Preface

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This special issue celebrates the scholarly contributions of Professor Fabio Casciati and Professor Lucia Faravelli who have each dedicated 45 years of their stellar careers to students, the global scientific community, and their colleagues in the fields of structural dynamics, stochastic mechanics, materials science, computational mechanics, soft computing, nonlinear random vibrations, smart structures, and mechatronics within the discipline of civil engineering. In an effort to advance the safety and reliability of infrastructure systems and hazard mitigation, and to protect human lives, their work has elevated the state-of-the-art in the areas of durability, protection of the built environment, material degradation, nonlinear dynamics, structural safety and reliability in response to extreme loading, man-made or natural hazard environment. Furthermore, Professors Casciati and Faravelli have made novel and seminal contributions in the areas of vibration mitigation, including computational and experimental validation. They have also carried out pioneering and original work in the treatment of uncertainties in modelling, design and in measurements.

Professors Casciati and Faravelli's research and extensive studies in the aforementioned fields have resulted in numerous international scientific collaborations that have significantly supported the advancement, growth, development, prosperity, and fruition of the disciplines of smart structures, structural control and health monitoring, as partially demonstrated by the contributions collected in this special issue.

Several milestones which outline the development, and original contributions, of these colleagues' research are summarised as follows:

- They were among the first leading scholars who confronted the challenging problems of 'Scienza delle Costruzioni' with a particular focus on the problems of numerical solution aiming to determine the ultimate behaviour of complex structural systems at their incipient collapse. They succeeded to implement the constitutive laws of materials, ranging from the classical to smart materials, such a shape memory alloys.

- Next, they focused their research efforts on the treatment of uncertainties and uncertainty quantification, by the development and utilisation of methodologies for the reliability assessment of structural systems. In particular, they proposed the adoption of the response surface methodology to evaluate important structures, such as nuclear power plants, and to address the impact problems.
- Subsequently, they pursued the tasks of risk assessment and analysis in the field of earthquake engineering by the introduction of artificial intelligence methods, neural networks and expert systems.
- Throughout their entire career span, they have pioneered the introduction of structural control strategies, which initially coupled with and further extended to the development of structural monitoring techniques. They devoted particular attention to the design and experimental evaluation of controllers and sensors, with emphasis on their wireless use.
- They have also always collaborated with research centres and agencies worldwide to foster important exchanges of knowledge with the scientific community. These scientific collaborations, and the innovations that have resulted, have been visionary, quite rewarding, fruitful and often ahead of their times making them a source of motivation and a stimulus for the new generations.

Since 1993, Fabio and Lucia have provided valuable guidance and support to both the International Association for Structural Control and Monitoring (IASCM) and European Association for the Control of Structures (EACS). Under the auspices of these two associations, the World Conference on Structural Control and Monitoring and the European Conference on Structural Control have been alternatively held every four years with the aims of promoting advanced structural control and monitoring technologies and enabling these fields to stay abreast of contemporary standards in the workflow and new developments in the discipline. Their editorial work has also provided a valuable resource for the researchers in the general areas of structural control, structural health monitoring theory and smart materials and structures.

For 22 years, Professor Fabio Casciati and Professor Lucia Faravelli provided a leadership role in the PhD School in Civil and Environmental Engineering at the University of Pavia, Italy (http://www.dipmec.it/dott/obiettivi_en.php). They co-founded the school in 1994 and promoted, with continuity in time, the scientific rigor, the internationalisation, and the up to date versions of its curricula. To support the research and the teaching activities, they setup and conducted both a laboratory for the analysis of vibrations and material characterisation, and an educational facility for the study of computational mechanics. Their international cooperation with other universities and research institutes enabled the exchange of both PhD students and the members of the teaching staff involved in joint research activities and in the offering of the PhD courses. They personally supervised more than 20 PhD students and doctoral projects on the following research topics:

- numerical and experimental techniques for the studies of the nonlinear dynamics of structures
- structural systems identification

- soft computing, expert systems, neural networks, and artificial intelligence methods for solving optimisation problems in structural engineering
- structural health monitoring with contactless methods, terrestrial systems (accelerometers, displacement sensors) and satellite-controlled systems (GPS), and wireless communication
- numerical and experimental aspects of passive, active, and semi-active structural control
- numerical modelling of aeroelastic forces and aerodynamic instability in huge span bridge design and cable vibration control
- numerical and experimental study of smart materials (shape memory alloys) and their applications in monumental buildings rehabilitation
- characterisation tests for the mechanical and fatigue behaviour of shape memory alloys and plastic materials for hydraulic and structural engineering applications
- probabilistic analysis and simulation methods for structural safety
- environmental, industrial and territorial risk analysis
- probabilistic analysis and simulation methods for seismic vulnerability evaluation
- seismic risk analysis and risk mitigation methods
- numerical techniques for the simulation of the ground-structure interaction.

As an addendum to this 'Preface', a brief biography of Fabio and Lucia is provided below.

Fabio Casciati was born in Naples, Italy, on January 16, 1949. He achieved a Laurea magna cum laude in Civil Engineering from the University of Pavia, Italy, on June 15, 1972. He held the following academic positions: Research Assistant (1974–1980), Lecturer (1976–1980), and Full Professor (1980–2019) of Scienza delle Costruzioni at School of Engineering of the University of Pavia, Italy. He served as the Institute and the Department Chairman from 1980 to 1983. He was a member of the faculty of the PhD course on Structural Engineering, jointly administered by the Polytechnic of Milan and the University of Pavia during 1984 to 1994. Professor Casciati was the Chairman of the Civil Engineering Council from 1986 to 1989; and was responsible of the Infrastructure Engineering undergraduate school from 1993 to 2001. From 1994 to 2016, he served as the Coordinator of the PhD School in Civil and Environmental Engineering of the University of Pavia, Italy. Within the national project CAMPUS, he implemented these new curricula and he designed and realised both a numerical and an experimental laboratory.

Other noteworthy accomplishments and academic endeavours of Professor Casciati included: Visiting Researcher at the Virginia Polytechnic Institute and State University, Blacksburg, Virginia, USA, in 1985, Visiting Researcher at Stanford University, Stanford, USA, in 1986, Visiting Professor at Florida Atlantic University in Boca Raton, USA, in 1992, and Visiting Researcher at Karlsruhe University Germany in 1993. Since 1999, he served as a member of the PhD graduation committees of the universities of Barcelona, Granada, Hong Kong and Rome. Since 2019, he has been an Adjunct

Professor at the College of Civil Engineering and Architecture, Zhejiang University, Hangzhou, China.

He served as the President of the EACS from 1993 to 2008, and the President of the International Association for Structural Control (IASC) from 2000 to 2004. Since 2002, he has been a Scientific Partner of the Mechatronics Excellence Centre ACCM, Linz, Austria.

Fabio Casciati is the Editor-in-Chief of *Smart Structures and Systems*, and a member of the editorial board of *Structural Safety*, *J. of Structural Control and Health Monitoring*, *Computers and Structures*, *Acta Mechanica Solida Sinica*, *J. of Earthquake Engineering and Engineering Vibrations*, and *Vietnam Journal of Mechanics*. He also served as member of the editorial boards of *Probabilistic Engineering Mechanics* (1986–1988), *Nonlinear Dynamics* (1994–2009), *Journal of Structural Control* (1995–2017; senior editor since 2015), and *Earthquake Engineering and Engineering Dynamics* (1996–2003).

In 2006, he was awarded a distinguished plaque in recognition of his cooperation effort from the Asian Network of Centers of Research in Smart Structures Technology, and in 2018, he was awarded the Takui Kobori Prize 2015.

He has given several plenary lectures worldwide and has chaired the organisation of Euromech 250, Como, Italy, in 1989 (proceedings published by Elsevier, with I. Elishakoff and J.B. Roberts as co-editors, ISBN: 0-444-88803-9), the IUTAM Symposium on Nonlinear Stochastic Mechanics, Torino, Italy, in 1991 (proceedings published by Springer-Verlag, Berlin, edited by N. Bellomo and F. Casciati, ISBN: 3-540-55545-5), and the 3rd International Conference on Structural Control, Como, Italy, in 2001 (proceedings published by Wiley, edited by F. Casciati, ISBN: 978-0-471-48980-1). He also co-edited the following proceedings: Civil Infrastructure Systems: Intelligent Renewal. Proceedings of the Third International Symposium, Capri, Italy, in 1997 (published by World Scientific Publishing Company, co-edited by F. Casciati, M.P. Singh, P. Spanos and F. Maceri, DOI: https://doi.org/10.1142/3853); Structural Control for Civil and Infrastructure Engineering. Proceedings of the 3rd International Workshop on Structural Control, Paris, France, in 2000 (published by World Scientific Publishing Company, co-edited by F. Casciati and G. Magonette, ISBN: 981-02-4475-4); Structural Health Monitoring 2010, the Fifth European Workshop on Structural Health Monitoring, Sorrento, Naples, Italy, in 2010 (proceedings published by Destech Publications Inc., co-edited by F. Casciati and M. Giordano, ISBN: 978-1605950242); CIMTEC 2016, 2012, and 2008 (proceedings published by Scientific.net, Advances in Science and Technology, Vol. 101, 83, and 56 co-edited by F. Casciati and P. Vincenzini, ISSN: 1662-0356).

From 1991 to 2007, he served as an invited lecturer and chaired several advanced courses at the International Centre for Mechanical Sciences (CISM), Udine, Italy. He edited or co-edited the following monographs of the CISM/Springer series: *Reliability Problems: General Principles and Applications in Mechanics of Solids and Structures*, 1991, ISBN: 978-3-211-82319-4, and *Dynamic Motion: Chaotic and Stochastic Behaviour*, 1993, ISBN: 978-3-7091-2682-0.

Professor Casciati was the principle investigator in several research grants from the National Research Council (CNR) since 1976. From 1980, he acted as the Coordinator of several projects of relevant national interest. Financed by the European Commission, he also acted as the Coordinator of a FP4 Telematics project (RADATT, EN1011-96), two INTAS projects (97-1140 and 2003-51-5547), an FP5 INCOMED project

(ICA3-99-06), and an FP6 INCOMED project (FP6-INCO/509085). He acted as the Vice Chairman of the COST action E24 (2000–2005) and served as a member of the Management Committee of the COST actions E55 and TU0601. He was the Director of the Cooperlink projects with Algeria, Armenia and Macedonia from 2006 to 2012.

Since 1994, Professor Casciati has been an expert reviewer of the scientific programs of the National Science Foundation (NFS), the European Science Foundation (ESF), the European framework programs FP4, 5 and 6, and the national agencies operating in Austria, France, Italy, Luxembourg and Romania. He has authored or co-authored more than 200 papers (more than 60 were published in ISI international journals) and three books: Augusti, G., Baratta, A. and Casciati, F. (1984) *Probabilistic Methods in Structural Engineering*, CRC Press, London, ISBN: 9780412222306, translated also in Russian; Casciati, F. and Faravelli, L. (1991) *Fragility Analysis of Complex Structural Systems*, Research Studies Press, Taunton, UK, ISBN: 9780863801143; Casciati, F., Magonette, G. and Marazzi, F. (2006) *Technology of Semiactive Devices and Applications in Vibration Mitigation*, John Wiley & Sons, Chichester, ISBN: 9780470022894. He is also the co-editor, with J.B. Roberts, of *Mathematical Models for Structural Reliability Analysis*, *Mathematical Modelling Series*, 1996, CRC, Boca Raton, ISBN: 9780849396311.

Professor Casciati's research fields of expertise include: stochastic mechanics, earthquake engineering, nonlinear dynamics, structural control, smart materials and structural monitoring.

Lucia Faravelli was born in Travaco' Siccomario (PV), Italy, on August 27, 1947. She graduated in Mathematics from the University of Pavia, Italy, on February 29, 1972. She has held the following academic positions: Research Assistant (1972–1983), Lecturer (1980–1983), Associate Professor (1983–1990) of Scienza delle Costruzioni at School of Engineering of University of Pavia, Italy, Professor at School of Engineering of University of Perugia, Italy, from 1990 to 1991, and Full Professor at School of Engineering of the University of Pavia, Italy, from 1991 to 2017. She served as the Chairperson of the Civil Engineering Council in the period from 1995 to 2001, and she was a Co-Founder and faculty member of the PhD School in Civil and Environmental Engineering from 1994 to 2016. She is the first scholar in Italy to introduce a structural safety course in a civil engineering curriculum. She was a Visiting Researcher at the Virginia Polytechnic Institute and State University, Blacksburg, Virginia, USA, in 1985; Visiting Researcher at Stanford University, Stanford, USA, in 1986, with an NSF Award. Since 2000, she has served as a member of the PhD graduation committees of the universities of Bologna, Padova, Roma, Girona, Sydney and Hong Kong. Since 2019, she has been an Adjunct Professor at the College of Civil Engineering and Architecture, Zhejiang University, Hangzhou, China.

Professor Faravelli served as a member of the Board of Directors of the EACS from 1993 to 2012, a member of the Board of Directors of the International Civil Engineering Risk and Reliability Association (CERRA) and a member of the Italian Association of Theoretical and Applied Mechanics (AIMETA). Since 2002, she has been a Scientific Partner of the Mechatronics Excellence Centre ACCM, Linz, Austria.

Lucia Faravelli is the Editor-in-Chief of the *Journal of Structural Control and Health Monitoring* and a member of the editorial board of *Smart Structures and Systems*, *Acta Mechanica* and *International Journal of Reliability and Safety* (*IJRS*).

In 1986, she received the NSF Award for Distinguished Woman Scientists; in 2006, she received a distinguished plaque in recognition of her cooperation effort from the Asian Network of Centers of Research in Smart Structures Technology; and in 2018, she was awarded the Takui Kobori Prize 2015.

She has given several plenary lectures worldwide, and has organised, as the European Chairperson, four ESF-NSF joint workshops on smart structures (2002, 2003, 2005 and 2006).

She served as the Coordinator of the Human Capital Mobility Program of the European Union on Stochastic Mechanics ERBCHXCT940565 (1994–1997), and the Coordinator of the European Science Foundation (ESF) Research Program CONVIB on Innovative Control Technologies for Vibration Sensitive Civil Engineering Structures (2001–2005). She was responsible of the Cooperlink project with Cyprus in 2011.

Since 1990, Professor Faravelli has been an expert reviewer of the scientific programs of the NFS, the ESF, the European framework programs FP6 and 7, and the national agencies operating in Austria, Belgium, Italy, Romania, Chile and China.

She has authored or co-authored more than 200 papers (more than 58 were published in ISI international journals) and two books: *Sicurezza Strutturale* (in Italian), Pitagora, Bologna (ISBN: 9788837104160) and *Fragility Analysis of Complex Structural Systems*, Taunton Press, co-author F. Casciati (ISBN: 9780863801143). She is also a co-editor of *Shape Memory Alloys: Advances in Modelling and Applications*, CIMNE, Barcelona (ISBN: 84-89925-82-8).

Professor Faravelli's research fields of expertise include: structural reliability, stochastic mechanics, earthquake engineering, boundary elements analysis, structural control, structural identification and smart materials.