

## In memory of Rostislav Mikhaïlovich Ryndin

Rostislav Mikhaïlovich Ryndin, a brilliant physics theorist, died after a severe illness on March 23, 1999; he went through his illness with the courage that was so typical of him.

Rostislav Mikhaïlovich was born on January 20, 1929 in the family of an assistant professor of the Leningrad State University. His father, Mikhail Mikhaïlovich Ryndin, was a man of great erudition and of high culture, mastering twelve languages.

Rostislav Mikhaïlovich's youth was quite hard, as of all of his generation. During the Second World War, he lived in Leningrad during the toughest months of the siege. A kid of 13, he was on night-duties on the roof, pushing incendiary bombs off onto the ground. His father died of hunger in his arms. In September 1942, Rostislav Ryndin was evacuated from Leningrad through the Path of Life (across the Onezhskoe lake) together with his mother and his sister. Ryndin's mother worked in a kindergarten, and the family accompanied it into evacuation to Altaï territory in Western Siberia. Here Ryndin contracted typhoid, stayed unconscious for a long time but miraculously survived. Being the only 'man' in the family, he carried the burden of the hardest work in the kindergarten: storing wood for heating and cooking, stitching felt boots, tending to the horses, etc. This had to be done on Sundays; his weekdays were spent at the school to which he walked fifteen kilometers, in clothes too flimsy for the Siberian frosts.

Having returned to his native city, Rostislav Ryndin graduated first from the secondary school and then in January 1952 from the Physics Faculty of Leningrad State University. He was assigned to work at Novo-Ivan'kovo (now known as Dubna), at the Hydrotechnical Laboratory (which became known a couple of years later as the Institute for Nuclear Problems, and in 1956 became part of the Joint Institute for Nuclear Research created at Dubna). Rostislav Mikhaïlovich was actively doing research here in the group of theorists guided at that time by I Ya Pomeranchuk. Their results were at first strictly classified (no papers were published) and only official reports were written; his first open publication (together with Ya A Smorodinskiĭ) appeared only in 1955.

Ryndin's first work was aimed at a theoretical study of problems that experimenters, including those in Dubna, studied intensely in the 1950s and 1960s: the scattering of nucleons and pions by various targets. Quite soon the problem of the so-called 'complete reconstruction experiment' came to the fore: the determination of the set of experiments that would allow the reconstruction of the scattering amplitudes from the measurement data — unambiguously and with maximum accuracy. Of course, a detailed analysis of various polarization effects was needed if this problem was to be solved. Ryndin's work on the complete reconstruction experiment, still considered to be classic, made



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(20.01.1929 – 23.03.1999)

the body of his thesis for Candidate of Physicomathematical Sciences (thesis for PhD, 1958). Spin dynamics remained one of Ryndin's favorite topics for the rest of his life.

The natural continuation of this research was the thorough study of symmetries that simplify the structure of amplitudes. It was shown in particular that many important relations governing polarization characteristics immediately follow from T-invariance. An analysis of the symmetry-driven consequences in polarization effects and, conversely, the possibilities to use these effects for experimentally testing the symmetries was included into Ryndin's thesis for Doctorate of Physicomathematical Sciences (thesis for the doctor of science, 1966). Rostislav Mikhaïlovich became a recognized authority in the theory of polarization effects. His experience in this field proved to be useful not only for the scattering problems, but for a wider set of actively discussed problems as well. For instance, it was applied to the

determination of the spin and parity of strange particles and resonances. Rostislav Mikhailovich was also interested in other types of interactions. To take an illustration, long before weak intermediate bosons were discovered, Ryndin and B Pontecorvo presented to a Kiev International Conference (1959) their proposals on how to observe the creation of these particles. Although Ryndin stopped working directly on polarization phenomena after 1970, he remained one of the leading experts in this field until the end.

In 1970, Ryndin, an expert of high standing in elementary particle physics, returned to Leningrad and started his research in the theoretical department of the A F Ioffe Physical-Technical Institute (FTI); on the base of this department, a theoretical department was soon created at the B P Konstantinov Leningrad (now St. Petersburg) Institute of Nuclear Physics (LIYaF). The rest of the scientific life of Rostislav Mikhailovich was devoted to this department.

In the 1970s, Ryndin concentrated on various manifestations of symmetries and especially on symmetry breaking. He became aware of a beautiful possibility of detecting small effects of space parity violation due to weak interactions in ordinary atoms. Ryndin proposed to heighten them by specially tuning the energy levels of different parity by external electric and magnetic fields. Rostislav Mikhailovich with colleagues carried out appropriate calculations for the simplest atom, the hydrogen. Precision measurements of such effects in hydrogen would allow one to investigate, with minimum theoretical uncertainty, the structure of the weak neutral currents, using methods that differ from and are independent of those employed in high-energy physics. This problem is still in the list of interesting ones, although the experiments in hydrogen proved to be exceptionally complex and so far remain on paper only. A theoretical analysis of parity violation was also carried out for mesoatoms. An extensive series of publications was summarized in a review published by *Physics-Uspekhi* in 1976. Similar investigations were later extended to macroscopic effects. Ryndin's collaboration with experimenters led to publications on parity-nonconserving photogalvanic effects in gases and semiconductors. Since parity violation makes a medium optically active, it was possible to build a classical theory of electromagnetic wave propagation through such media. On top of the application to the original problem, this theory made it possible to predict a number of novel beautiful effects for waveguides with an optically active core (1984).

In recent years, Rostislav Mikhailovich's attention was focussed on the motion of particles with nonzero spin in electric and magnetic fields. It was discovered in the process that such a well-worn topic as the interaction between moving multipoles (both electric and magnetic) and an external field was not sufficiently investigated even in classical physics. There are obvious uncertainties in the quantum domain as well. An impressive program of studies was drawn up; its implementation was interrupted by Ryndin's illness.

Assessing Ryndin's work in the Dubna period of his life, Ya A Smorodinskiĭ wrote: "Ryndin's creativity in physics was always distinguished by ultimately clear formulations of problems and by an equally clear display of the results of the solution. He may be marked as a typical representative of that group of physics theorists who have chosen the deciphering of the physical picture of the world as the purpose and meaning of their lives. His profound understanding of physics, the brilliance in using mathematical techniques, his keen interest

in mastering the newest fields of physics place R M Ryndin in the ranks of the best representatives of Soviet physics". This assessment holds true for the later stages of Rostislav Mikhailovich's career as well. It is relevant to add here that Ryndin was always attracted to those aspects of theoretical physics that would stimulate new experimental efforts.

Being given the opportunity of travelling abroad (to CERN) as early as 1956, R M Ryndin very soon gained acceptance and high standing in the new circles too. He was able to establish firm scientific and human contacts and found friendships that lasted to the end of his life. From that first visit, Ryndin was a welcome guest in the physics institutes of many countries.

Rostislav Mikhailovich was a frequent lecturer at the FTI–LIYaF (now PIYaF) physics schools, and in later years was among their organizers. His lectures were also included in the programs of other workshops, including international physics workshops. He found considerable time for scientific editing and physics publication duties, and was one of the team composing regular collections of papers on the progress of physics research at LIYaF (PIYaF). His attention to young physicists was exemplary.

From a family of intellectuals, Rostislav Mikhailovich was an intellectual in the best sense of the word. He was an exceptionally bright and charming man, widely knowledgeable and with broad range of interests; he loved and knew the arts, literature, and films well. He was not religious but knew the Bible in detail, compared its different translations, and studied its interpretations. Rostislav Mikhailovich always shared his knowledge generously with anyone interested and ready for it. Talking to him was a pleasure, he was a quiet and wise interlocutor. He was faithful in friendship and love, and friends and family were happy to return his feelings.

A very important characteristic of Rostislav Mikhailovich Ryndin was his rare ability to earn respect and a position of moral authority in any circle. His firm principles and invariable insistence on fair treatment allowed him to influence the moral climate of the teams he worked in. The Division of Theoretical Physics of PIYaF underwent this Ryndin effect. There is no doubt that R M Ryndin was one of the personalities who formed the image of the entire division.

A very humane portrait of Rostislav Mikhailovich (Slava to his friends) looks at us from the responses to the sad news of his passing away; these were immediately sent in by e-mail. Here are some of them. B L Ioffe: "Slava was the noblest and purest person and a genuine scientist. Nature will take a long time to gift us with another human being of this caliber". Yu A Simonov: "I will remember Slava as one of the most charming people I ever encountered, and I won't even mention his honest stance in life". V G Zelevinskiĭ: "My memory shows Slava with his very special smile and an intelligent, kind and somewhat sad expression on the face. This is how I will always remember him". Yu L Dokshitser: "... we've lost a huge chunk of regularity in the surrounding structured world".

The death of Rostislav Mikhailovich Ryndin is a heavy loss to his family, to all his numerous friends, and to the whole of Russian physics.

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Yu L Dokshitser, D I D'yakonov, I T Dyatlov,  
L N Lipatov, A N Moskalev, L B Okun',  
Yu V Petrov, I B Khriplovich, M I Ėides*