

**Select Quotations from Eminent Scientists about
Dr. Tuncer Ören's Scientific Contributions**
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1/5

From the book: Levent Yilmaz (ed.) (2015 April). [Concepts and Methodologies for Modeling and Simulation: A Tribute to Tuncer Ören](#). Springer.

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From the [Forward](#) by Prof. Bernard P. Zeigler

The work of Tuncer Ören, the archetypal Renaissance man of the modeling and simulation community, embodies the vision of M&S as the essential enabler of future science and engineering. Ören's vision stretches widely over the whole M&S domain encompassing its fundamental body of knowledge, its methodology, its practice, and its ethics. It also includes the quality of M&S products and specific application domains such as cognitive and emotive social simulation. The authors

From the [Preface](#) by Prof. Levent Yilmaz

Since 2003, I have had the privilege to collaborate with Dr. Ören, whom I see as my mentor and a titan in our field. The articles in this book are a testament to the diversity and innovativeness of his thoughts. As evidenced by this volume, his influences in the philosophy, theory, methodology, ethics, and the body of knowledge of M&S have numerous connections to recent advancements in our field and continue to provide directions for its further development. This book is largely due

Simulation Methodologies

[Ch 1](#) – Toward Agent-Supported and Agent-Monitored Model- Driven Simulation Engineering by Prof Levent Yilmaz

design metaphors in simulation modeling. However, this limited view of the use of agents in M&S was critiqued in Ören (2000a, b). In his panel statement (Ören 2000b) at the 2000 Winter Simulation Conference, Dr. Ören has pointed out a broader vision for the use of agents in M&S. Besides using M&S for modeling agent systems in the form of agent-based models, by which agent concepts are leveraged to create abstractions of the system of interest, Dr. Ören has suggested that agents can also be used to assist or support model behavior generation as part of the simulators or provide cognitive support as front-end or back-end interface to a simulation system. He called this expanded view as *agent-directed simulation* (ADS).

Ch 2 - Service-Oriented Model Engineering and Simulation for System of Systems Engineering by Profs. Bernard P. Zeigler and Lin Zhang

It helps to recount some history relevant to *service-oriented model engineering* (SOME) as appropriate to a volume dedicated to Tuncer Ören's 80th birthday. As early as 1973, Ören was expressing his normative views for modeling and simulation (M&S) methodologies (Ören 1973) and recently published a treatise on the synergies of simulation, agents, and systems engineering (Ören and Yilmaz 2012). Many of his views on these synergies are covered in the book with Yilmaz on *Agent-directed Simulation and Systems Engineering* (Yilmaz and Ören 2009).

Over the years, the scope of Ören's concerns has broadened to formulate a body of knowledge for M&S expressed in many publications and presented in detail in Ören (2005, 2014), where he describes a paradigm shift from use of the term M&S to the term simulation systems engineering (SSE): "In the early days, only very few were referring to M&S. Afterwards, to stress modeling process and the associated activities and environments, the term M&S is used by large number of

Ch 3 - Research on High-Performance Modeling and Simulation for Complex Systems by Prof. Bo Hu Li et al.

It was a great honor to take the opportunity to participate in the tribute volume for Professor Tuncer Ören since Ören has been one of the most respected friends and partners to both the Chinese simulation community and me. We have communicated and coworked closely on simulation technologies for years. Many concepts and ideas from Professor Tuncer Ören became inspirations for our research, especially for our research on High-Performance Modeling and Simulation for Complex Systems, which the following sections of this chapter are about to introduce. In this background section, I would like to discuss some important inspirations from Ören for our research on modeling, simulation, application, and the body of knowledge (BOK) of HPMSCS.

Ch 4 - Dynamic Data-Driven Simulation: Connecting Real-Time Data with Simulation by Prof. Xiaolin Hu

Data plays an essential role in almost every aspect of computer modeling and simulation. The importance of data in modeling and simulation was discussed in many of Tuncer Ören's works. In a well-cited early work (Ören and Zeigler 1979), Ören and Zeigler pointed out that one of the shortcomings of conventional simulation techniques was the lack of needed tools for managing data and models. Data was regarded as an important factor in the conceptual framework of simulation.

In another work devoted to the topic of "Impact of Data on Simulation" (Ören 2001), Ören systematically studied the relationship between data and simulation and elaborated the multiple ways data can impact simulations. According to the

Using online simulation to support real-time decision-making was identified as an important application of simulation: “Simulation has the potential of surpassing its own abilities of being an off-line decision making tool to be also an on-line decision support tool for complex and important problems.” (Ören 2000). Ören’s differentiation of two types of simulations and discussions of how data can impact simulations provide a conceptual framework to categorize the many existing works

Modeling Methodologies

Ch 5 - **Learning Something Right from Models That Are Wrong: Epistemology of Simulation** by Prof. Andreas Tolk

If we now include the idea of Big Data and marry it with multimodeling, the future of M&S remains indeed bright, and many ideas of Tuncer Ören will continue to make it from his visionary concept to the tool sets of engineers, scientists, scholars, and decision-makers. While Big Data exposes correlations we were not

Philosophy of simulation answers *WHAT* we are doing. It completes simulation as a science and engineering discipline answering *HOW* we do something and the code of ethics for simulationists answering *WHY* we are doing our task. Each simulationist must be aware of these three pillars of our profession. Tuncer Ören contributed as a titan in this field to all three interrogatives with questions, ideas, and answers (Ören et al. 2002; Ören and Yilmaz 2013). His students and protégés are carrying this flame on in order to mature M&S as a discipline carried by engineering, ethics, and philosophy.

Finally, my utmost thanks go to Dr. Tuncer Ören himself. He was my mentor and tutor from the day we met and, more important than this, a friend who made me aware of the imperative of keeping engineering, philosophy, and ethics in balance. I truly hope that one day, my students and colleagues will look with similar admiration at my legacy as I look at his still ongoing work today: He is truly a titan in our domain!

Ch 6 - **Managing Hybrid Model Composition Complexity: Human–Environment Simulation Models** by Prof. Hessam Sarjoughian et al.

However, decomposition of a system model into subsystem models or inversely composing the system model from the subsystem models is difficult (Davis and Anderson 2004). Models can be conceptualized and defined to be connected to one another in many ways. Tuncer Ören has developed a list of coupling types and associated terms (Ören 2014). It details structural input/output relationships with types for coupled models with considerations such as dynamic changes in input/output couplings and model parts that can be defined using the system-theoretic approach (Wymore 1993; Ören and Zeigler 2012).

Ch 7 - Transformation of Conceptual Models to Executable High-Level Architecture Federation Models by Profs. Gürkan Özhan and Halit Oğuztüzün

An early insight into the importance of a model-based approach for the field of modeling and simulation was offered by Tuncer Ören and his colleagues. As early as 1979, Ören and Zeigler set forth their concepts for the design and implementation of advanced simulation methodologies. In Ören and Zeigler (1979), they contend,

Ören advocated “model-based simulation” initially in Ören (1984), later elaborated in Ören (2009). He identifies three types of model-based activities: model building, model-based management, and model processing. Model transformation and to a lesser extent behavior generation are two of the model processing activities that are the subjects of the present chapter. In Ören (2002), he called for exploratory research for the interoperability of next-generation HLA federates from the following perspectives: “(1) Domain-specific and graphic specification environments would be useful in specifying simulation studies. (2) A translator, to be developed

Ch 8 - Using Discrete-Event Cell-Based Multimodels for the Simulation of Evacuation Processes by Prof. Gabriel Wainer

Prof. Ören is a pioneer in the fields of Multimodeling and Agent-Based Modeling and Simulation. In Ören (1987), he introduced the concepts of extension and generalization for multimodel formalisms, including formal M&S like DEVS (Discrete Event System Specification) (Zeigler et al. 2000). According to Yilmaz and Ören (2004), a multimodel can be defined as a modular mathematical entity that subsumes multiple submodels that together represent the behavior of the model.

The work of Prof. Ören in the area of agent-based simulation is extensive; in particular, we are interested in human behavior modeling, like in Ghasem-Aghaee and Ören (2003). In Yilmaz and Ören (2004), Profs. Ören and Yilmaz define a detailed taxonomy on agent-based multimodeling methodologies. The idea is that

Quality Assurance and Reliability of Simulation Studies

Ch 9 - Quality Indicators Throughout the Modeling and Simulation Life Cycle by Prof. Osman Balci

Dr. Ören’s seminal paper in the *Communications of the ACM* has expanded my horizon in assessing the acceptability of modeling and simulation applications. I am honored to contribute this chapter presenting quality indicators that can be used for such acceptability assessment. Dr. Ören has published and presented more than 85 articles just on the topic of reliability, quality assurance, and failure avoidance in modeling and simulation since his seminal paper. He has been an internationally recognized leading authority not only in this topic but also in the whole modeling and simulation discipline. Dr. Ören’s linguistic ability is beyond my comprehension. He is the only person I know who can deliver a very technical speech in

[Ch 10](#) - **Verification, Validation, and Replication Methods for Agent-Based Modeling and Simulation: Lessons Learned the Hard Way!** by Profs. S. M. Niaz Arifin, Gregory R. Madey

In this chapter, we review and summarize some important papers by Ören and his colleagues and describe the influence of some of the early works by Ören. We

[Ch12](#) - **Generalized Discrete Events for Accurate Modeling and Simulation of Logic Gates** by Profs. Maamar El Amine Hamri, Norbert Giambiasi, and Aziz Naamane

Note that our work is a part of recent research works on normative views for M&S methodologies for which Ören and Zeigler (1979) have been the precursors. In addition, in the field of specification languages in order to keep user models, we propose through our framework to keep networks of logic gates. Ören (1984) has proposed GEST, a specification language, and proved thus the importance of specification languages which make the modeling task easier for the user.

Cognitive, Emotive, and Social Simulation

[Ch13](#) - **Specification and Implementation of Social Science Models** by Prof. Paul K. Davis

Many years have intervened, and I have often found Tuncer's papers to be provocative and insightful, especially his many contributions to agent-based modeling (Yilmaz and Ören 2009) and his recognition that agent modeling could help in understanding international disputes and crises in the context of peace studies. In the remainder of this paper, I sketch work that drew on the principles mentioned above that benefited from Tuncer's early influence.

[Ch 14](#) - **Simulating Human Social Behaviors** by Prof. Yu Zhang

Dr. Tuncer Ören is one of the first researchers who have philosophical thoughts on the mode, scope, and originality of bridging human decision processes and computer simulation. His research in human behavior simulation has pursued a decision theory-centric focus. Through Tuncer's whole career, he investigates a variety of decision-making techniques to meet a diverse set of needs. For example, advances