

Un grand homme s'en est allé...



It is with deep sadness that we have learned of the death of Prof. Massimo Salvatores on March 27.

Prof. Salvatores, or simply Massimo or Max, as he liked to be addressed, will be remembered for his many contributions to Reactor Physics and Nuclear Science. Many of these contributions were made as part of international collaborations that he often spearheaded. At the NEA, Massimo had been the driving force behind numerous initiatives and collaborative projects for over 35 years.

Massimo held a PhD in physics (1963) from the University of Turin, Italy. He joined CEA in 1977. Very early on, he realized the central importance of nuclear data in reactor calculations and became very active in that area. His pioneering work on the application of perturbation theory and sensitivity studies applied to fast reactor analysis is well known. Two of his many publications illustrate well his career-long interest for this field of research: « Nuclear Data Adjustment with Integral Experiments » (NSE, 1973) and « Use of Integral Experiments in the Assessment of Large Liquid Metal Fast Breeder Reactor Basic Design Parameters » (NSE, 1984).

With a handful of other key players, Massimo took a leading role in establishing the NEA Data Bank JEF nuclear data file project, which he chaired from 1985 to 1994. The very successful JEF-2.2 file was released during that period, and is still in use today in the nuclear industry. In the late 80's, Massimo was instrumental in the creation of the NSC Working Party on International Nuclear Data Evaluation Co-operation (WPEC), which he chaired from 1993 to 1995. Subsequently, he became chairman of the NEA Nuclear Science Committee.

Massimo realised early on the importance of experiments in nuclear reactor physics, particularly integral experiments in critical facilities and reactors, not only for nuclear data and model validation purposes, but also for adjusting cross sections and reducing uncertainty margins. In the 80's and early 90's, as head of the CEA Cadarache Reactor and Fuel Cycle Physics Division, he made key contributions to fast reactor core analysis methods, neutron physics experiments, control-rod and sodium-void worth calculations, as well as radiation shielding studies, all of which had important implications for the SUPERPHENIX reactor start-up and subsequent operation. Massimo's interests were not limited to fast reactor physics; in fact, his actions had a far broader scope, helping give much momentum to neutron physics and reactor physics in general and make it an attractive field of research. He stimulated collaborations with the UK, Italy, Germany, Belgium, Switzerland, the Netherlands, USA, Japan, Russia, and other countries. Some of us still have vivid memories of the 1st

ANS-sponsored international conference on Reactor Physics held outside the US, which he organized in Marseille in 1990!

In the 1990s and 2000s, as CEA Research Director, Prof. Salvatores played a leading scientific role in the development of research programs on plutonium burners (European CAPRA program), then on actinide and fission product separation and transmutation, both at the national (French waste management acts of 1991 and 2006) and international levels. He was involved in the NEA Working Party on Scientific Issues in Nuclear Waste Partitioning and Transmutation (WPPT, 2000) and co-authored the well-known NEA 2006 report: "Physics and Safety of Transmutation Systems". He led several international studies and assessments on innovative fuel cycles, plutonium management, Partitioning and Transmutation technologies and related impact assessments. He proposed unique demonstration experiments, he also developed an original concept of regional fuel cycle with applications to Europe.

Massimo later served as Senior Scientific Advisor to the CEA Nuclear Energy Director. From 2007 to 2009, he was Policy Director of the Generation-IV International Forum. He served as advisor to the Karlsruhe Institute of Technology, Germany and to Argonne National Laboratory, USA.

For a large fraction of his career, Massimo was also involved in the education and training of young physicists. For about 20 years, he gave advance graduate-level lectures on Reactor Physics and Shielding. He was also the thesis director of numerous PhD students. In 1995, he created the Frédéric Joliot Summer School in Reactor Physics. This Summer School has had considerable success from its start, and is still running today.

After retiring, Massimo continued some research activities on nuclear data, sensitivity and uncertainty analysis, on innovative data assimilation techniques and on advanced simulation and experimental validation. He contributed many important inputs to the international High Priority Request List, a valuable guide for the nuclear data community. Some of his activities were actually part of NEA projects he had himself initiated, in particular several WPEC subgroups, two of which are still ongoing: SG39 on *Methods and approaches to provide feedback from nuclear and covariance data adjustment for improvement of nuclear data files*, and SG46 on the *Efficient and Effective Use of Integral Experiments for Nuclear Data Validation*.

Massimo's contribution to the field of nuclear physics bears the mark of his considerable insight, guidance, inspiration, and leadership. If he believed in your project, then he gave you his full support. If he disagreed with you, he told you and gave you scientific arguments to convince you. If you had a question, he quickly captured the essence of it and provided answers and directions based on his vast experience. He taught and encouraged at length, and he was keen to transfer his knowledge to those who wanted to learn. He was a master at combining friendly advice with reasoned persuasion to convey his ideas about a way forward. As a result, more often than not, our perceptions and plans took a different path than anticipated, following the guidelines he had set out.

Massimo had received many distinctions and awards, especially the prestigious French Academy of Sciences "Grand Prix Ampère," the American Nuclear Society (ANS) Nuclear Technology Award and the "Eugene Wigner" Reactor Physicist Award. He was also a Fellow of the ANS and member of the International Nuclear Energy Academy.

Massimo's name is synonymous with more than forty years of personal dedication to nuclear reactor physics and related science, with many outstanding technical and scientific contributions, the promotion of research programs and international collaboration, and the training of two generations of young physicists. He was an extraordinarily active and knowledgeable scientist, a leader, an inspiring and stimulating person, a pleasant person to work with, a role model for many.

Massimo liked to refer to Enrico Fermi as one of a few giants, “many other physicists being mere dwarfs perched on his arms and shoulders.” Today, as Massimo is no longer among us, we feel like dwarfs having lost their giant.

We will miss a colleague and a friend. Our pain is huge, commensurate with his legacy. Our thoughts and condolences go to his family, also to Pino and Brigitte.