Vladimir Naumovich Gribov (on his sixtieth birthday)

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The outstanding Soviet theoretician, Corresponding Member of the USSR Academy of Sciences V. N. Gribov has celebrated his sixtieth birthday.

V. N. Gribov was born in Leningrad on March 25, 1930. In 1947 he enrolled at the physics department of Leningrad University. He graduated in physics in 1952.

The first paper of V. N. Gribov, "Interaction of two electrons," was published in 1953 in the journal *Vestnik Leningradskogo Universiteta* [Leningrad University Bulletin]. Nonetheless, only in 1954, when he became a research assistant at the Leningrad Physicotechnical Institute (LPI), was he able to begin independent research. From 1952 to 1954 V. N. Gribov worked as a schoolteacher at vocational school No. 22 of the Leningrad district.

V. N. Gribov was recommended for the assistantship at LPI by I. M. Shmushkevich and K. A. Ter-Martirosyan. But even earlier, while working as a schoolteacher, V. N. Gribov began theoretical research in cooperation with L. É. Gurevich, with whom he published his first papers on the theory of ionic dielectrics and hydrodynamics. After beginning work at LPI, V. N. Gribov shifted his scientific focus to nuclear and elementary particle physics under the influence of L. A. Sliv, K. A. Ter-Martirosyan, and I. M. Shmushkevich. His candidate's dissertation on neutron excitation of the rotational levels of nonspherical nuclei was completed in 1956 under the supervision of K. A. Ter-Martirosyan.

In a series of papers published in 1957–1959 V. N. Gribov developed a phenomenological theory of near-threshold reactions that produce several particles and described what later became a classic method of determining pion-pion scattering lengths. This was followed by a large series of papers on the analytic properties of amplitudes in quantum field theory. V. N. Gribov's lectures on quantum field theory, which were published on the LPI rotary duplicator, became the standard reference and textbook for an entire generation of Soviet physicists.

In the 1960's, V. N. Gribov, together with I. Ya. Pomeranchuk, played a decisive role in the development of the theory of complex momentum. He derived the fundamental result on the narrowing of the diffraction cone and the increase of interaction radius at high energies. To understand what influence V. N. Gribov had on the theory of complex momentum it suffices to list the classic results that bear his name: The Froissard–Gribov partial wave decomposition; factorization theorem of Gribov and co-workers, the Gribov–McDowell symmetry of fermion trajectories, the Gribov-Volkov conspiracy relations, Gribov–Morrison selection rules in diffractive dissociation: Gribov–Pomeranchuk–Ter-Martirosyan reggeon unitarity conditions; Gribov reggeon field theory; Abramovskiĭ–Gribov–Kancheli cut rules for inclusive processes, etc. His studies of the theory of complex momenta propelled V. N. Gribov into the first rank of high-energy interaction theorists and brought him worldwide acclaim.

Research into the multiparticle unitarity constraints on complex momenta, which began with Gribov's seminal 1964 paper co-authored with I. Ya. Pomeranchuk and K. A. Ter-Martirosyan, concluded in 1967 with the development of the Gribov reggeon field theory. Gribov's analysis of scaling laws, deduced together with E. M. Levin and A. A. Migdal in the tight-binding version of the interacting pomeron theory, played an important role in the evolution of the modern theory of type II phase transitions. In 1972 V. A. Abramovskiĭ, V. N. Gribov, and O. V. Kancheli published their famous paper in which they derived the relation between multipomeron contributions to the elastic scattering amplitude and inclusive spectra in multiparticle production processes—the so-called AGK cut rules that underpin the modern theory of inclusive processes. We should note that for a long time V. N. Gribov's papers on pomeron theory and inclusive processes headed the list of the most cited works by Soviet physicists.

VLADIMIR NAUMOVICH GRIBOV

A 1965 paper by V. N. Gribov, B. L. Ioffe, and I. Ya. Pomeranchuk merits special mention. In this paper they were the first to discuss the possible relativistic increase of longitudinal distances that are in strong interactions. This paper and later V. N. Gribov's 1973 lectures on the parton model and its connection with reggeon field theory played a key role in the development of the modern space-time picture of inclusive processes. The idea of a relativistic increase of the secondary particle production domain is now fundamental to the theory of multiparticle production in nuclear collisions.

V. N. Gribov also made a significant contribution to the theory of interactions between nuclei and high-energy parti-

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cles. In 1969 he developed the field theory of multiple scattering and constructed a theory of inelastic screening. Inelastic screening is of central importance to the estimation of neutron cross-sections from data on interactions with deuterons. Also in 1969, V. N. Gribov formulated a model of generalized vector dominance that is now widely used in the analysis of the connection between photoabsorption and deep inelastic lepton scattering from nucleons and nuclei.

In a series of groundbreaking papers in the 1960's, together with V. G. Gorshkov, L. N. Lipatov, and G. V. Frolov he studied the reggeization of elementary particles in quantum field theory. They obtained a fundamental result: in gauge field theories the vacuum singularity—pomeron—lies in the plane of complex momenta with $j > 1$ and corresponds to an increasing total cross-section. This series of papers introduced the double logarithmic approximation. Now a basic method in the theory of electromagnetic processes at electron-positron colliders.

In 1972 V. N. Gribov and L. N. Lipatov constructed a consistent field formulation of the parton model and proposed a computational technique for evaluating deviations from scaling that occur in deep inelastic scattering and electron-positron annihilation into hadrons. In these papers, which preceded quantum chromodynamics, they were the first to derive equations for the evolution of parton distributions, which today are known as the Altarelli–Parisi equations. We emphasize that the 1977 Altarelli–Parisi paper was a simple generalization of the Gribov–Lipatov 1972–1974 results to quantum chromodynamics.

A classic paper by V. N. Gribov, B. L. Ioffe, and I. Ya. Pomeranchuk demonstrated that the cross-section for electron-positron annihilation into hadrons should obey scaling. This result preceded the formulation of the parton model. Also deserving of special note is the 1969 paper by V. N. Gribov and B. M. Pontecorvo on neutrino mixing, which anticipated many results of the wide-ranging debate on neutrino oscillations that came a decade later. In the early 1970's V. N. Gribov authored a separate series of papers on exchange of massless particles, where he derived limits on the rate of increase of weak cross-sections and discovered the so-called cone singularities. Although the derivation of cone singularities in neutrino exchange was of somewhat academic interest, the logarithmic singularity in pomeron trajectory due to small pion mass discovered by A. A. Ansel'm and V. N. Gribov leads to changes in the inclination of the diffraction cone at small momentum transfers. This effect partially explains the experimental results.

V. N. Gribov authored important papers on gauge field theory. He was the first to point out that instantons correspond to tunneling between topologically different vacuums. In 1977 V. N. Gribov discovered the nonuniqueness in the quantization of non-Abelian gauge fields. The problem of Gribov's vacuum copies has not been solved to date. The most recent papers of V. N. Gribov are devoted to quark nonemission and the possible link between nonemission and gauge anomalies. V. N. Gribov remains one of the few who are still actively pursuing the physical solution of the nonemission problem—the most difficult problem of quantum chromodynamics.

V. N. Gribov's scientific research is inseparable from his pedagogic activity. Although he began work at LPI as a research assistant in 1954, V. N. Gribov quickly became the acknowledged leader of the Leningrad school of elementary particle physicists. Already by 1962 he became head of the theoretical physics section of LPI. When the Leningrad Institute of Nuclear Physics was created in 1971 he became head of the theoretical section there. Between 1969 and 1980 he held a joint appointment as a professor at Leningrad University. Today the theoretical section of the Leningrad Institute of Nuclear Physics is staffed almost exclusively by two generations of his students, many of whom have long ago defended their doctoral dissertations. V. N. Gribov's pupils include many physicists working in Moscow, Tbilisi, and other cities. The annual Schools of Nuclear and Particle Physics held at the Leningrad Institute of Nuclear Physics have played a significant role for entire generations of Soviet theoretical physicists. V. N. Gribov's lectures and evening seminars over and above the regular program at these Schools have always been and continue to be a particular attraction.

From 1980 onwards V. N. Gribov has headed the theoretical physics section at the L. D. Landau Institute of Theoretical Physics of the USSR Academy of Sciences.

The scientific achievements of V. N. Gribov have brought him wide acclaim. In 1971 he became the first recipient of the L. D. Landau prize of the USSR Academy of Sciences. In 1972 he was elected a Corresponding Member of the USSR Academy of Sciences as well as an Honorary Member of the American Academy of Arts and Sciences in Boston. In 1978 he was awarded the "Badge of Honor."

Contact with V. N. Gribov is invariably both useful and pleasant. On his birthday we wish Vladimir Naumovich continued creative successes.

Translated by A. Zaslavsky