on the international stage concentrates on exploring ever-more exotic regions of the nuclear chart, working at the limits of stability of nuclei. For this purpose, nuclear physicists in Europe are in the process of building several large-scale facilities. They have planned to create the European ISOL (isotope separation on-line) facility, EURISOL, which will be a radioactive ion beam (RIB) facility that will allow researchers to investigate hitherto unreachable parts of the nuclear chart. NuPECC has recommended the construction of EURISOL as one of the two "next-generation" Radioactive Ion Beam (RIB) infrastructures in the European Union (EU). The other project, FAIR (Gesellschaft für Schwerionenforschung (GSI), Germany), will use the projectile fragmentation technique and covers also another important part of nuclear physics, called hadron physics or nuclear matter physics, as well as RIB physics. The study of the state of nuclear matter in extreme conditions, such as the matter at the central part of neutron stars, is FAIR's goal for investigation.

The EURISOL project aims to build a "next-generation" European ISOL RIB facility. The ion yields delivered by current ISOL facilities, or by those under construction (HIE-ISOLDE, SPES, SPIRAL2) will be exceeded by at least a factor of 100. This will open a large field of research for physicists; however, it will still take years before construction will begin. NuPECC therefore recommended the establishment of preparation platforms at existing and/or under-construction European ISOL facilities toward EURISOL, such as SPIRAL2, SPES, and

HIE-ISOLDE etc. They are called EURISOL-DF (Distributed Facilities) and will be bridges of physics between present real activities and future dreams. The European hadron physics community that, according to the original schedule, should have been conducting research in full-swing at FAIR, has had to conduct their activities at facilities outside of Europe as well as at existing electron-beam based facilities such as MAMI at Mainz University, due to delays. For that purpose and more generally, to bridge the current research in the field relevant to FAIR, GSI decided to restart part of its existing SIS18 accelerator facility.

As an observer from Asia, I presented on nuclear physics activities in the Asia Pacific region at the three NuPECC meetings that I attended, with a talk entitled, "News from ANPhA". NuPECC always allocated 30 minutes for this talk. Asian nuclear physics facilities are now internationally competitive. In particular, the radioactive ion beam facility at RIKEN (RIBF) in Japan and HIRFL (Heavy Ion Research Facility in Lanzhou) in China are leading facilities in operation for RI beams via projectile fragmentation. ISOL facilities at the Beijing Tandem Accelerator Facility (BTANL) in China, which has just started its operation, and the RISP (Rare Isotope Science Project) facility in Korea, which is under construction, will soon be the world's most advanced facilities. China's future plan for an RI beam project, Beijing ISOL, would be one of the strongest competitors of EURISOL. I believe the work currently done in Asia created some impetus for the development of European projects and this was reflected in the European LRP. The operational status of J-PARC, a Japanese high intensity accelerator facility for nuclear and hadron physics, had some influence in the partial re-opening of the SIS18 facility at GSI.

In the Asia Pacific region, however, we do not yet have such a region-wide LRP; rather, each individual country may have its own national LRP. As a result, sometimes facilities with similar accelerator systems and/or physics goals are being constructed in this region. On the other hand, physicists who do not find appropriate facilities in Asia travel to Europe and/or North America to conduct their experimental research. ANPhA is now preparing the ANPhA White Paper, a catalog of accelerator facilities in the Asia Pacific region. This should help in enhancing collaboration and the common use of accelerator facilities, and should be the first step toward creating a long-range plan for nuclear physics in the Asia Pacific region. Our interactions with NuPECC were productive, and we believe that we will continue to learn much from our European colleagues and from NuPECC. More information regarding activities at NuPECC, ANPhA and Eurisol can be found at the websites listed below.

(1) NuPECC
http://www.nupecc.org/
(2) ANPhA
http://ribf.riken.jp/ANPhA/
(3) NuPECC Long Range Plan
http://www.nupecc.org/index.php?display=lrp2016/main
or
http://www.nupecc.org/lrp2016/Documents/lrp2017.pdf
(4) EURISOL
http://www.eurisol.org/
(5) ANPhA White Paper
https://kds.kek.jp/indico/category/1706/

Notes for Google Chrome Users: the page to enter the username and password is found on the "click for the password" button, which can be found after closing the popup window to login.