OBITUARIES

To notify the community about a colleague's death, subscribers can visit **www.physicstoday.org/obituaries**, where they can submit obituaries (up to 750 words), comments, and reminiscences. Each month recently posted material will be summarized here, in print. Select online obituaries will later appear in print.

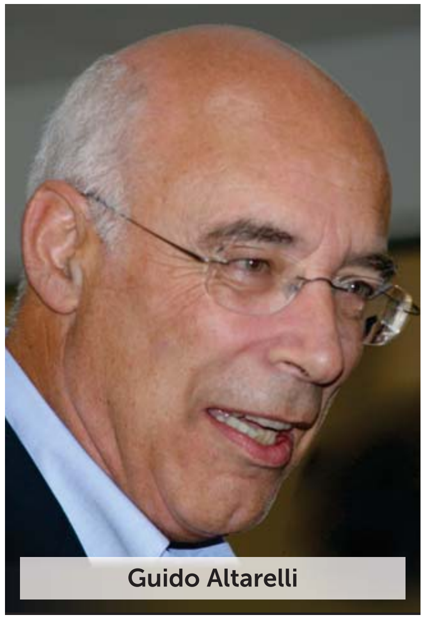
Guido Altarelli

Guido Altarelli, one of the most well-known and respected high-energy physicists, was born in Rome on 12 July 1941 and died in Geneva on 30 September 2015. His influence is ubiquitous. His most famous contribution is the discovery with one of us (Parisi) of the evolution equations of quark and gluon distribution functions inside hadrons.

Guido graduated with a *laurea* in physics from the University of Rome "La Sapienza" in 1963; his adviser, Raoul Gatto, was at the University of Florence at the time. Guido collaborated on his thesis with his friend Franco Buccella on the process $e^+e^- \rightarrow e^+e^-\gamma$; their computations were later used in experiments at the ADONE particle-beam collider at the Frascati National Laboratory. In 1964 he went to the University of Florence to join the lively and large group of young researchers (*gattini*) working under Gatto's careful and inspiring supervision. Guido spent 1968–70 at New York University and at Rockefeller University.

In 1970 Guido became an assistant professor of theoretical physics at La Sapienza and was made a full professor in 1980. From 1985 to 1987, he directed the Rome section of the National Institute for Nuclear Physics. During that time he also spent long periods at other institutions such as the École Normale Supérieure in Paris and Boston University.

Guido became a senior staff physicist in the theory division at CERN in 1987; he worked there until 2006, and he served as the theory division leader in 2000–04. In 1992 he joined the newly founded University of Rome 3, where he remained until formal retirement in 2011. He then divided his time between teaching in Rome and conducting research, mostly at CERN. He continued his research up to his last months. Toward the end of his career, he received three prestigious awards: the 2011 Julius Wess Award from Karlsruhe Institute of Technology, the 2012 J. J. Sakurai Prize for Theoretical Particle Physics (shared with Bryan Webber and Torbjörn Sjöstrand) from the American Physical Society, and the 2015 High Energy and Particle Physics Prize from the European Physical Society.


Guido Altarelli

Guido devoted his scientific efforts exclusively to the theory of high-energy physics. While he was in Florence, he worked with Gatto and the other *gattini*—among them Buccella, Giuliano Preparata, and one of us (Maiani)—mostly on topics that were fashionable at that time, such as $SU(6)$ symmetries and Regge poles. After his arrival in Rome, Guido focused his scientific interests on the parton model. Later he concentrated on what we now call the standard theory; he followed the strong tradition of the Rome school, led by Nicola Cabibbo, of using field-theory tools to understand particle physics. He wrote many of the resulting research papers with Cabibbo, Keith Ellis, Guido Martinelli, Roberto Petronzio, and both of us.

Among Guido's most important contributions are his papers on octet enhancement of nonleptonic weak interactions in asymptotically free gauge theories. He showed for the first time how the newly born theory of quantum chromodynamics (QCD) could contribute to solving some of the old mysteries of weak interactions—in this case, the dominance of the $\Delta I = \frac{1}{2}$ strangeness-changing processes over the much weaker $\Delta I = \frac{3}{2}$ processes. His other important contributions of that period are the first computation of the electroweak corrections to the muon magnetic-moment anomaly, the discovery of a large QCD correction to the naive parton prediction in $\mu^+\mu^-$ production, and above all, the derivations of the Altarelli–Parisi equations. The evolution equations stemmed from an idea of Guido's to make previously obtained results on scale violations clearer and more exploitable. The paper was written while both authors were in Paris, and Guido liked to remark that it is the most cited high-energy physics French paper.

In the 1980s Guido became interested in making predictions—specifically for production of jets, heavy-vector mesons, and other exotic objects like Higgs and supersymmetric particles—for future CERN experiments. He continued analyzing the consequences of QCD on weak interactions and computing the two-loop contributions. He also wrote seminal papers on the decay of heavy quarks. Guido started to be deeply intrigued by the polarized-proton structure function; with Graham Ross, he discovered the crucial interplay between the gluon anomaly and polarization effects.

Guido produced abundant results from his many interactions at CERN. Among the many problems he worked on were a model-independent analysis of electroweak data, done with Riccardo Barbieri, and theoretical predictions of the Higgs mass and production cross section.

With the new millennium, Guido started working on a subject he had become fascinated with: the elegance of the tri-bimaximal neutrino mixing. Many of his papers, mostly with Ferruccio Feruglio, are dedicated to the search for the origins of that baffling symmetry.

His scientific success was inseparable from his human qualities. Guido aimed to get a deep understanding of the world, hence his great passion for history, especially that of the many countries he traveled through. His characteristic traits were his great kindness and intellectual honesty, coupled with a rather ironic view of life in general and of himself. His great inquisitiveness and the enjoyment that he derived from learning new things and putting a puzzle together allowed him to summarize subjects in ways that permitted us to take stock of the current state of a field of research and see new directions to pursue. He liked clear, precise formulations that could be understood by all.

Guido was a generous scientist who conceived many of his works in a spirit not only of discovery but also of service to the community. He relished his collaborations in the large particle-physics community. It is difficult to think what the status of the field would be without his contributions.

Luciano Maiani
Giorgio Parisi
University of Rome "La Sapienza"
Rome, Italy

Benjamin Lax

Benjamin Lax, a pioneering solid-state and plasma physicist, an MIT professor of physics, and the long-time director of the MIT National Magnet Laboratory, died at age 99 on 21 April 2015 in Newton, Massachusetts.

Born on 29 December 1915 in Miskolc, Hungary, Ben moved with his family in 1926 to the US, where they settled in Brooklyn, New York. After completing Boys High School in Brooklyn, he graduated cum laude from the Cooper Union for the Advancement of Science and Art in 1941 with a degree in mechanical engineering. He wanted to do graduate work in mathematics at Brown University, but he was drafted into the US Army in 1942. Assigned to the famous MIT Radiation Laboratory, he worked on a crash program to develop a new radar system, named Little Abner, which was successfully tested in the field. After World War II ended, Ben went to MIT, where he completed his PhD in physics in 1949 under Sanborn Brown. For his thesis, "The effect of magnetic field on the breakdown of gases at high frequencies," he utilized cyclotron resonance, a technique that he continued to pursue throughout his career.

In 1951 Ben joined the MIT Lincoln Laboratory, where he made significant contributions to the understanding of semiconductors, particularly by using cyclotron resonance to study the semiconductors' energy band structure. Ben and his coworkers employed cyclotron

BACHRACH PHOTOGRAPHY

Benjamin Lax

resonance absorption of microwave radiation to measure the effective mass of electrons, which was determined by the curvature of the energy bands. His studies of germanium and silicon were particularly important to the progress of semiconductor devices. Ben was also a coinventor on an early patent for the semiconductor laser. Because of his scientific advances and his abilities as a leader, Ben was made head of the Lincoln Laboratory's solid-state division in 1958 and served as associate director of the lab in 1964–65. In 1960 he was recognized by the American Physical Society with the Oliver E. Buckley Condensed Matter Physics Prize "for his fundamental contributions in microwave and infrared spectroscopy of semiconductors."

In the late 1950s, Ben led a group of scientists and engineers in proposing that a high-magnetic-field laboratory be built on the MIT campus to conduct research in solid-state and plasma physics, magnetic resonance spectroscopy, and magnet engineering. The successful proposal led to the 1960 establishment of the National Magnet Laboratory (NML), later renamed the Francis Bitter Magnet Laboratory. Ben served as director for its first 21 years. In 1965 he also accepted a position as a professor in the MIT physics department.

Under Ben's leadership, the NML became known internationally for its wide-ranging research, including in such areas as the physics of solids in high magnetic fields; high-field nuclear magnetic resonance; biomagnetism; magnet technology, including magnetic levitation for trains; laser–plasma interactions in high magnetic fields; and laser–plasma diagnostics. He was also interested in the use of high magnetic fields to achieve better confinement of plasmas for fusion. The first high-magnetic-field tokamak confinement device, Alcator A, was constructed at the NML and successfully demonstrated the benefits of the high-field approach. But the research on fusion energy and plasma physics soon required larger facilities, which led to the creation of what is now the MIT Plasma Science and Fusion Center.

Ben supervised 36 PhD students, many of whom went on to highly successful careers in physics and engineering. Ben retired from the NML in 1981 and from the physics faculty in 1986. But he continued working in physics for over 15 more years, including being a consultant at the Lincoln Laboratory. He was coauthor with Kenneth Button of the classic book *Microwave Ferrites and Ferrimagnetics* (McGraw-Hill, 1962) and author or coauthor of more than 300 journal articles and book chapters.

Ben was also a talented athlete; he was a gymnast in his youth and began skiing at the age of 50. He brought to the athletic field the same intensity and enthusiasm he conveyed in the laboratory. He was a wonderful mentor to countless students, young scientists, and colleagues. Ben's brilliance, his boundless energy, and his enthusiasm for physics will be greatly missed.

Daniel Cohn
Richard Temkin
Massachusetts Institute of Technology
Cambridge PT

RECENTLY POSTED NOTICES AT
www.physicstoday.org/obituaries:

Robert James Swenson
3 March 1934 – 26 December 2015

Lev Borisovich Okun
7 July 1929 – 23 November 2015

Jan Korringa
31 March 1915 – 9 October 2015

Paul S. Wesson
11 September 1949 – 16 September 2015

Michael S. Moore
24 October 1930 – 22 July 2015

Richard Roy Boedeker
8 April 1933 – 8 April 2015