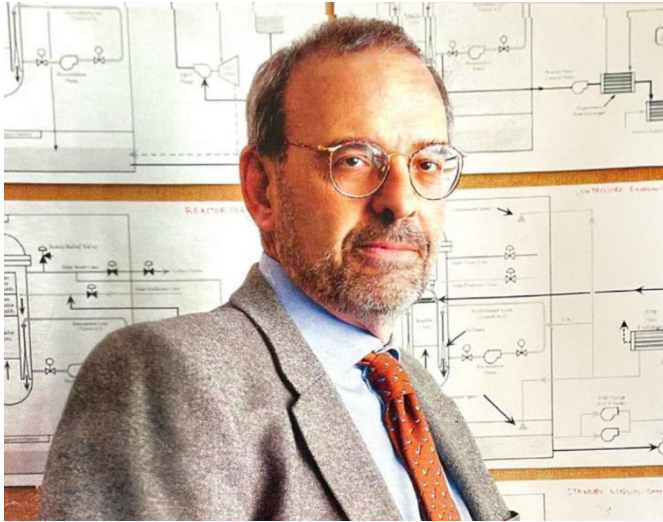


Ioannis Agamemnon Papazoglou

In Memoriam

1950 to 2021



Our dear friend and esteemed colleague passed away on October 2, 2021, after a lengthy fight with cancer. Yannis is remembered by many for his profound contributions to the field of probabilistic risk assessment (PRA) and for his exacting standards of intellectual integrity. His creative talents and keen leadership skills resulted in many significant contributions to PRA and the impact of modern technology on human safety and the environment.

Yannis earned his undergraduate degree in electrical and mechanical engineering with

honors from the National Technical University of Athens in 1972 and the same year he entered graduate school in nuclear engineering at Massachusetts Institute of Technology (MIT) where he received his Master of Science degree in 1974. Under the guidance of Professor Elias Gyftopoulos, he then began his doctoral thesis studies on PRA as applied to nuclear reactors. His thesis work was largely conducted at Brookhaven National Laboratory (BNL), during 1975-1977 under the supervision of Dr. Robert A. Bari who was a group leader for fast reactor safety. At the same time his wife Angelica, an urban planning economist, joined the energy analysis center at BNL and since then the two of them have always been together.

During those years, BNL was supporting the U.S. Nuclear Regulatory Commission (NRC) in its elaborate review of the license application for the Clinch River Breeder Reactor, which was planned to be the demonstration reactor of the U.S. fast reactor technology program based on sodium technology. In the mid-1970s, the Clinch River Breeder Reactor was planned to be the first step towards commercializing of fast reactors in the U.S. Work on the prototype large breeder reactor (PLBR) was planned for licensing review starting in 1978, to be followed by licensing review of CBR-1 – a full commercial-size power reactor starting in 1980.

Yannis' doctoral thesis was entitled: "Markovian Reliability Analysis Under Uncertainty with An Application on The Shutdown System of The Clinch River Breeder Reactor." BNL benefitted greatly from his association with the Laboratory because Yannis provided a series of lectures for the staff on the new field of PRA which was concurrently being defined by the epic study on risk assessment of commercial reactors in the U.S., known as WASH-1400. BNL was grateful to NRC for providing funding for Yannis' work at BNL. However, the sponsor wanted to be assured that the research conducted by Yannis would not have implications for regulation because, at the time immediately after publication of WASH-1400, it was viewed that PRA was not directly relevant to regulatory decision making.

In 1978, Yannis returned to MIT to lead a study of non-proliferation risks of the nuclear fuel cycle. This work was part of the US-based program: Nonproliferation Alternative Systems Assessment Program (NASAP). Professor Norman Rasmussen participated in this study which was influenced by the techniques developed in the WASH-1400 study. The results of this work did not appear in the open literature at that time, but an extension of the essential methodology appeared in the Proceedings of PSAM 7 (2004) as "Decision Analysis Based Methodology for the Assessment of the Proliferation Resistance of Nuclear Power Systems" (Papazoglou and Bari).

In the aftermath of the 1979 accident at the Three Mile Island (TMI) Nuclear Plant, Unit 2, risk analysis began to be more widely appreciated as potentially important in NRC work, and Yannis returned again to BNL in 1980 and starting in 1981 led a group on PRA as applied mainly to light water reactor safety. For some years, this group supported the US Nuclear Regulatory Commission (NRC) in applications of risk analysis to decision-making about reactor safety. In those early years of formulation of the use of PRA in licensing activities, there were plans to have the reactor industry perform full scope PRAs for all commercial reactors as part of NREP: the National Reliability Evaluation Program. Because NREP had to be viewed in the context of other post-TMI impacts (e.g., degraded-core rulemaking) the actual PRA programs and requirements that emerged, evolved to accommodate those needs. A main outcome of this program was the development of a PRA Procedures Guide (NUREG/CR-2815) and a PRA Review Manual (NUREG/CR-3485) to be used in conjunction with licensing activities for the commercial reactors in the USA. Eventually, under the NRC's "Individual Plant Examination" program launched in 1988, all plants did in fact perform PRA-style analyses, but a great deal of PRA-related work was done for NRC by Yannis' group before that happened. One key application of PRA methods was a study done to help resolve NRC's "Unresolved Safety Issue A-17 on Systems Interactions." Based on an earlier comprehensive review of systems interactions methods by A. Buslik, Papazoglou, and Bari, a BNL team in Yannis's group applied modified PRA methods to search for systems interactions in an operating plant, and actually found a functional systems interaction that violated the licensing basis, although that plant had by then been operating for some years.

Yannis departed from BNL in 1985 to join the National Center for Scientific Research (NCRS) "DEMOKRITOS." In 1988 Yannis started research on probabilistic analyses of chemical installations at while working on the project "Benchmark Exercise on Major Hazard Analysis". This was the first project funded by the European Union, where 11 European research groups assessed risk of an ammonia refrigerated tank and compared their methods and results. At this period probabilistic methods already developed for the nuclear industry, where applied and tested in the chemical. Yannis created the "Systems Reliability Laboratory and Industrial Safety" within NCSR "DEMOKRITOS" and was the head of it until his retirement. Within this Lab, he developed Markovian methods for dynamic chemical systems and was the principal investigator in EU and national funded research projects. In the early 1990s he developed a methodology and associated tool for quantification of risk from accidental releases of toxic and/or flammable substances which incorporated uncertainty assessment, within the EU funded project "SOCRATES." He also developed a methodology and associated tools for emergency response and land use planning around chemical sites based on multi criteria decision making method, within the EU funded project "LUPACS." In the early 2000s he developed an integrated probabilistic methodology incorporating technical and the managements systems of chemical installations and Master Logic diagrams for the chemical industry within the EU funded project "I-RISK".

In the period 2003-2014 he developed a methodology and associated tools for supporting decisions relevant to the management of occupational risk in the ORCA (Occupational Risk Calculator) project, performed on behalf of the Ministry of Social Affairs and Employment of the Netherlands. As part of the ORCA project a list of sixty-four generic hazards related to various aspects of worker's activities were identified and risk to workers in the Dutch population from each of these hazards was quantified. This research was performed in collaboration with several Dutch research organizations, such as TUDelft, RIVM, and WhiteQueen. Two tools were developed in this period the "bowtie builder" to develop and quantify bowties and "ORCA" for risk quantification of any kind of working activities.

The "Systems Reliability Laboratory and Industrial Safety" collaborated with the Greek ministry of Environment and developed guidelines for quantitative risk assessment of the SEVESO industries handling toxics, flammables, and explosives. In collaboration with the Ministry of Social Affairs the Lab performed guidelines for evaluating Safety studies and almost all the safety studies of the Greek industry were evaluated.

Yannis was President and Board of Directors of IAPSAM (International Association for Probabilistic Safety Assessment and Management) in the period 1994-1996 and member of the Board of Directors 1996-2002. He was also the Chairman of ESRA (European Safety and Reliability Association) in the period 2005-2009 and Officer of the Association from 2000 to 2005. He was the General Chairman of two ESREL conferences, the first one held in 1996 in Crete together with PSAM 3 and the second one held in Rhodes in September of 2010.

Yannis was the Director of the Institute "Nuclear Technology and Radiation Protection" and member of the Board of Directors of NCSR "DEMOKRITOS" in the periods 1988-1994 and 2008-2011 His colleagues mourn the loss of the gentleman and leader. In addition to his scientific accomplishments, Yannis was an incredible human being. Always giving, sharing ideas, inspiring a whole generation of young scientists in Greece and the US. His contributions to science, engineering, public safety, and the well-being of his friends and colleagues, pass the test of time. He is survived by Angelica, his loving wife of 50 years, and children Agamemnon and Stathia, already accomplished young professionals in Athens and London correspondingly. He was blessed with the support and love of this incredible family during his last difficult years. His humanity, intellect, humor, and great personality will be missed, and Yannis' memory will be with us always.

February 2022

Olga Aneziri

Robert A. Bari

Vasilis M. Fthenakis

Robert W. Youngblood