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PERSONALIA

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In memory of Viktor Isaakovich Ogievetskiĭ

Professor V I Ogievetskiĭ, a world famous theorist, the author of fundamental studies on symmetries in elementary particle physics, died untimely on 23 March, 1996.

He was born in Dnepropetrovsk on August 6, 1928; his father I E Ogievetskiĭ was Professor of mathematics. In 1948, when a student, V I Ogievetskiĭ was introduced to Igor Evgen'evich Tamm and his colleagues at the theoretical department of the P N Lebedev Physical Institute, and this acquaintance greatly influenced his scientific interests and the whole of his life. V I Ogievetskiĭ started his work and scientific activity as a school-teacher in Dnepropetrovsk in 1950 upon graduating from the Dnepropetrovsk State University. He could be engaged in theoretical physics, then recognised by him as the main purpose of life, while not working at school. His first scientific investigations were devoted to problems of the penetration of gamma-rays through matter. On this subject V I Ogievetskiĭ received a degree of Candidate in Physics and Mathematics at the P N Lebedev Physical Institute in 1954.

By recommendation of I E Tamm in 1955, V I Ogievetskiĭ was admitted to the V I Veksler laboratory at Dubna in the M A Markov group and actively joined researches on elementary particle physics and quantum field theory. Since the foundation of the Joint Institute for Nuclear Research in 1956, the scientific activity of V I Ogievetskiĭ proceeded for 40 years at the Laboratory of theoretical physics of JINR.

The field most attractive for V I Ogievetskiĭ was the theory of symmetries of elementary particles. Universality of gauge theories and their applicability not only to quantum electrodynamics, but also to other types of interactions were about understanding in those years. V I Ogievetskiĭ quickly realised extraordinary prospects and beauty of gauge theories. The criterion of beauty played always an important role in all his scientific work. In a tight collaboration with I V Polubarinov, he carried out a cycle of studies on the field-theoretical interpretation of gauge theories and gravity theory. They much influenced the development of this major direction of the modern theory of elementary particles. The role of spin of interacting fields in gauge theories was emphasised and it was realised that the gauge invariance in quantum electrodynamics and non-Abelian gauge theories is intended to ensure the consistency of interactions of spin-1 fields with each other and with the conserved vector currents of matter. In a similar way, the Einstein theory was interpreted as the gauge theory of an interacting spin-2 field coupled to a conserved tensor current. During these researches, V I Ogievetskiĭ and I V Polubarinov made discoveries whose applications became clear only several years later. In 1965, they introduced the

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'notoph', an antisymmetric tensor gauge field which describes helicity 0 and, in a sense, is complementary to the photon describing helicities ± 1. This object was later rediscovered in the context of string theories and turned out to be a necessary ingredient of many supersymmetric field theories. Another pioneer contribution became the discovery, in 1964, of the possibility to define spinors with the nonlinear in metric transformation law under the general-covariance group in the gravity theory. This result anticipated the theory of nonlinear realisation developed later by S Weinberg, D V Volkov et al.

Upon brilliant defence of the doctor's thesis based on that cycle of results in 1966, V I Ogievetskiĭ carried on with intensive work on the symmetry methods in quantum field theory. In the late 60s, V I Ogievetskiĭ became especially

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interested in the just mentioned theory of nonlinear realisation and in the concept of spontaneous symmetry breaking, mainly, as applied to space-time symmetries including the Poincare group. His striking result in this domain was the interpretation of gravitation theory as a joint nonlinear realization of two spontaneously broken finite-parameter symmetries, conformal and affine ones, which in their closure yield a general-covariance group. This result is now known as the Ogievetskiĭ theorem (1973). According to this ideology, the graviton appeared to be not only a gauge field but also an analog of the Goldstone field of nonlinear realisation of internal symmetry. Later, it was proved that other gauge fields admit such a double interpretation, as well. This deep analogy of gravity theory and gauge theories with sigma models turned out to be extremely fruitful in further studies, in particular, in topological field theories and in the theory of string and superstring embeddings.

The next stage of scientific activity of V I Ogievetskiĭ was connected with a new unfamiliar type of symmetry, the supersymmetry unifying the fields of different statistics, fermions and bosons, as well as spatiotemporal and internal symmetries. V I Ogievetskiĭ was much enthusiastic about the concept on supersymmetry as soon as first papers devoted to this subject appeared. This was to a great extent due to the fact that in the 60s he and I V Polubarinov were on the verge of discovering supersymmetry when asking themselves what the theory with spin - 3/2 conserved currents could describe. V I Ogievetskiĭ was preoccupied by beauty of the idea of superspace, an extension of the ordinary Minkowski space by anticommuting coordinates. One of the first reviews on supersymmetry and superfield techniques was published by V I Ogievetskiĭ and L Mezincescu in *Usp. Fiz. Nauk* in 1975. It is unrivalled in lucidity and completeness of the exposition and up to now can serve as an excellent introduction to this subject.

In the same years, V I Ogievetskiĭ organized a group of followers at Dubna who were highly inspired by the beauty of his ideas on the geometry of supersymmetric theories. The geometric superfield formulation of supergravity as a supersymmetric extension of the gravity theory was a summit of his studies of that period. This formulation is based on the superfield extension of the idea of coupling to a conserved current, this time to the supercurrent that unifies the energy-momentum tensor, the source of graviton, with the spin-3/2 current, the source of gravitino, a superpartner of the graviton. Consistent realisation of this idea resulted in the construction of linearized superfield supergravity (in 1977) and then in the discovery of the fundamental gauge group of supergravity as the group of general coordinate transformations in a complex chiral superspace. Profound connections of supergravity with the theory of complex manifolds were thus revealed.

Subsequently, the problem arose of how to generalise the superfield theory of a simple ($N = 1$) supersymmetry to a more complicated extended supersymmetry that includes the nontrivial group of internal symmetry. Break-through came about in 1984 when the Dubna group headed by V I Ogievetskiĭ invented the concept of harmonic superspace that involves parameters of the internal-symmetry groups as coordinates. The method of harmonic superspaces is at present universally recognised as an adequate geometric approach to extended supersymmetries and supersymmetric integrable systems; it has a deep analogy with the Penrose twistor method.

During the last years, up to his premature death, Viktor Isaakovich remained faithful to the subjects related to supersymmetry, to applications and generalisations of the harmonic superspace approach. Many excellent results he obtained that time still remain to be fully understood and further developed. In his last year, he was especially interested in self-dual supersymmetric theories including self-dual supergravity. Just a few months before his death, V I Ogievetskiĭ was very excited by his discovery that super-self-duality permits a consistent description of fields with higher spins that is forbidden in conventional supersymmetric theories. Unfortunately, the disease and subsequent disasters descended upon him prevented him to go through with studies along these promising lines.

V I Ogievetskiĭ received the I E Tamm prize of the Academy of Sciences of the USSR in 1986 and the von Humboldt award (Germany) in 1992. He was 4 times awarded the JINR prizes; he was also awarded the Diploma of Honour from the Ministry of Russia for Science on the occasion of the 40th anniversary of JINR. V I Ogievetskiĭ was a member of the editorial board of the journal *Yadernaya Fizika* [*Sov. J. Nucl. Phys.*], participated in many conferences on group-theoretical methods in physics and quantum gravity, was a permanent chairman of the organizing committee of regular international workshops on supersymmetries and quantum symmetries he had founded at Dubna. He was a member of the governing board of the International centre for fundamental physics founded by the P N Lebedev Physical Institute and NORDITA in Moscow.

Viktor Isaakovich created a scientific school with many students who are mourning over his unexpected and tragic death. He was for them not only a teacher and example of a high-professional and creative attitude to science, but also the person of absolute honesty and adherence to principle. His vivid individuality, extraordinary amicability, kindness, and frankness attracted numerous colleagues and friends to him from many countries. On his initiative, the Laboratory of Theoretical Physics, JINR was frequently visited by prominent scientists from abroad, a fruitful collaboration with whom has been established for many years. In the last years, he was able to work in many foreign centres of theoretical physics, he easily established scientific contacts and struck his new colleagues with the creativeness of his thinking. Plenty of messages with condolences for his decease witness the great fame and authority, he had over the world community of theorists.

We have lost a great scientist and a remarkable man. His dedicated work, extraordinary energy, adherence to principle and benevolence are an ideal which is hard to attain. He will live in memory of all those who worked with him and admired him. With great sorrow, we dip in respect for our friend and teacher.

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V G Kadyshevskiĭ, L V Keldysh, D A Kirzhnits,
B M Zupnik, É S Sokachev, E L Feĭnberg,
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