

REPORT ON A FUSTIPEN SUPPORTED VISIT TO GANIL

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The first days of the visit were occupied by the topical meeting “*Low-energy nuclear collective modes and excitations*”, May 24-25, where I was one of the organizers (together with Denis Lacroix and Marek Ploszajczak from GANIL).

This meeting reviewed the present status of studies of low-energy collective motion in complex nuclei. In spite of great advances of nuclear science there are still many unresolved and intriguing questions concerning collective excitations, including physics of loosely bound and marginally stable nuclei, pairing and clustering, soft collective modes, interrelation between collective motion and chaotic trends of many-body dynamics etc. The meeting was well attended by actively working nuclear theorists from various European countries and Russia, the informal setting was extremely fruitful for deep discussions and starting new collaborations. I opened the meeting by presenting a talk on *Personal List of Unsolved Theoretical Problems*. The following talks and discussions were very useful for the plans of further work.

The rest of the visit was mainly devoted to the continuation of collaborative work with French physicists Nathalie Pillet and Caroline Robin. This work was started few years ago by their prolonged visits to the Michigan State University. We are trying to develop a promising approach to the physics of complex nuclei based on a multiconfigurational approximation that will allow us to calculate all spectroscopic properties of nuclear wave functions in the situations where the direct shell-model diagonalization of the many-body Hamiltonian is not a realistic option due to the catastrophically growing matrix dimensions. This new method is based on the specific choice of a limited number of the most important many-body configurations found by the variational approach self-consistently along with the mean field. The admixtures of highly excited configurations can be evaluated with the help of the statistical consideration using the ideas of quantum chaos. The first publications along these lines just appeared [N. Pillet, V.G. Zelevinsky, M. Dupuis, J.-F. Berger, and J.M. Daugas, *Low-lying spectroscopy of a few even-even silicon isotopes investigated by means of the multiparticle-multihole Gogny energy density functional*, Phys. Rev. C **85**, 044315 (2012)]. The work in this direction will continue by the planned visit of French physicists to the MSU in June of 2013.

Apart from this collaboration I am thankful for the chance to have very inspiring discussions with theorists and experimentalists at GANIL (M. Ploszajczak, P. Van Isacker, N. Alahari et al.). I found a common interest with Prof. Sandulescu with whom we discussed the problem of alpha-clustering in heavy nuclei and its competition with standard pairing (in our recent publication [R.A.

Sen'kov and V.G. Zelevinsky, *Unified BCS-like model of pairing and alpha-correlations*, Phys. At. Nuc. **74**, 1296 (2011)] we developed an alternative approach to this important problem).

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