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THIRTY FIFTH INTERNATIONAL WORKSHOP ON NUCLEAR THEORY IN THE HEARTH OF RILA

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Dedicated to the bright memory of Professor Ivan Zhelyazkov Petkov, D.Sc.

The anniversary **35th** International Workshop on Nuclear Theory (**IWNT**) was held from 26-th of June to 2-nd of July 2016 in Rila Mountains, Bulgaria. **IWNT** is annually organized since 1980 by the **Nuclear Theory Laboratory (NTL)** of the **Institute for Nuclear Research and Nuclear Energy (INRNE)** of the **Bulgarian Academy of Sciences** and the **Faculty of Physics** of the **University of Sofia 'St. Kliment Ohridsky'**.



**Prof. Ivan Zh.
Petkov, D.Sc.**

1932-1995

The aim of the Workshop is to provide an international forum for exchange of ideas, discussions and collaboration between researchers in Nuclear Physics and related areas from all over the world. The idea belongs to **Prof. Ivan Zhelyazkov Petkov, D.Sc.** The International Workshop on Nuclear Theory is organized and held every year in Giolechitsa, Rila Mountains, Bulgaria. Prof. Petkov has been the President of the Organizing Committee since 1980 up to 1995.

Professor Ivan Zhelyazkov Petkov was born in 1932 in Sliven (Bulgaria) and had graduated from the **University of Sofia 'St. Kliment Ohridsky'** in 1956. After three years of work for the **Institute of Physics** of the **Bulgarian Academy of Sciences** in Sofia, he had been a **Ph.D.** student of the **Moscow State University 'M. Lomonosov'**. Later, from 1962 till 1970 he had worked as research fellow and senior research fellow for the **Laboratory of Theoretical Physics** of the **Joint Institute for Nuclear Research (JINR)** in Dubna (Russia). In 1966 he acquired his **Ph.D.** degree in the same institute.

Since 1970 Prof. Petkov had started his work in **INRNE** in Sofia and in the next years he created the **Nuclear Theory Group**. In 1976 he defended his **D.Sc.** thesis in Sofia and from 1983 he had been Professor in **INRNE**.

Professor Ivan Zh. Petkov published more than **150** scientific papers, the most of them in the important international journals on Nuclear Physics and many-body theory, such as **Nuclear Physics**, **Annals of Physics**, **Zeitschrift für Physik**, **Soviet Journal of Nuclear Physics** and others. He was a co-author of three monographs in Nuclear Physics, two of them published in the **Oxford University Press**: '**Nucleon Density and Momentum Distributions in Nuclei**' (1988), '**Nucleon Density Functional Theory**' (1991) and one published by **Springer-Verlag** in Berlin '**Nucleon Correlation in Nuclei**' (1993).

The achievements of Prof. I. Zh. Petkov are in various fields. One should mention his results on the electron elastic and inelastic scattering on nuclei, the heavy ion physics (and especially some pioneer works on nuclear fusion studies), the optical potential theory, the

studies of short-range correlation effects in nuclei, the density functional theory and its applications to nuclear, atomic and molecular systems.

Prof. I. Zh. Petkov was a supervisor of eight **Ph.D.** students who defended successfully their theses. He took an important part in the work on substantial subjects developed in two **D.Sc.** theses defended by his collaborators.

He reported on important international conferences and meetings in Russia, Denmark, England, France, Germany, Japan and Bulgaria.

Prof. I. Zh. Petkov worked also as Head of the **Physics Department** of the **University of Shoumen 'Konstantin Preslavski'** (1973-1976) giving lectures in Theoretical Physics, Atomic and Nuclear Physics. He was also a lecturer on Nuclear Reaction Theory in the **University of Sofia 'St. Kl. Ohridsky'**.

He had been Vice-Director of the **Centre of Physics** of the **Bulgarian Academy of Sciences** and a scientific secretary of the **INRNE** in Sofia for several years.

In 1995 Professor Ivan Zhelyazkov Petkov passed away and the Bulgarian science lost one of the distinguished and recognized Bulgarian scientists abroad, as well as one of the initiators of the studies in nuclear structure and reaction theory in our country. He helped many young scientists to find their own way in the Nuclear Physics and left the **Nuclear Theory Group** founded by him in **INRNE** whose works have been accepted and recognized by the physical community abroad. We lost our teacher and wonderful friend. The memory of Prof. Ivan Zh. Petkov and his contributions will remain.

The program of **IWNT35-2016** included the most recent theoretical and experimental advances in the field covering the following topics:

- Nuclear structure and reactions;
- Symmetries and dynamics;
- Collective and intrinsic motions of nuclei;
- Exotic nuclei;
- Few-body and many-fermion systems;
- Nuclear astrophysics and related topics.

About fifty participants from around the world took part in it – colleagues from Bulgaria, China, Czech Republic, France, Greece, India, Italy, Japan, Kazakhstan, Portugal, Romania, Russia, Slovakia, South Africa, Spain, US, Uzbekistan, Yemen, etc. gathered to discuss problems in leading areas of Nuclear Physics. This year we were very glad to meet for a first time many young fellows from abroad. Most of our famous foreign colleagues have participated in the Workshop even more than ten times. The friendly atmosphere is of great significance for our future work and fruitful collaboration. It is wonderful when theoreticians and experimenters work together side by side. The discussions continued till late into the night. As we heard a member of the staff of the hotel commenting several years ago: 'The participants of the other conferences rarely enter the lecture hall but these nuclear physicists don't go out of it at all!'

Here are some interesting topics of delivered reports:

- Dissipation in Quantum Time Dependent Mean Field;
- Recent Conclusions from Proton-Induced ^3He - and α -Emission into the Continuum;
- Deformed Shell Model Study of Heavy $N=Z$ Nuclei and Dark Matter Detection;
- Elastic Proton-Scattering on ^{13}C and ^{15}C Nuclei in the Diffraction Theory;
- Interaction of Electrons and Neutrinos with Nuclei: The Relativistic Mean Field;
- Recent Progress in Neutrino-Nucleus Scattering;
- Volume and Surface Components of the Nuclear Symmetry Energy;
- Short Range Correlations in Nuclei – Progress and Prospects;
- Theoretical Optical Potential Derived from Chiral Potentials;
- Three-Body Observables with Core Excitation;

- Elastic Scattering of ^8B Proton-Halo Projectile on Nuclear Targets at Energies $20 < E < 170$ MeV;
- Charged-Current Inclusive Neutrino Cross-Sections in the Superscaling Model Including Quasielastic Pion Production and Meson-Exchange Contributions;
- Large Scale Shell Model Calculations for Xenon Isotopes;
- Spin-Orbit Splittings between $2p_{1/2} - 2p_{3/2}$ and $1f_{5/2} - 1f_{7/2}$ Neutron States in ^{40}Ca , ^{38}Ar , ^{36}S , and ^{34}Si N=20 Isotones with Covariant Density Functionals;
- Neutrino Mass and Forbidden Beta Decays;
- Neutrinoless Double Beta Decay with Left- and Right-Handed Currents Revisited;
- Spectral Distribution Method for Neutrinoless Double Beta Decay: ^{82}Se and ^{76}Ge Examples;
- Two Decay Paths for Calculating Nuclear Matrix Element of Neutrinoless Double-Beta Decay;
- Reduced E2-Transition Probabilities in Excited Collective States of Triaxial Even-Even Nuclei;
- Dynamics of Anti-Proton – Protons and Anti-Proton – Nucleus Reactions;
- Towards Nonlinear QRPA Description of States of Multiphonon Origin;
- Emergence of SU(3) Symmetry in Deformed Nuclei;
- Prolate-Oblate Shape Transition in Neutron-Rich Heavy Rare Earths;
- Study of Alternating-Parity Spectra in Ba-Ce Nuclei;
- Relation between Parity Shift Effects in the Spectra of Neighboring Even-Even and Odd-Mass Octupole Deformed Nuclei;
- Phase Transitions in the Algebraic Microscopic Pairing-plus-Quadrupole Model for N~Z ds-Shell Nuclei: Role of the Single-Particle Term in the Hamiltonian;
- Few-Body Models in Dark Matter Problem;
- Neural Network Applications in Nuclear Physics: Determination of Semi-Empirical Mass Formula Coefficients;
- Barrier Height and Excitation Function Calculations for Nuclear Fusion;
- Effect of Entrance Channel Parameters on Incomplete Fusion Reactions.

ACKNOWLEDGEMENTS

I would like to thank the Organizing Committee and the International Advisory Committee for the perfect arrangements concerning the jubilee **35th Workshop on Nuclear Theory-2016**, as well as for the interesting social program. Thanks to the collaborators of **NTL** group of **INRNE-BAS** and our common research projects I have the opportunity to attend the **IWNT** for many years. We are grateful to all colleagues for the amazing friendly atmosphere in which the national and religious differences completely disappear. Once again we felt part of a research society united by our scientific goal – to jointly overcome the difficulties on our common way in science.

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ТРИДЕСЕТ И ПЕТИ МЕЖДУНАРОДЕН СЕМИНАР ПО ТЕОРИЯ НА ЯДРОТО В СЪРЦЕТО НА РИЛА

Галина Крумова

Русенски университет „Ангел Кънчев”

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**35-th International Workshop on Nuclear Theory (IWNT35),
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