

N08-TNET, website:
www.nucleartheory.net/tnet

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Second TNET Workshop

The second TNET workshop "Theory Network for Nuclear Structure and Reactions" was held at the ECT*, Trento (IT) from Monday 7th through Friday the 11th January 2008. The acceptance of the Board of the ECT* to hold the Workshop at ECT*, the excellent support and facilities provided by the ECT* staff, especially by Ms Ines Campo, and the excellent research environment are gratefully acknowledged by the organisers.

The second workshop organizing committee was composed of Jeff Tostevin (U-Surrey, Coordinator, UK), Jan Vaagen (U-Bergen, NO) and Antonio Fonseca (U-Lisbon, PT).

The workshop brought together the TNET nuclear structure and reactions theorists, 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.

Main themes identified for the Workshop were:

- * 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

The detailed programme of the workshop is given in Annex 1 and on the TNET website. The workshop talks (as pdf files) can be browsed from the TNET webpage <http://www.nucleartheory.net/tnet/presentations.htm>. A complete list of participants and a summary of the workshop are also given in Annex 1.

Second TNET Workshop / ANNEX 1

1. List of Participants

A total of 30 nuclear theorists, experimentalists, observers and students attended the Workshop. Participants that led discussions, and their affiliations, are listed in the Workshop programme below. In addition, student participants were Oyvind Jensen (U-Bergen), Elizabeth Cunningham, Emma Suckling and Edward Simpson (U-Surrey).

2. Workshop programme

Monday	January 7th		
09.00am	<i>Arrival and registration</i>		
09.30am	Ron Johnson	U-Surrey	Transfer Reactions with Deuterons
11.00am	Pierre Descouvemont	ULB Brussels	Challenges for three-body scattering problems
12.00noon	Winfried Leidemann	U-Trento	Study of reactions with the Lorentz integral transform (LIT) method
14.30pm	Mahir Hussein	MPI Dresden	Absorption-fluctuation theorem for nuclear reactions
16.00pm	Raquel Crespo	IST Lisbon	Faddeev multiple scattering calculations for proton elastic and break-up scattering from halo nuclei
Tuesday	January 8th		
09.30am	Antonio Fonseca	U-Lisbon	Three-body approach to direct nuclear reactions
11.00am	Joaquin Gomez Camacho	U-Sevilla	Algebraic approach to the scattering with internal degrees of freedom

12.00noon	Marek Ploszajczak (Lead)	GANIL	Lessons from Helsinki: Future activity
14.30pm	Antonio Moro	U-Sevilla	Extracting spectroscopic information from transfer reactions involving weakly bound nuclei
16.00pm	Pierre Capel	ULB Brussels	Analysis of 8B break-up experiments with a Dynamical Eikonal Approximation
Wednesday	January 9th		
09.30am	Marek Ploszajczak	GANIL	Many-body calculations for weakly-bound and unbound states
11.00am	Jimmy Rotureau	ORNL	Density Matrix Renormalization Group Approach for many body open quantum systems
12.00noon	Sofia Quaglione	LLNL	Extending the <i>ab initio</i> no-core shell model to the continuum via the resonating-group method
14.30pm	Gaute Hagen	ORNL	Coupled-Cluster Approach to Nuclear Structure
16.00pm	Markus Stauf	U-Manchester	Coupled cluster method with a hardcore potential for finite nuclei
Thursday	January 10th		
09.30am	Paul Stevenson	U-Surrey	Time-Dependent Hartree-Fock for structure and reactions
11.00am	Arnau Rios Huguet	NSCL/MSU	A time-dependent Green's functions approach to nuclear reactions
12.00noon	Hermann Wolter	U-Munich	The nuclear symmetry energy at low density
14.30pm	Marcella Grasso	Orsay	Evolution of proton states in neutron-rich Ca and Ar isotopes
16.00pm	Jeff Tostevin	U-Surrey	Observing correlations using reactions
Friday	January 11th		
09.30pm	Giuseppina Orlandini	U-Trento	Ab-initio (LIT) method for reactions in the continuum and applications
11.00am	Haik Simon	GSI	Correlation studies in 3-body halo break-up reactions
12.00noon	Manuela Rodriguez Gallardo	U-Lisbon	Standard four-body CDCC calculations
14.00pm	Jim Al-Khalili	U-Surrey	The two-potential approach to one-proton emission
15.00am	<i>Close of Workshop</i>		

3. Summary of the Workshop, by the Coordinator

The workshop was able to review advances and allow discussion of open questions for a considerable range of theoretical work within and in collaboration with TNET partners. The instructions to discussion leaders were to review the current status, the underpinning theoretical methodologies, open problems and future opportunities. The resulting presentations and extensive discussions were effective in touching each of these bases.

Recent advances and future possibilities were revealed at the Workshop. 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 Faddeev/AGS equations for few-body dynamical systems in the presence of Coulomb and complex effective interactions, which is permitting assessments of the accuracy of other approximate dynamical theories of break-up 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. New GSI and NSCL measurements that link strongly with several of the theoretical activities under discussion were presented 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 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, GANIL-ORNL, Sevilla-Surrey-NSCL, Brussels-Surrey, Bergen-ORNL, and Lisboa-Sevilla-Surrey joint activities. Fonseca, Ploszajczak, Gomez-Camacho and Tostevin were able to coordinate final input and manpower priorities toward the FP7 ENSAR proposal and discuss future network activity with the ECT*.

3. Presentations

Presentations from the 24 discussion leaders (minus the associated and extensive discussion) and the full Workshop details are available on the TNET website. All presentations can be browsed at

<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 being posted on the TNET website.

The Scientific Report of the Workshop delivered to ECT* can also be found at the TNET website.

24 January 2008