Social networks are a research field pioneered by sociologists. It has experienced explosive growth in the last decade fueled by the symbiosis of humans and digital devices that enables instantaneous communication, computation, and access to data and sensing. This symbiosis changes the way people interact and creates the vast amount of data about their interactions and about the environment in which they operate. The magnitude of recorded data on human interactions further opens the social network field to many disciplines ranging from mathematics and physics, to computer science and to sociology, political science, and psychology. Based on the experience of the speaker from leading a large, multi-disciplinary collaborative research effort involving scientists from universities, and industrial and government institutions, this talk will discuss the current challenges and opportunities in this field in particular and in complex network in general. We will start with discussing abstract and predictive models and quantitative laws furthering our understanding for dynamics of social movements, the spread and evolution of cultures and ideologies, as well as opinions and innovations. Then, we will present challenges of modeling the spread of risks in complex networks (e.g., severity of terrorist attacks, failures in power grids). Finally, we will discuss an approach to understanding dynamics of risk networks.

Boleslaw K. Szymanski is the Claire and Roland Schmitt Distinguished Professor of Computer Science and a Professor of Cognitive Science at Rensselaer Polytechnic Institute. He is also the Founding Director of the Network Science Center and of the ARL Social and Cognitive Networks Academic Research Center. He published over 300 scientific articles. He is an IEEE Fellow and a National Lecturer for the ACM and a foreign member of the National Academy of Sciences in Poland. He received the Wilkes Medal of British Computer Society in 2009 and the RPI Willey Distinguished Faculty Award in 2003. His current research focuses on computational social networks and network science.