

## SCS and Simulation: Fifty Years of Progress

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The SCS publications and conferences have been excellent platforms for simulationists to share their experiences and the results of their research. During 2002, on its 50<sup>th</sup> anniversary, the SCS started a total rejuvenation process to serve better the sophisticated simulationists as well as the casual users of simulation techniques through individual and institutional memberships and completely redesigned publications and activities. Simulation continues to fascinate me and I still see tremendous challenges both for its advancement and for its role as an enabling technology for so many important application areas. I have been involved in simulation since 1964. Throughout different phases of my career, I have observed the interactions of SCS and simulation while I was active in both of them:

*1963-1967:* I was working as a systems engineer at IBM Turkey. I became a member of the SCS in 1966, and during this period, I tried to become knowledgeable on simulation and sources of simulation. My references had over 2000 entries. In the early days, analog and hybrid computers dominated. In 1967, SCS published the definition of CSSL (Continuous System Simulation Language) which was influential for continuous system simulation languages for many years.

*1967-1970:* I was in Tucson, AZ, working toward my Ph.D. My dissertation entitled “GEST: General System Theory implementor,” was the first model-based simulation specification language for continuous systems. Some concepts such as component models, model coupling, time-varying coupling, program generators transforming specifications of models of dynamic systems—expressed by a set of ordinary differential equations and possibly by additional output functions—into executable table-driven simulation programs, hence allowing maintenance of mathematical models instead of maintenance of simulation programs, were presented for the first time in my dissertation and related publications. (I am glad that after nearly 30 years, there are conferences focusing on component-based software engineering. And for some time coupling of simulation models has started to catch the attention of the simulationists.) While in Tucson, I sent an article on GEST to Simulation, the journal of the SCS. The reviewers rejected the article. I started to correspond with

the editor. Finally, John McLeod intervened and informed me that the article would not be published in Simulation. I was not expecting at that time to have a reviewer open to a categorically different paradigm. Since then however, John—founder of the SCS—has become one of my best friends.

*1970-1996:* I worked as a professor at the Computer Science Department (which later became SITE – School of Information Technology and Engineering) of the University of Ottawa in Canada. During this period, simulation was advancing and SCS was contributing to the process. In 1974, I became an associate editor of the Simulation Journal. In 1975, I documented the syntactic errors of CSSL (Ören, 1975).

I published over 320 documents in total, most of them on numerous areas of simulation. (The subject index of my publications on simulation is over ten pages.) Having published taxonomies on several aspects of simulation, I am pleased to notice that now, specification of the body of knowledge in simulation is considered to be of primordial importance. Equally, after having published over two dozen articles on simulation quality assurance (QA), I am pleased to notice that some leading colleagues on validation and verification (V&V) studies are acknowledging the importance of QA which is a superset of V&V studies.

In 1976, I organized a symposium in Namur, Belgium. One of my invited speakers was Prof. Bernard P. Zeigler (among other achievements as a scientist, he is the president, 2002-2004, and the driving force behind the restructuring of the SCS). Later, Bernie, Maurice S. Elzas, and I organized a series of Symposia (in one of them we also had Prof. George J. Klir) to promote methodology and artificial intelligence in modeling and simulation (Zeigler et al., 1979; Elzas et al., 1986, 1989; Ören et al., 1984).

I contributed in over 300 conferences and seminars, mostly on simulation, held in 27 countries and was fortunate to make many simulationists friends.

In 1977, when I was on a sabbatical leave at the University of Wageningen, The Netherlands, Maurice Elzas gave me

the privilege of contributing to the 25<sup>th</sup> Anniversary issue of Simulation. Referring to this article, a colleague later wrote: “The use of AI in simulation had been proposed already in 1977 by Ören, who discussed how AI could assist simulation ...” (Tsatsoulis, 1991).

In the early days of artificial intelligence (AI), most of the relevant works were published as cybernetics and simulation. Later, when AI became acceptable, studies on the synergy of AI and simulation were published mainly in the proceedings of the conferences organized by the SCS. This is one of the many important contributions of our society to the advancement of the field. Afterwards, the journals well known for the quality of their refereeing process started to publish relevant articles.

In 1978, Bernie and I wrote—in one week—an article for the Simulation Journal (Ören and Zeigler, 1979). It changed the paradigm of modeling and simulation to a model-based activity. The concept “model base” was introduced for the first time in that article in the Simulation Journal.

During 1980-1996, for four consecutive terms, I was a member of the Technical Advisory Committee (TAC) of the Atomic Energy of Canada Ltd. (AECL) on the Nuclear Fuel Waste Management Program as the representative of the Canadian Information Processing Society and Chair of the System Analysis Subcommittee of TAC. One of my responsibilities was to advise on the software and simulation quality assurance of the AECL’s very important simulation program.

In 1991, I accepted the challenge to be the founding director of the Ottawa Center of the McLeod Institute of Simulation Sciences (MISS) of the SCS.

*1996-2001:* After my early retirement from the University of Ottawa, as an emeritus professor, I joined the Information Technology Research Institute of the Marmara Research Center in Turkey. My last position was Acting Director of the Institute. I was member of several NATO and WEAG (West European Armament Group) committees and groups on modeling and simulation. My tasks included contributing to the development of the NATO Modeling and Simulation Master Plan. During this period, I participated in about 40 meetings held in several NATO countries.

*2001-present:* Return to Canada. Several involvements within SCS: (1) Member of the Board of Directors (2002/2004). (2) AVP for ethics, (3) Director of the Ottawa Center of MISS Network. (4) Director of the MISS Network with the mandate to transform it into a network of centers of excellence on modeling and simulation. (5) Editor of a volume on selections from the publications of the SCS.

My views on challenging development areas for simulation are summarized in a recent article (Ören 2002a). I hope that among other challenges, several simulation groups will adopt a code of professional ethics for their members (Ören et al., 2002; Ören, 2002b; SimEthics). The future of simulation appears to be very promising. The progress continues and I would like to share the following view with readers: Progress in any area is not possible by keeping the status quo –no matter how advanced it can be; we should emulate nature and keep blooming.

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