The ECOS town-meeting took place on the 5th and 6th of October at the CNRS headquarters in Paris. Around 120 people registered and about 100 to 105 attended the town-meeting. It is perhaps worth mentioning that the dates of the town-meeting coincided with a period of heavy teaching duties for many of our colleagues, in the UK, Sweden and Germany and only a few of them could attend the meeting.

The program of the two day-meetings was organised as follows, with presentations related to each of the key points discussed in the document prepared by the ECOS working group for NuPECC:

Thursday 5th of October

Session 1 (chair: Azaiez)

9:00- 9:05: Welcome (S. Gales)

9:05- 9:15: Introduction (B. Fulton)

9:15- 9:45: Search of SHE -Theories (M. Bender)

9:45- 10:20: Search of SHE - Experiments (S. Hofmann)

10:20-10:50: Chemistry of SHE (A. Yakushev)

Session 2 (chair: P. H. Heenen)

11:10-11:40: SHE's Spectroscopy-theories (H. Goutte)

11:40-12:10: Opportunities for Spectroscopy of Transfermium Nuclei (R-D. Herzberg)

12:10-12:40: Nuclear structure theory (F. Nowacki)

12:40-13:10: Neutron rich nuclei populated by deep inelastic reactions (G. de Angelis)

Session 3 (chair: S. Lunardi

14:30- 15:00: Giant collective modes in nuclei (A. Maj)

15:00- 15:30: Proton rich nuclei-spectroscopy (R. Julin)

15:30- 16:00: Proton-drip line nuclei-decay studies (B. Blank)

Session 4 (chair: N. Alamanos)

16:20-16:50: Nuclear astrophysics studies at energies below the Coulomb Barrier (C. Rolfs)

16:50-17:20: Present status of the $^{12}C(\alpha,,\gamma)^{16}O$ reaction rate study (A. Lefebvre)

17:20-17:40: Astrophysical consequences of nuclear cross section uncertainties: the $^{14}N(p,\gamma)^{15}O$ an $^{12}C(\alpha,\gamma)^{16}O$ cases (G. Imbriani)

17:40-18:20: Stable Ion beams for nuclear astrophysics-Present status and future perspectives (S. Harissopulos)

Friday 6th of October

Session 5 (chair: D. Guillemaud-Mueller)

9:00-9:30: Ground state properties (J. Aysto)

9:30-10:00: Reaction mechanisms around the barrier (L. Corradi)

10:00- 10:30: Exotic shapes (A. Goergen)

10:30- 11:00: Future gamma array (A. Korichi)

Session 6 (G. Sletten)

11:20- 11:50: High intensity - exotic cluster modes (M. Freer)

11:50-12:20: Ion Plasma (G. Maynard)

12:20-12:55: Stable ion beams facilities: present status and upgrade plans (S. Branderburg)

Session 7 (chair: L. Tecchio)

14:30- 15:00: Ion sources (T. Lamy)

15:00- 15:30: Recoil separators (A. Villari)

15:30- 16:00: High intensity ion beam accelerators (U. Ratzinger)

Session 8: (Moderator: W. Gelletly)

16:00- 16:20: ECOS within FP7/Eurons (A. Mueller)

16:20- Discussion and conclusions of ECOS recommendations (Moderator: W. Gelletly)

In the final discussion session, the recommendations of the ECOS document for NuPECC were debated. They received the approval of an overwhelming majority of the participants:

Stable beam facilities in Europe, capable of accelerating a large variety of ions at high intensity are vital for the future of nuclear physics research and are regarded as very important by the research community. They will continue to be used to address major physics problems at the frontiers of nuclear structure and reaction studies. Among all the physics cases outlined one can identify two main categories:

1. Prompt in-beam studies of radiation and particles emitted at the target position: In these experiments the beam intensity is limited by the capabilities and characteristics of the detectors around the target, the associated electronics and data acquisition system since it is important to distinguish and resolve correlated radiations (originating from the same event) and uncorrelated radiations (coming from two different reactions). This depends of course on the total reaction cross-section, but taking into account the ongoing and future development of highly segmented detectors, digital electronics and triggerless data acquisition systems, beam intensities in such experiments are unlikely to exceed some few 100 *p*nA. Hereinafter, we shall refer to them as the ‘medium intensity’ case.

2. Studies away from the primary target: In these experiments the maximum beam intensity is dictated by the target’s capability to sustain a large power deposition and by the resolving and rejection power of recoil separators. The most advanced cooling technologies in conjunction with novel approaches to target composition together with advances in recoil spectrometer design mean that the highest beam intensities usable in this type of experiment are of the order of 100 *p*μA and we refer to this type of experiment as the ‘high intensity’ case.

We envisage that the in-beam studies will take advantage of the existing stable beam facilities principally at Jyväskylä, KVI and Legnaro. **JYFL** is currently capable of providing up to 100 *p*nA of several of the stable beam species and is actively pushing the necessary ion source R&D to extend the list of available beams. **KVI** is planning an upgrade that will allow a considerable increase in the available beam intensities. **LNL** is soon expected to reach this level of beam intensity for very heavy elements, once PIAVE routinely replace the tandem as the injector for the ALPI linear accelerator.

The recommendation of the committee is to ensure a strong support from both the nuclear physics community and the funding agencies for existing stable ion beam facilities not only for their accelerator system development but also for the

instrumentation and experimental infrastructure that are needed to host dedicated research programmes.

Stable ion beams of medium intensities can also be provided by the UNILAC at GSI and by either the CSS1 or the CIME cyclotron at GANIL (both separately or simultaneously). However, the committee feels that in-beam studies at medium beam intensity are but one aspect of the wide and varied research programmes at these two facilities.

It is also important to meet the challenge of developing appropriate instrumentation that can cope with the increasing beam currents. While the highest beam currents naturally are envisioned for experiments using in-flight separation techniques, prompt spectroscopy at the target position presents its own set of challenges at currents more than one order-of-magnitude higher than those currently used and they must be considered at the same time as the upgrade in beam current.

It is beyond the remit of this report to make detailed recommendations for the next generation of instruments. Indeed, specifications have to follow the physics goals of the user community. However, we recommend that the necessary advances in instrumentation must be developed in parallel to the design of the accelerator and be an integral part of a comprehensive design study.

Concerning the second category of experiments that requires the highest intensity beams, it appears clear that none of the existing, upgraded or future facilities in Europe fits the experimental specifications.

The UNILAC upgrade will provide one order-of-magnitude greater beam intensity than is available today. This is a major improvement, which will greatly enhance the programme to search for and study SHEs. The great advantage of the UNILAC will be its dedication to the SHE research field. **The committee believes that the realisation of this upgrade is highly important and lends it its full support.**

LINAG, the SPIRAL2 driver is another attractive possibility as it fully matches the specification of the required high intensity stable ion beam facility, with the caveat that it will be limited to light and medium-mass ions. It will be possible to upgrade LINAG with a new RFQ suitable for heavier ions but this is envisaged only in a longer-term perspective. **Nevertheless, this project is strongly recommended as a first step to the desired facility.** It is an important proof of feasibility and a test bench for all technical issues related to very high intensity heavy ion beams. Moreover, despite its primary dedication as a deuteron accelerator driver for the production of neutron rich radioactive beams at SPIRAL2, it is foreseen that a significant amount of beam time is foreseen to be used for the production of high intensity light- and medium-mass stable ion beams. This makes it ideal for many of the experiments envisaged with high-intensity beams also provides important tests with the highest intensity heavy ion beams in several physics areas such as the production and study of nuclei at and beyond the proton-drip produced in fusion-evaporation reactions.

The use of the upgraded UNILAC and the very intense light and medium-mass beams from LINAG is an attractive medium-range perspective for the community from the point of view of the physics opportunities and also from the point of view of the possibilities of testing and improving instruments and methods. **The long-term goal of a new dedicated high intensity stable ion beam facility in Europe (with energies of few MeV.u) is considered to be one of the important issues to be discussed and planned in the context of the next Long Range Plan of the nuclear physics community.**

A low-energy high-intensity stable-ion beam facility dedicated to nuclear astrophysics is seen as vitally important to improvement of our current understanding of stellar evolution and nucleosynthesis. Such a facility will complement the considerable efforts currently devoted in Europe to radioactive ion beam facilities relevant to nuclear astrophysics studies. Such a facility, built on the earth's surface, will have to meet demanding specifications if it is to resolve outstanding open questions in nuclear astrophysics. It will, also, help reveal those challenging issues that can only be met by studies in an underground laboratory. In this direction, the opportunities for the development of a high-intensity accelerator in a salt mine should be thoroughly explored.

In order to be ready for these new projects it is essential that research and development on the various related keys issues such as targets, spectrometers, ion-sources, detectors, electronics and data acquisition systems are initiated and organised at the European level in synergy with future RNB projects.

Future plans of ECOS

The future goals of ECOS were discussed and received a resounding vote of confidence during the town meeting. This goal consists of organizing and steering within FP7 (future EURONS) the following activities:

- A European network of stable ion beam facilities in Europe
- A JRA merging research and development activities on high power thin-target technology and high selection spectrometers and separators.
- A JRA on high current accelerator sub-systems