

ESREL 2015

25th European Safety and Reliability Conference

PROGRAM

September 7 - 10, ETH Zurich, Switzerland

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ETH Risk Center

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Preface

The annual European Safety and Reliability Conference, ESREL, stems from a 1989 European initiative to merge several national conferences into a major yearly conference under the auspices of the European Safety and Reliability Association, ESRA. The 25th edition of the conference, ESREL 2015, provides a forum for presentation and discussion of scientific contributions covering the theories and methods in the field of risk, safety and reliability, and their application to a wide range of industrial, civil and social sectors and problem areas. ESREL 2015 is also an opportunity for researchers, practitioners, academics and engineers to meet, exchange ideas, and gain insights from each other.

Our goal for ESREL 2015 is to advance the understanding, modeling, and managing of complex engineered systems. ESREL 2015 offers a multidisciplinary platform to address the technological, societal and financial aspects of system safety and reliability. We aim to broaden the scope of risk, safety and reliability studies from the purely technical to the natural, financial and social aspects, focusing on the interdependencies of functions and the cascade of failures that characterize complex engineered systems.

ESREL 2015 is the largest ESREL to date. More than 850 abstracts were submitted, followed by more than 650 full papers. The Technical Committee reviewed all submitted papers and accepted 569 of them for publication in the ESREL 2015 Proceedings. Of these, 563 papers will be presented at this conference. We greatly appreciate the efforts of the authors to write, revise and submit their papers, as well as the diligence and speed of the reviewers to evaluate the submitted papers and offer constructive criticism and suggestions for improvements.

ESREL 2015 takes place at ETH, the Swiss Federal Institute of Technology, in Zurich, Switzerland. Since its founding in 1855, ETH has been one of the leading international universities for engineering, technology and the natural sciences. The ETH Risk Center and the Paul Scherrer Institute are sharing the organization of this Conference.

Acknowledgements

The support of ESREL 2015 sponsors, Swiss Re, AXA Winterthur, the Swiss Federal Office of Civil Protection, and the City of Zurich, is gratefully acknowledged.

We thank Professor Emeritus Wolfgang Kröger for serving at the ESREL 2015 Honorary Chairman and suggesting complex engineered systems as the conference theme. We gratefully acknowledge the Chairs of the ESRA Technical Committees, the members of the ESREL 2015 Technical Program Committee, and the numerous ESREL 2015 Reviewers, listed on the following pages, for volunteering their time and doing an exceptionally good job. We also thank the ESREL 2015 Keynote Speakers for offering their unique perspectives on risk, safety and reliability at this conference. We appreciate the effort of the following ESRA TPC members for their contribution to the organization of thematic sessions: Olga Fink for the sessions on RAMS in railway systems, Andrija Volkanovski for the sessions on nuclear PSA, Ralf Mock for IT Security Risk Assessment session, Tomasz Nowakowski for supply chain and logistic systems session, and Stig Johnsen for sessions on human factors.

Finally, we are deeply obliged to the ESREL 2015 Organization Team without whom ESREL 2015 would not have taken place.

Božidar Stojadinović
Enrico Zio
Wolfgang Kröger
Luca Podofillini
Bruno Sudret

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Ulrich Weidmann, ETH Zurich, Switzerland

Tuesday, 08.09.2015, 10:10-11:00

(ETH HG AUDI MAX),

Dr. Didier Sornette, Professor of Entrepreneurial Risk at ETH Zurich

Safety and Reliability in Dragon-Kings' Lair

I argue that most systems of interest to humans are punctuated by extreme events of outlier proportion (king) and of unique origin (dragon). The ubiquitous human nature to control their environments and their created artifacts may in fact participate to the creation of the dragon-kings. The bad news is that risks are much larger than currently quantified in most domains. The good news is that these risks do not come out of the blue, but can be anticipated and, in favorable cases, predicted. Indeed, dragon-kings tend to emerge at the climax of a slow maturation towards an instability both in natural and man-made structures. I will present a wealth of evidence for these claims in finance, economic geography, hydrodynamic turbulence, mechanical ruptures, avalanches in complex heterogeneous media, earthquakes, epileptic seizures, rock falls, epidemics, cyber-risks, nuclear disasters and so on. I will review the known existing mechanisms for the appearance of dragon-kings and present the feasibility to suppress them by tiny and occasional perturbations on the system, opening the field to the "control of dragon-kings".



Didier Sornette

is professor of Entrepreneurial Risks in the department of Management, Technology and Economics at the Swiss Federal Institute of Technology (ETH Zurich), a professor of finance at the Swiss Finance Institute, and is associate member of the department of Physics and of the department of Earth Sciences at ETH Zurich. He uses rigorous data-driven mathematical statistical analysis combined with nonlinear multi-variable dynamical models including positive and negative feedbacks to study the predictability and control of crises and extreme events in complex systems, with applications to financial bubbles and crashes, earthquake physics and geophysics, the dynamics of success on social networks and the complex system approach to medicine (immune system, epilepsy and so on) towards the diagnostic of systemic instabilities. In 2008, he launched the Financial Crisis Observatory to test the hypothesis that financial bubbles can be diagnosed in real-time and their termination can be predicted probabilistically. The Financial Crisis Observatory now delivers daily an extensive survey of +25000 assets worldwide and a summary cockpit of the main positive and negative bubbles developing in all asset classes. Since 2012, his group has developed InnovWiki, an original collaborating platform where users can openly collaborate and contribute to various ideas/projects, combined with a prediction market to facilitate quality assessment of various ideas/projects based on a wisdom of the crowd approach, and empowered by a tools repository and data visualization software.

Tuesday, 08.09.2015, 17:10-18:00

(ETH HG AUDI MAX),

Moderators: Dr. Terje Aven and Dr. Enrico Zio
Current and former Chairmen of ESRA

Uncertainties in Risk Assessment: How do we manage them? Do we manage them well? What is...the Risk?



Dr. Terje Aven

is Professor of Risk Analysis and Risk Management at the University of Stavanger. His research covers foundational issues in risk analysis and management; risk acceptance criteria and risk reduction processes; risk analysis methods; risk and societal safety; and more. He is the Chairman of the European Safety and Reliability Association (ESRA).



Dr. Enrico Zio

is Director of the Chair in Complex Systems and the Energetic Challenge of the European Foundation for New Energy of Electricité de France (EDF) at CentraleSupélec and Politecnico di Milano, full professor, President and Rector's delegate of the Alumni Association and past-Director of the Graduate School at Politecnico di Milano, adjunct professor at University of Stavanger. He is the former Chairman of the European Safety and Reliability Association (ESRA).