TNET: THE EURONS EUROPEAN THEORY NETWORK SECOND WORKSHOP "THEORY NETWORK FOR NUCLEAR STRUCTURE AND REACTIONS"

DATE: January, 7 -11 2008

ORGANISERS:
Jeffrey A Tostevin (Co-ordinator) (*U-Surrey, UK*),
Antonio Sa Fonseca (*U-Lisboa, PT*),
Jan S Vaagen (*U-Bergen, NO*)

NUMBER OF PARTICIPANTS: 30

MAIN TOPICS:

- Correlations in nuclei: their role, treatment and observation
- Novel reaction methodologies: approaches and new technologies
- Novel phenomena in the study of nuclei far from stability
- Few- and many-body methods, status, opportunities and limitations
- Experimental and theoretical reaction capabilities at new facilities
- Break-up and transfer reaction methods and spectroscopy
- Structure models at the interface with the continuum
- Priorities, future directions and (FP7) opportunities

SPEAKERS:

Ron Johnson (*U-Surrey, UK*),
Pierre Descouvemont (*ULB, BE*),
Winfried Leidemann (*U-Trento, IT*),
Mahir Hussein (*MPI Dresden, DE*),
Raquel Crespo (*IST-Lisboa,PT*),
Antonio Fonseca (*U-Lisboa, PT*),
J Gomez-Camacho (*U-Sevilla, ES*),
Pierre Capel (*ULB, BE*),
Marek Ploszajczak (*GANIL, FR*),
Jimmy Rotureau (*ORNL, USA*),
Sofia Quaglione (*LLNL, USA*),
Gaute Hagen (*ORNL, USA*),
Antonio Moro (*U-Sevilla, ES*),
Markus Stauf (*U-Manchester, UK*),
Paul Stevenson (*U-Surrey, UK*),
Arnau Rios Huguet (*NSCL, USA*),
Hermann Wolter (*U-Munich, DE*),
Marcella Grasso (*Orsay, FR*),
Jeffrey Tostevin (*U-Surrey, UK*),
Giuseppina Orlandini (*U-Trento, IT*),
Haik Simon (*GSI, DE*),
Manuela Rodriguez Gallardo (*U-Lisboa, PT*),
Jim Al-Khalili (*U-Surrey, UK*),

SCIENTIFIC REPORT:

Aim and Purpose: The workshop brought together a specific network of nuclear structure and reactions theorists (TNET within EURONS) with a track record of collaborative activity, plus students. A number of young European scientists presently working overseas also participated.
The aims of the Workshop were primarily:
(1) To share knowledge and foster further research collaboration on topical problems in nuclear reactions, structures, and their interface,
(2) To review most recent theoretical advances and understanding, as driven by new experimental capabilities,
(3) To give exposure to the state-of-the-art theoretical tools and of open questions to young scientists, and to foster younger researcher networking,
(4) To allow assessment of priorities concerning reaction theory and the reactions and structures interface as input into integrated theory themes in FP7.
The latter discussions, that informed the TNET community of future plans within the FP7 I3 proposal (ENSAR) made the workshop particularly timely. Discussions among those active in the theory part of the ENSAR proposal also fine-tuned the current joint research and networking proposals.

Results and Highlights: The workshop format was designed to allow maximum interaction, discussion and questioning. Discussion leaders played an excellent role in staging their presentations to this instruction. The major methodologies, underpinning physics, and challenges to advances in direct nuclear reactions, few-body, (ab-initio) many-body and time-dependent approaches were presented. A particular advance is the practical solution of the Fadeev/AGS equations for few-body dynamical systems in the presence of Coulomb and complex effective interactions, that is permitting assessments of the accuracy of other approximate dynamical theories of breakup and transfer reactions. The enormous efficiency gains resulting from the implementation of the J-scheme within the coupled-cluster approach is also allowing calculations of ground states of medium mass nuclei, to confront experiment. Simon presented new GSI measurements that link strongly with several of the theoretical activities under discussion and stimulated much interest. These included data for nucleon knockout reactions that reveal intriguing differences in residue yields when using a nuclear and a nucleon target. The participation of young European-trained scientists (presently

working overseas), Drs J Rotureau, G Hagen (ORNL), Quaglione (LLNL) and Rios Huguet (NSCL) strengthened emerging and fostered new collaborative opportunities. The (upstairs) facilities available at ECT* were ideal for the workshop format. All planned discussion leaders were able to attend (other than Jan Vaagen, who could not attend due a family bereavement). The role of directing FP7 discussions was ably led by Marek Ploszajczak.

Conclusions: The workshop was of immense value in both disseminating recent theoretical advances and in setting out clearly the theoretical foundations of the methodologies used. A number of ongoing collaborations were enlivened and new ones stimulated, by new results, data and theory capabilities. These included, at the time of the workshop, Sevilla-Surrey, Lisboa-Surrey-GSI, ORNL-Trento, Sevilla-Surrey-NSCL, Brussels-Surrey, Bergen-ORNL, and Lisboa-Sevilla-Surrey joint activities. Fonseca, Ploszajczak, Gomez-Camacho and Tostevin were also able to coordinate final input and manpower priorities toward the FP7 ENSAR proposal and discuss future network activity with the ECT*.

Presentations: All presentations from the 24 discussion leaders (minus the associated and extensive discussion) and the full Workshop details are available on the TNET website:
http://www.nucleartheory.net/tnet/presentations.htm
Given the open nature of the workshop, including the sharing of many new (and yet unpublished) results, these presentations have in some cases been edited by the authors prior to their posting on the public website.