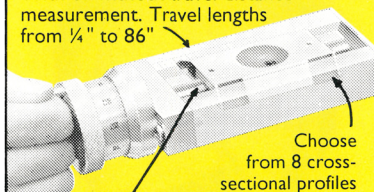


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cluding five in the mathematical and physical sciences.

NAS will give its Alexander Agassiz Medal to **Walter C. Pitman III**, a senior research scientist at Columbia University's Lamont-Doherty Earth Observatory in Palisades, New York. Pitman is being cited for "his fundamental contribution to the plate tectonic revolution through insightful analysis of marine magnetic anomalies and for his studies of the causes and effects of sea level changes." The Agassiz Medal is given every three years.

The NAS Award in Applied Mathematics, also presented every three years, will go to **Paul R. Garabedian** for "his spectacular contributions to computational fluid dynamics, especially the mathematical design of the first shock-free transonic airfoil." The citation also mentions his work for future controlled thermonuclear fusion, specifically, "the first stellarator with an almost smooth magnetic field." Garabedian is a professor of mathematics at New York University.

**Allen J. Bard**, who holds the Hackerman/Welch Regents' Chair in Chemistry in the department of chemistry and biochemistry at the University of Texas at Austin, will receive the NAS Award in Chemical Sciences. Bard is being recognized for "his fundamental

developments in mechanistic electrochemistry, electrochemiluminescence, semiconductor photoelectrochemistry, and scanning electrochemical microscopy."

**Wayne A. Hendrickson** will be the first recipient of the NAS Alexander Hollaender Award in Biophysics, an award that will be given every three years. He was chosen for "his contributions to macromolecular crystallography, in the development of robust methods of phasing and refinement, and in determination of complex and biologically important structures." Hendrickson is an investigator at the Howard Hughes Medical Institute and a professor in the department of biochemistry and molecular biophysics at the Columbia University College of Physicians and Surgeons.

The NAS Award for Scientific Reviewing is given for reviewing in various fields, and the 1998 field is geology and geophysics. **James R. Holton**, a professor in the University of Washington's department of atmospheric sciences, has been selected to receive this award. The citation praises Holton for "his landmark reviews that have become the primary cornerstones of the current understanding of dynamical meteorology of the Earth's stratosphere for both researchers and students."

## OBITUARIES

### Vladimir Naumovich Gribov

**V**ladimir Naumovich Gribov, a leading theorist in particle physics, died in Budapest on 13 August 1997 in the aftermath of a stroke. His outstanding results, original ideas and powerful techniques formed the basis of the current theoretical description of high-energy particle collisions and are applied by theorists and experimentalists worldwide.

Born on 25 March 1930 in Leningrad, Gribov graduated from Leningrad University in 1952. But only in 1954, when the antisemitism of the regime became looser after Stalin's death, could he, with the help of Ilya Shmushkevich and Karen Ter-Martirosyan, start research at the Leningrad Physico-Technical Institute. Rather soon, he became a recognized leader of theorists—informally at first, then later as the head of the institute's theory division.

Gribov's close personal contact with Lev Landau and Isaak Pomeranchuk during his trips to Moscow in the late 1950s was turning point in his scientific life. Landau considered him as his fu-



VLADIMIR NAUMOVICH GRIBOV

ture successor. Pomeranchuk inspired Gribov's interest in the collisions of hadrons at asymptotically high energies.

In 1961, Gribov applied the technique of complex angular momenta, which was first used by Tullio Regge in nonrelativistic quantum mechanics, to the asymptotic behavior of scattering amplitudes. Exploiting the analyticity



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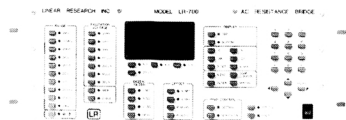
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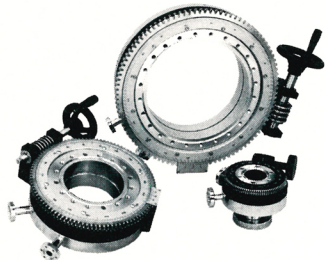
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and unitarity of the  $S$ -matrix, Gribov predicted that the diffraction cone in elastic hadron scattering should shrink asymptotically as the inverse logarithm of energy—a fact that corresponds to the increasing radius of interaction. By using similar ideas, Geoffrey Chew and Steven Frautschi independently reached analogous conclusions, while Marcel Froissart derived his upper limit on the rate of asymptotic increase of hadron cross sections.

In 1962, Gribov and Pomeranchuk—and, independently, Murray Gell-Mann—proved that the exchange of a Regge pole leads to so-called factorization: They established asymptotic relations between cross sections of various scattering processes. Thus, for example, the square of the cross section of pion-nucleon scattering should be equal to the product of the pion-pion and nucleon-nucleon cross sections.

The Regge pole with quantum numbers of the vacuum became known as the Pomeranchuk pole, or pomeron, as it naturally led to the asymptotic equality of particle and antiparticle cross sections on the same target, an equality that had been predicted a few years earlier by Pomeranchuk. From the pomeron, there was a direct path to poles with other quantum numbers, such as the  $\omega$  meson,  $\rho$  meson or nucleons. In the mid 1960s, after Stanley Mandelstam's discovery of new singularities—known as Regge cuts (branch points)—that are more complicated than Regge poles, Gribov created the reggeon diagram technique. This method not only accommodated intricate problems in relativistic hadron physics, but also played an important role in statistical physics by making possible the calculation of the critical indices for second-order phase transitions in condensed matter.

In parallel, Gribov with collaborators from his Leningrad group, applied his methods to sum up higher-order terms in pure quantum electrodynamics. They calculated the cross sections of such processes as the Compton and electron-positron scattering at high energies in the leading double logarithmic approximation. (In particular, they showed that double logarithmic asymptotes do not necessarily have a simple exponential form, but, instead, involve Bessel functions and so on.)

In 1972, within the framework of a pre-quantum chromodynamics field theory, Gribov and Lev Lipatov published a theory of deep inelastic scattering and electron-positron annihilation. Their perturbation parameter was the coupling constant,  $g^2$ , multiplied by the logarithm squared of energy or momentum. In the framework of QCD, the Gribov-Lipatov approach

was realized in 1977 by Yuri Dokshitzer and, independently, by Guido Altarelli and Giorgio Parisi. Under the acronym DGLAP (assembled from the first letters of the researchers' surnames), these equations are widely used to describe hard collisions at high-energy accelerators.

Many young theorists who were attracted to the beauty of theoretical physics by Gribov's skills as a teacher. One of them was his son Lenya, who died in 1984 in a mountaineering accident. The loss of their only child was a tragic shock for his parents.

Gribov's theoretical school and his seminars—first at Leningrad Physico-Technical Institute, then, since 1973, at the newly established Leningrad Institute of Nuclear Physics—became world-famous. Unlike seminars in the West, they were open-ended, for each seminar was a real brainstorming session that lasted until a clear resolution was achieved and it was decided that the paper under discussion was either correct or wrong. Visitors, many of them from abroad, were happy to go through this beneficial ordeal.

In the 1970s, Gribov was elected to the Soviet Academy of Sciences and to the American Academy of Arts and Sciences. He was the first recipient of the Landau Prize. Later, he became an honorary member of the Hungarian Academy of Sciences, received the Alexander von Humboldt award in Germany and the J. Sakurai prize of the American Physical Society.

Gribov worked very hard on any subject that interested him. Together with Bruno Pontecorvo, he described  $\nu_\mu \leftrightarrow \nu_e$  oscillations in a scheme with a minimal number of neutrino components. (This was in 1969, when the  $\tau$  lepton was unknown.) He discovered and formulated the problem of gauge copies in nonabelian theories. What became known as Gribov's copies are cited in modern papers on lattice and topological theories. Unfortunately, he often did not publish his ideas and results. I once witnessed a discussion between Gribov and Yakov Zeldovich, in which Gribov insisted, long before Steven Hawking's proposal, that, due to quantum tunneling, black holes must emit particles.

Gribov moved to the L. D. Landau Institute of Theoretical Physics in Moscow in 1980, after which he concentrated fully on the problem of confinement in QCD. He was concerned with the role of light quarks and especially with a general problem of binding together massless particles. His last paper "QCD at Large and Short Distances," which was posted on the Los Alamos preprint server in August 1997, awaits serious study, as do his preced-

ing papers and lectures on the subject.

Vladimir Gribov, Volodya, had a special charm that attracted people. He did not like to accept "the common wisdom." His approach to any new phenomenon, not only in physics, was critical and creative. His way of thinking was original, witty and deep; human charm was uniquely combined with this intellectual power. Volodya's death is a grief for all who knew him. His impact on physics and physicists will be remembered with admiration and gratitude.

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## Russell La Verne Heath

Russell La Verne Heath, well known for his leadership in many of the developments in gamma-ray spectrometry, died in Idaho Falls, Idaho, on 15 October 1997.

Born in Denver on 13 June 1926, Russ grew up in Durango, Colorado. After obtaining a BS degree in physics from Colorado State University in 1949, he first attended Rutgers University but then moved to Vanderbilt University, where he obtained a MS degree in physics in 1951.

From 1950 to 1952, Russ worked with P. R. Bell at Oak Ridge National Laboratory in the development of inorganic and organic scintillators for use as gamma-ray detectors. The skills and interest that Russ acquired during this period set the course for his life-long involvement with gamma-ray spectrometry and related nuclear instrumentation.

In 1951, Russ moved to the National



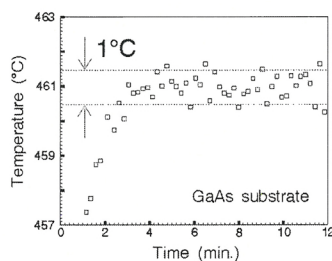
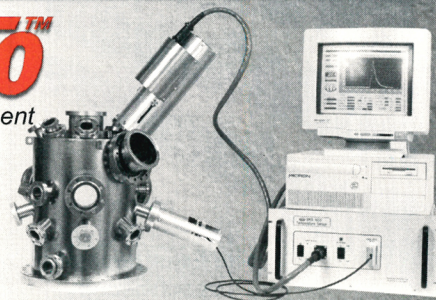
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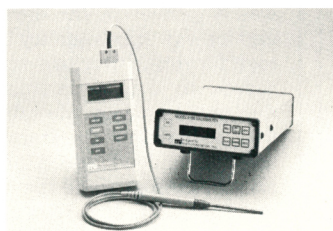
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