

Ugo Amaldi – Curriculum Vitae

Ugo Amaldi, born in Rome on 26 August 1934, is an Italian and Swiss (since 2006) citizen. He graduated *cum laude* in Physics from Sapienza University in 1957. He spent fifteen years at the Physics Laboratory of the Italian National Health Institute (ISS, Rome) and twenty-seven years at CERN (Geneva). At ISS he was Director of Research, leading two teams: one focused on fundamental research in nuclear and atomic physics, and another on applied research, including nuclear power plant monitoring and the application of X-rays to cancer therapy.

Following the 1973 co-discovery—at the CERN Intersecting Storage Rings—of the increase in the proton-proton cross section with energy, he was offered a permanent position as Senior Scientist at CERN. There he worked both experimentally and theoretically on proton and neutrino collisions at the Proton Synchrotron (PS) and the Super Proton Synchrotron (SPS).

To study high-energy electron-positron collisions, in 1980 he founded and led the DELPHI Collaboration, composed of approximately 500 physicists from 40 laboratories in 20 countries. DELPHI was one of four international collaborations that installed large detectors (about 12 metres long and 12 metres in diameter) on the 27 km Large Electron-Positron Collider (LEP). In 2025, in recognition of his contributions to CERN, he was named Scientist Emeritus.

Following a national competitive examination, in 1991 he was appointed full professor, first in Florence and subsequently in Milan. He taught Medical Physics and Accelerator Physics at the University 'Statale' of Milan and, until 2006, at the University of Milano-Bicocca.

He has authored more than 600 publications in atomic, nuclear, particle, accelerator and medical physics (Discipline H-index = 83; citations 29,500 – Research.com 2024). Notable scientific contributions include:

- With Franco Selleri (1962), the first use of the unitarity relation to calculate proton-proton diffraction at about 1 GeV.
- The first coincidence experiments on quasi-free electron scattering on nuclei (1964).
- The first coincidence experiment on quasi-free electron scattering on atoms (1969). These two lines of investigation opened new research fields that remain active to this day.
- The co-discovery at CERN (1973) of the rising proton-proton cross section with energy, introducing the now-standard “Roman pots” technique.
- The first published proposal (1975) for a very high-energy superconducting electron-positron linear collider.
- A proposal and measurement (1979) of the polarization of muons produced in neutrino interactions, within the CHARM collaboration.
- The first LEP measurement (1991), with the DELPHI collaboration, of the three-gluon coupling.
- The first evidence (1991), based on early LEP data and work with Wim de Boer, of the convergence of the weak, electromagnetic and strong couplings around 10^{16} GeV—pointing to supersymmetric unification of the fundamental forces.
- The proposal (1993) of a new type of accelerator—the ‘cyc-linac’, a combination of a 20–30 MeV cyclotron with a high-frequency linac—for improving the quality of hadron therapy treatments.

He has authored several science books for educated readers and the general public:

- *Fisica delle radiazioni* (Boringhieri, 1971; 925 pages);
- *Molecole e radiazioni* (Editrice Universitaria, 1972; 176 pages);
- *Fisica Moderna* (Zanichelli, 1999; 228 pages);
- *Cosmogenesi e Astrofisica* (Zanichelli, 2000; 65 pages);
- *La Fisica del Caos* (Zanichelli, 2011; 116 pages);
- *Sempre più veloci – La vera storia del bosone di Higgs* (Zanichelli, 2012; 280 pages), which received second prize in the 2013 inaugural science communication competition of the 'Associazione del Libro';
- *Relatività e quanti* (Zanichelli, 2012);
- *Particle Accelerators: From Big Bang Physics to Hadron Therapy* (Springer, 2015; 284 pages).

Over the past forty years, he has co-authored—together with secondary school teachers—approximately forty physics textbooks. These are used by over one-third of Italian high-school students. More than two million pupils have studied physics with “*l’Amaldi*”.

In the early 1990s, Ugo Amaldi shifted his focus from fundamental physics to medical applications, particularly in cancer therapy and diagnostics. Since then he has served as President of the TERA Foundation, which he established in 1992 in Novara together with Gianpiero Tosi, Gaudenzio Vanolo and other colleagues to promote hadron therapy—a term he coined—in Italy and Europe. This radiotherapy technique spares healthy tissues better than conventional X-rays and, using carbon ion beams, can treat radioresistant tumours that are untreatable with photons.

In the late 1990s, in collaboration with CERN and scientists from the MedAustron project, the TERA Foundation designed an innovative synchrotron-based facility for protons and carbon ions. In 2002 it secured funding from the Italian Ministry of Health, enabling the creation of the CNAO Foundation—established with five major hospitals in Lombardy—to build in Pavia, with support from the Italian National Institute for Nuclear Physics (INFN), the National Centre for Oncological Hadron Therapy.

The first patient was irradiated in September 2011. Since then, over 6,000 patients have been treated—under the National Health Service—for more than ten types of solid tumours untreatable with conventional X-rays. Thanks to three recent upgrades, by 2027 CNAO (www.cnao.it) will be the best-equipped hadron therapy centre among the roughly hundred and thirty currently operating worldwide. Ugo Amaldi is CNAO President Emeritus.

To pursue the same goals as TERA, in 2023 he founded the Tera-Care Foundation in Geneva (www.tera-care.ch), where he serves as Scientific Director. The foundation is currently working with CERN and other institutions to design and construct SHARP (Systemic Hadron-therapy with Alpha Radioisotopes Platform) on the CNAO site.

In 1992 he was elected member of the Accademia delle Scienze (Accademia dei XL) and in 1994 he gave the *lectio magistralis* opening the Academic Year, in the presence of the President of the Republic Oscar Luigi Scalfaro.

In 2007 the President of the Italian Republic Giorgio Napolitano awarded him the Gold Medal for Merit in Science and Culture. He has also received the Order of Friendship of the Russian Federation.

In 2025 he was named Scientist Emeritus by CERN.

In 2026 he was appointed, *motu proprio* of the President of the Italian Republic Sergio Mattarella, Cavaliere di Gran Croce and, by the Holy See, Commendatore dell'Ordine di San Gregorio Magno.

He is a Fellow of the European Physical Society: "For his many important contributions to high-energy particle physics, in particular for his decisive role in the approval and construction of the DELPHI experiment at CERN, as well as for his recent contributions to medical physics."

He is also an Honorary Member of the Italian Physical Society (SIF) and the Italian Association of Medical Physics (AIFM).

Ugo Amaldi is a member of the European Academy of Sciences and Arts, the Polish Academy of Arts and Sciences, the Academy of Sciences of Turin, and the Istituto Lombardo – Academy of Sciences and Letters of Milan.

In 2026 he was elected Foreign Member of the Accademia Nazionale dei Lincei.

He is Distinguished Affiliated Professor at the Technical University of Munich (TUM) and Doctor *honoris causa* of the Universities of Lyon, Helsinki, Valencia and Uppsala.

In 2025, Research.com placed him 59th among the 90 Best Physics Scientists in Switzerland, with a Discipline H-index of 83 and 29,500 citations.

His awards include:

- the F. M. Grimaldi Prize (1965 – Italian Physical Society, SIF), for the quasi-free electron scattering experiments on nuclei;
- the Bruno Pontecorvo Prize (1995 – Dubna, first edition), for contributions to the unification of the fundamental forces;
- the Renata Borlone Prize – Woman in Dialogue (2006 – Loppiano);
- the International Prize for Catholic Culture (2012 – Bassano del Grappa);
- the Leonardo-UGIS Prize for lifetime achievements (2014 – National Museum of Science and Technology, Union of Italian Science Journalists);
- the International Day of Medical Physics Award (2018 – Italian Association of Medical Physics).

Geneva, July 2026

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