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In memoriam Yurii Fedorovich Smirnov:
Some personal reminiscences on a great physicist

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It is a great honour for me to say a few words about the late Professor Yurii Fedorovich Smirnov.

My first contact with the work of Yurii Smirnov goes back to 1978 when my colleague J. Patera showed me, on the occasion of a NATO Advanced Study Institute organised in Canada by J.C. Donini, a beautiful book written by D.T. Sviridov and Yu.F. Smirnov\textsuperscript{[1]}. This book dealt with the spectroscopy of \(d^N\) ions in inhomogeneous electric fields (a part of a disciplinary domain known as crystal- and ligand-field theory). In 1979, B.I. Zhilinskiï, while visiting Dijon and Lyon in France in the framework of an exchange programme between USSR and France, provided me with another interesting book, dealing with \(f^N\) ions in crystalline fields, written by D.T. Sviridov, Yu.F. Smirnov and V.N. Tolstoy\textsuperscript{[2]}. At that time, the references for mathematical aspects of crystal- and ligand-field theory were based on works by Y. Tanabe, S. Sugano and H. Kamimura from Japan\textsuperscript{[3]}, J.S. Griffith from England\textsuperscript{[4]}, and Tang Au-chin and his collaborators from China\textsuperscript{[5]} (see also some contributions by the present author\textsuperscript{[6]}). The two above-mentioned books by Smirnov and his colleagues shed some new light on the mathematical analysis of spectroscopic and magnetic properties of partly filled shell ions in molecular and crystal surroundings. In particular, special emphasis was put on the derivation of the Wigner-Racah algebra of a finite group of molecular and crystallographic interest from that of the group \( SO(3) \sim SU(2)/\mathbb{Z}_2 \).

My second (indirect) contact with Yurii goes back to an invitation to participate in the fifth workshop on \textit{Symmetry Methods in Physics} in Obninsk in July 1991. Unfortunately, I did not get my visa on time so that my participation was reduced to a paper in the proceedings of the workshop edited by Yu.F. Smirnov and R.M. Asherova\textsuperscript{[7]}.

\textsuperscript{1}Presented at the 13th International Conference on Symmetry Methods in Physics (SYMPHYS-XIII) organized in memory of Prof. Yurii Fedorovich Smirnov by the Bogoliubov Laboratory of Theoretical Physics of the Joint Institute for Nuclear Research and the International Center for Advanced Studies at Yerevan State University, held in Dubna, Russia, 6-9 July 2009.
In the beginning of the 1990's, I had a chance to get in touch with another facet of Yurii's work. In 1989, a Russian speaking student from Switzerland, C. Campigotto, spent one year in the group of Prof. Smirnov. He started working on the so-called Kustaanheimo-Stiefel transformation, an $\mathbb{R}^4 \to \mathbb{R}^3$ transformation associated with the Hopf fibration $S^3 \to S^2$ with compact fiber $S^1$. (Such a transformation makes it possible to connect the Kepler-Coulomb system in $\mathbb{R}^3$ to the isotropic harmonic oscillator in $\mathbb{R}^4$.) Then, Campigotto (well-prepared by Smirnov and his team, especially A.M. Shirokov and V.N. Tolstoy) came to Lyon to prepare a French doctorate thesis [8]. He defended his thesis in 1993 with G.S. Pogosyan (representing Yu.F. Smirnov) as a member of the jury.

A fourth opportunity to get involved with Yurii came from our mutual interest in quantum groups and in nuclear and atomic spectroscopy. I meet him for the first time in Dubna in 1992. We then started a collaboration (partly with R.M. Asherova) on $q$- and $qq$-boson calculus in the framework of Hopf algebras associated with the Lie algebras $su(2)$ and $su(1, 1)$ [9]. In addition, we pursued a group-theoretical study of the Coulomb energy averaged over the $n \in \mathbb{N}$–atomic states with a definite spin [10]. We also had fruitful exchanges in nuclear physics. Indeed, Prof. Smirnov and his colleagues D. Bonatsos (from Greece), S.B. Drenska, P.P. Raychev and R.P. Roussev (all from Bulgaria) developed a model based on a one-parameter deformation of $SU(2)$ for dealing with rotational bands of deformed nuclei and rotational spectra of molecules [11]. Along the same line, a student of mine, R. Barbier, developed in his thesis a two-parameter deformation of $SU(2)$ with application to superdeformed nuclei (in mass region $A \sim 130 - 150$ and $A \sim 190$) [12]. It was a real pleasure to receive Yurii in Lyon on the occasion of the defence of the Barbier thesis in 1995. Indeed, from 1992 to 1995, Yurii made several stays in Lyon (one with his wife and one with his daughter) and we jointly participated in several meetings, one in Clausthal in Germany (organised by H.-D. Doebner, V.K. Dobrev and A.G. Ushveridze) and two in Bregenz in Austria (organised by B. Gruber and M. Ramek).

I have not the shoulders to carry the weight of all the fields in which Yurii was recognized as a superb researcher. It is enough to say that he contributed to many domains of mathematical physics (e.g., finite groups embedded in compact or locally compact groups, Lie groups and Lie algebras, quantum groups, special functions) and theoretical physics (e.g., nuclear, atomic and molecular physics, crystal- and ligand-field theory). He was also an exceptional teacher. It was very pleasant, profitable and inspiring to be taught by Prof. Smirnov. I personally greatly benefited from discussions with Yurii Smirnov.

Yurii Fedorovich Smirnov will remain an example for many of us. We will remember the exceptional qualities of the man as a scientist, as a teacher and as a generous person. Yurii, we shall not forget you.
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