

PERSONALIA

PACS number: **01.60.+q**

Albert Nikiforovich Tavkhelidze (on his seventieth birthday)

DOI: 10.1070/PU2001v044n02ABEH000938

December 16, 2000 was the 70th birthday of Albert Nikiforovich Tavkhelidze, prominent scientist and science manager, theoretical physicist of world-wide renown, President of the Academy of Sciences of Georgia and Member of the Russian Academy of Sciences.

After graduating in 1953 from Tbilisi State University, where he read theoretical physics, A N Tavkhelidze was recommended by Members of the Academy I N Vekua and N I Muskhelishvili for a post-graduate course at the V A Steklov Mathematical Institute of the USSR Academy of Sciences. Member of the Academy N N Bogolyubov became his science advisor.

In 1956, N N Bogolyubov and A A Logunov invited A N Tavkhelidze to start working at the Laboratory of Theoretical Physics of the Joint Institute for Nuclear Research, based at the International Physical Centre that had been opened in Dubna shortly beforehand. While working on fundamental physical problems, he became active as a science manager. He accepted A A Logunov's offer to take part in organizing the Sector of Theoretical Physics at the Institute of High-Energy Physics in Protvino. In 1967, he worked together with N N Bogolyubov to establish the Institute of Theoretical Physics in Kiev (the institute has since been named after N N Bogolyubov). He contributed to the launching of the *Theoretical and Mathematical Physics* journal. Much of his time was devoted to training a new generation of physicists, organizing and conducting a whole range of symposia, workshops and conferences.

In 1970, the Presidium of the USSR Academy of Sciences appointed A N Tavkhelidze to the post of director of the newly founded Institute for Nuclear Research, Moscow. His task was to work out the structure of the new institute and to set the scientific dimensions of its activities. After discussion with prominent academics, with the final support of the Member of the USSR Academy M A Markov, two main avenues of research were chosen for the institute: particle and nuclear physics, and neutrino astrophysics. The institute drew up plans for building the Moscow Meson Factory in Troitsk, and neutrino observatories equipped with appropriate neutrino telescopes: underground ones at the Baksan neutrino observatory in the Elbrus region, and the underwater one at lake Baĭkal. At the Institute for Nuclear Research, A N Tavkhelidze still carries out successful study in the capacity of its science manager and head of the Department of Theoretical Physics.

While working in Moscow, A N Tavkhelidze paid much attention to promoting physics research in Georgia. With the support of Academy Member N I Muskhelishvili, the A M Razmadze Mathematical Institute opened a Department of Theoretical Physics, while Tbilisi State University established the High-Energy Physics Institute. Since 1995, A N Tavkhelidze has headed the latter institute. In 1967, A N Tavkhelidze was elected corresponding member of the Georgian Academy of Sciences; in 1974, he became a full member. In 1986, recommended by the Georgian government and supported by the USSR Academy of Sciences, A N Tavkhelidze was elected President of the Georgian Academy of Sciences. In 1993 and 1998, he was re-elected to this post by general assemblies of the Georgian Academy of Sciences. The Academy's contribution to the scientific and intellectual life of Georgia has been fully acknowledged.

Albert Nikiforovich Tavkhelidze

A N Tavkhelidze has authored over 200 science publications with a high citation index. Many of his co-authors who started as young researchers are now reputed world-wide as major scientists and science managers. The contribution made by A N Tavkhelidze has played a key part in the progress of several fields of modern theoretical physics. Let us name just a few of his scientific results.

Generalizing Bogolyubov's method of dispersion relations (DR) for inelastic processes and those with non-

Uspekhi Fizicheskikh Nauk **171** (2) 221 – 222 (2001)
Translated by V I Kisin

conserved numbers of particles in the quantum field theory (QFT), A N Tavkhelidze and A A Logunov were the first to obtain the DR for amplitudes of pion photoproduction on nucleons.

Working together with A A Logunov, A N Tavkhelidze suggested a three-dimensional version of the QFT, in which a system of two interacting particles is described by relativistic three-dimensional quasi-potential equations known as the Logunov – Tavkhelidze equations. They are very useful for calculating hyperfine corrections to the energy of hydrogen atoms, the bound state energies of quarks, etc.

Working together with A A Logunov and L A Solov'ev, A N Tavkhelidze obtained finite-energy (FE) sum rules for amplitudes of meson – nucleon scattering. Using the new sum rules, the three scientists discovered global duality: the integral relations between the resonance component of the scattering amplitude and the Regge parameters. The properties of the global and local (Venetiano) duality became the basis for creating a string model of hadrons. Subsequently, with the collaboration of N V Krasnikov and K G Chetyrkin, the FE sum rule method was generalized for the case of quantum chromodynamics with the use of the asymptotic freedom which is a property of this theory. FE sum rules are a nonperturbative method which is widely employed for calculations in quantum chromodynamics.

A N Tavkhelidze, B A Arbuzov and R N Faustov were among the first scientists to realize that the fermion mass could arise as a result of spontaneous symmetry violation in a two-dimensional model of QFT.

In 1965, A N Tavkhelidze, N N Bogolyubov and B V Struminskiĭ, working independently from Nambu and Khan, suggested that quarks may have a new quantum number, subsequently named 'color', that plays a key part in chromodynamics. Based on the quasi-independent quark model, the Matveev – Muradyan – Tavkhelidze formulas of quark count were discovered and registered in 1987; the new formulas predicted a power-law behavior for the elastic scattering amplitude and hadron form factors in large momentum at high energies and momentum transfers. The dynamic quark model of hadrons became the starting point in the search for a relativistic generalization of $SU(6)$ symmetry of elementary particles and finally brought about the formulation of relativistically covariant equations for bound systems of particles in the QFT (in collaboration with V G Kadyshevskiĭ, R M Muradyan, Nguyen Van Hieu, I T Todorov and R N Faustov).

A number of papers written by A N Tavkhelidze together with V A Matveev and R M Muradyan formulated the principle of self-similarity in high energy physics (1969) and, based on it, a consistent approach to describing phenomena of the scale-invariant behavior of deeply inelastic interaction between leptons and hadrons. Joint papers with N N Bogolyubov and V S Vladimirov (1972), gave rigorous justification of the existence, within the local QFT, of self-similar (scale-invariant) asymptotics of deeply inelastic processes and established the exact connection of the structural functions of these processes with the behavior of commutators of local currents in the vicinity of the light cone.

In the research that A N Tavkhelidze did jointly with V A Matveev, V A Rubakov, V F Tokarev and M E Shaposhnikov, they posed and solved the problem of instability of normal baryonic matter under extreme conditions of superhigh densities — for the first time in the standard theory of electroweak interactions. A result of major importance yielded by this research was that intensive decay of normal matter can occur upon contact with a droplet of superdense fermion matter, generating high energy release. Recently, the possibility of such phenomena was actively discussed in connection with the launch of a new generation of colliders of relativistic nuclei, and with the search for 'dark matter' in the Universe. In 1977, A N Tavkhelidze, N V Krasnikov and V A Kuz'min, working within the Grand Unification theory, suggested a gauge interaction model with superweak CP invariance violation that both describes the CP-violation in rare and K-decays and explains the origin of the baryonic asymmetry of the Universe.

In acknowledgment of his major contribution to science, A N Tavkhelidze was elected a Corresponding Member of the USSR Academy of Sciences in 1984, and a Member in 1990.

A N Tavkhelidze won the USSR State Award in 1973 for publications on photoproduction of π-mesons on nucleons. The joint papers on a new quantum number 'color' and the discovery of dynamic laws in a quark structure of elementary particles and atomic nuclei won the Lenin Award in 1988. In 1998, A N Tavkhelidze and a team of researchers from the Institute for Nuclear Research won the State Award of the Russian Federation 'For creating the Baksan neutrino observatory and research in the field of neutrino astrophysics of elementary particles and cosmic rays'.

In 1996, the National Academy of Sciences of Ukraine awarded A N Tavkhelidze the N N Bogolyubov Prize. In 1998, the International Association of Academies of Sciences gave A N Tavkhelidze a Gold Medal for his major contribution to strengthening the international cooperation of scientists. A N Tavkhelidze has won many honorary Soviet and Russian awards and prizes. He is a member of several academies and of the Pugwash Peace Movement.

Everyone who is well acquainted with A N Tavkhelidze is aware of his commitment to science and his great strength of character. An extraordinarily hardworking man, he can bring people together to work for a joint purpose. He is a true friend and a very kind man.

Albert Nikiforovich's colleagues at the Nuclear Physics Department of the Russian Academy of Sciences, at the RAS Institute for Nuclear Research and at the Joint Institute for Nuclear Research, his close associates and pupils wish him good health and happiness, and new major achievements for the benefit of science.

N S Amaglobeli, A M Baldin, G T Zatsepin,
V G Kadyshevskiĭ, V M Lobashev, N V Krasnikov,
V A Matveev, V A Rubakov, A N Sisakyan,
A A Slavnov, A E Chudakov, D V Shirkov