

# **CURRICULUM VITAE**

**Alberto Carpinteri**

**Born in Bologna-Italy on December 23, 1952**

**<http://staff.polito.it/alberto.carpinteri>**

## **EDUCATION**

**Doctoral Degree in Nuclear Engineering cum Laude, University of Bologna, Bologna-Italy, 1976**

**Doctoral Degree in Mathematics cum Laude, University of Bologna, Bologna-Italy, 1981**

## **CURRENT POSITION**

**Chair Professor, Shantou University, Department of Civil Engineering and Intelligent Construction, Shantou-China, 2023-**

## **PREVIOUS POSITIONS**

**Chair Professor of Solid and Structural Mechanics, Politecnico di Torino, Torino-Italy, 1986-2023**

**Director of the “A. Castigliano” Fracture Mechanics Laboratory, Politecnico di Torino, Torino-Italy, 1999-2023**

**Head of the Department of Structural Engineering, Politecnico di Torino, Torino-Italy, 1989-1995**

**Founding Director, Doctoral School of Structural Engineering, Politecnico di Torino, Torino-Italy, 1990-2014**

**Head, Engineering Division, European Academy of Sciences, Brussels-Belgium, 2016-2023**

**President of the National Research Institute of Metrology (INRIM), Torino-Italy, 2011-2013**

**Vice-president of the National Research Institute of Metrology (INRIM), Torino-Italy, 2006-2011; Acting President, July-November 2009**

**President, International Congress on Fracture (ICF), 2009-2013**

**President, European Structural Integrity Society (ESIS), 2002-2006**

**President, International Association of Fracture Mechanics for Concrete and Concrete Structures (IA-FraMCoS), 2004-2007**

**President, Italian Group of Fracture (IGF), 1998-2005**

**Member of the Congress Committee, International Union of Theoretical and Applied Mechanics (IUTAM), 2004-2012**

**Member of the Executive Board, Society for Experimental Mechanics (SEM), 2012-2014**

**Assistant Professor of Solid and Structural Mechanics, University of Bologna, Bologna-Italy, 1980-1986**

**Researcher, Nuclear Power Plants Programme, Consiglio Nazionale delle Ricerche (CNR), Bologna-Italy, 1978-1980**

**Engineer, Technical Office, Breda Fucine, Milano-Italy, 1977**

## **VISITING POSITIONS**

**“Zhujiang (Pearl River)” Professor of Guangdong Province, Shantou University, Shantou-China, 2019-2022**

**Visiting Professor, University of São Paulo, São Paulo-Brazil, July-August 2010**

**Visiting Professor, Tsinghua University, Tongji University, Architectural Institute of Nanjing, China, May-June 1996**

**Visiting Scientist, Lehigh University, Bethlehem-Pennsylvania, USA, 1982-1983**

**Visiting Scholar, Universities and Research Institutions across South Africa (Cape Town, Johannesburg, Pretoria, Bloemfontein), sponsored by the International Rotary Foundation, April-May 1981**

## **COMMISSIONS OF TRUST**

**Honorary Editor of the International Journal “Smart Construction & Sustainable Cities”, 2023-**

**Editor-in-Chief of the International Journal “Meccanica” (Springer, IF=1.949, in three years, the issues per year were brought from 6 to 12), 2012-2014**

**Member of the Editorial Board of eleven International Journals:**

**“Theoretical and Applied Fracture Mechanics”, 1984-2013**

**“Numerical and Analytical Methods in Geomechanics”, 1995-2013**

**“Strength, Fracture and Complexity”, 2003-**

**“Engineering Fracture Mechanics”, 2005-2022**

**“Physical Mesomechanics”, 2005-**

**“International Journal of Fracture”, 2006-2013**

**“Strain – An International Journal for Experimental Mechanics”, 2009-2015**

**“Curved and Layered Structures”, 2016-**

**“Archive of Mechanical Engineering”, 2010-**

**“Engineering Transactions”, 2016-**

**Member of the Expert Panel for the Research Evaluation of the Department of Civil Engineering at the Technical University of Denmark, Lyngby-Denmark, 2007**

**Member of the Expert Panel for the Scientific and Teaching Evaluation of the School of Civil Engineering at the University of Tianjin, Tianjin-China, 2019**

**Member of the Evaluation Committee for the attainment of the position of Full Professor at the following Universities:**

**(1) Israel Institute of Technology (Technion), Haifa-Israel, 2011;**

**(2) Indian Institute of Science, Bangalore-India, 2011;**

**(3) University of Athens, Athens-Greece, 2012**

**Nominator, Japan Prize, 2016-**

**Nominator, Global Energy Prize, 2015-**

**Chair of the Awards Committee, International Congress on Fracture (ICF), 2013-2017**

**Chair of the Committee of the International Pascal Medal for Engineering, awarded by the European Academy of Sciences, Brussels-Belgium, 2016- 2023**

**Member of the Committee of the International Panetti-Ferrari Prize for Applied Mechanics, awarded by the Turin Academy of Sciences, Torino-Italy, 1999-**

## **FELLOWSHIPS**

**Foreign Member of the Academy of Athens, Athens-Greece, 2023-**

**Life Fellow of the European Academy of Sciences, Brussels-Belgium, 2009-**

**Life Fellow of the Academia Europea, London-UK, 2013-**

**Fellow of the European Academy of Sciences and Arts, Salzburg-Austria, 2012-**

**Fellow of the International Academy of Engineering, Moscow-Russia, 2010-**

**Fellow of the Turin Academy of Sciences (founded by G.L. Lagrange in 1783), Torino-Italy, 2005-; Member, 1995-2005**

**Member of the Istituto Lombardo – Accademia di Scienze e Lettere (founded by A. Volta in 1804), Milano-Italy, 2006-**

**Member of the Bologna Academy of Sciences, Bologna-Italy, 2011-**

**Member of the Accademia Teatina per le Scienze, Chieti-Italy, 2006-**

**Honorary Fellow of the International Congress on Fracture (ICF), Ottawa-Canada, 2009-**  
**Founding Fellow, Indian Structural Integrity Society (InSIS), Hyderabad-India, 2018-**  
**Fellow of the European Structural Integrity Society (ESIS), Brno-Czech Republic, 2008-**  
**Fellow of the International Association of Fracture Mechanics for Concrete and Concrete Structures (IA-FraMCoS), Jeju-Korea, 2010-**

**Life Fellow of the American Society of Civil Engineers (ASCE), Reston-Virginia, USA, 1995-; Member 1985-1995**

## **INTERNATIONAL AWARDS**

**Odone Belluzzi Prize for Structural Mechanics, University of Bologna, Bologna-Italy, 1976**  
**Robert l'Hermite Medal, International Union of Laboratories for Materials and Structures (RILEM), Paris-France, 1982**  
**Eminent Scientist Award, Wessex Institute of Technology (WIT), Southampton-UK, 2000**  
**Griffith Medal for Fracture Mechanics, European Structural Integrity Society (ESIS), Brno-Czech Republic, 2008**  
**Jerold L. Swedlow Memorial Lecture Award, American Society for Testing and Materials (ASTM), Philadelphia-Pennsylvania, USA, 2011**  
**Inaugural Paul Paris Gold Medal, International Congress on Fracture (ICF), Beijing-China, 2013**  
**Guglielmo Marconi Prize, Academy of Sciences, Republic of San Marino, 2014**  
**Doctorate Honoris Causa in Engineering, Russian Academy of Sciences, Moscow-Russia, 2016**  
**Frocht Award, Society for Experimental Mechanics (SEM), Indianapolis-Indiana, USA, 2017**  
**Honorary Professorship, Tianjin University, Tianjin-China, 2017**  
**Giuliano Preparata Medal, International Society for Condensed Matter Nuclear Science (ISCMNS), Assisi-Italy, 2022**  
**George Irwin Medal, American Society for Testing and Materials (ASTM), Washington-DC, USA, 2023**

## **SUPERVISION OF PhD DISSERTATIONS**

**Supervisor of 36 PhD Candidates. Presently, most of them are taking University faculty positions in Italy or abroad (20/36): Six Full Professors, eleven Associate Professors, three Assistant Professors,**

three Post-doctoral Fellows, one PhD Student, whereas the remaining twelve are managers or officers in public or private enterprises

## **TEACHING ACTIVITIES**

European Coordinator of the “Innovative Learning and Training On Fracture (ILTOF)” Project, in the framework of the European Union Leonardo da Vinci Programme for Education and Culture (Total financial budget = Euro 480,000), 2006-2008

Courses taught at the Politecnico di Torino since 1986:

Structural Mechanics (Electrical Engineering, 14 credits), 1986-1987

Structural Mechanics (Mechanical Engineering, 14 credits), 1987-2002

Statics (Architecture, 8 credits), 1999-2000

Structural Mechanics (Civil Engineering, 10 credits), 2001-2002

Advanced Structural Mechanics (Civil Engineering, 10 credits), 2002-2010

Theory of Structures (Civil Engineering, 5 credits), 2004-2010

Fracture Mechanics (Civil Engineering, 5 credits), 2004-2010

Static and Dynamic Instability of Structures (Civil Engineering, 6 credits), 2010-2023

Fracture and Plasticity (Civil Engineering, 8 credits), 2010-2023

Adjunct Professor of Structural Mechanics (6 credits), National School of the Italian Army, 2018-2022

Visiting Professor of “Fracture Mechanics: Fundamentals and Advanced Applications” (6 credits), Shantou University, Shantou-China, 2019-2022

## **ORGANISATION OF MAJOR SCIENTIFIC EVENTS**

Organizer and Chairman, International ESIS-RILEM-CEB Workshop on “Applications of Fracture Mechanics to Reinforced Concrete”, Torino-Italy, 1990

Organizer and Chairman, International CNR Workshop on “Advanced Technology for Design and Fabrication of Composite Materials and Structures”, Torino-Italy, 1993

Organizer and Chairman of the Scientific Committee, IUTAM Symposium on “Size-Scale Effects in the Failure Mechanisms of Materials and Structures”, Torino-Italy, 1994

Organizer and Chairman of the Scientific Committee, 11<sup>th</sup> International Conference on Fracture (ICF11), Torino-Italy, 2005 (Record in the ICF

history: 1041 official participants)

Organizer and Chairman of the Scientific Committee, 6<sup>th</sup> International Conference on Fracture Mechanics for Concrete and Concrete Structures (FraMCoS-6), Catania-Italy, 2007

Organizer and Chairman, Mini-Symposium on “Cohesive Zone Models of Fracture and Failure”, 22<sup>nd</sup> International Congress of Theoretical and Applied Mechanics, Adelaide-Australia, 2008

Organizer and Chairman, 15<sup>th</sup> International Workshop on “Anomalies in Hydrogen Loaded Metals”, Assisi-Italy, 2022

Organizer and Chairman, Mini-Symposium on “Fracto-emissions in Structural and Seismic Monitoring”, 15<sup>th</sup> International Conference on Fracture (ICF15), Atlanta-Georgia, USA, 2023

## **SCIENTIFIC ACTIVITIES AND MAJOR ACHIEVEMENTS**

H-Index (Google Scholar) = 91

Total Citations (Google Scholar) = over 33,000

H-Index (Scopus) = 66

Total Citations (Scopus) = over 16,000

Ranking order number as a Top Scientist according to Research.com (Microsoft Academic) in the area “Engineering and Technology”:

n. 218 in the World

n. 2 in Italy

Author of over 1,000 publications, of which more than 500 are papers appearing in Refereed International Journals, and 58 are authored or edited volumes, on the following research topics:

fracture mechanics, fatigue resistance and fatigue crack growth, thermo-elasticity, seismic structures, reinforced concrete, structural monitoring, contact mechanics, fragmentation and comminution, drilling and wear, multi-layered and functionally-graded materials, nano-structured and hierarchical materials, acoustic, electromagnetic, and neutron emissions from fracture and earthquakes, buckling and snap-through in shallow roofing structures, dynamic flutter instability in long-span suspension bridges, tall buildings, seismic precursors, dynamics of macromolecular and protein structures

Five single-authored books published by major International Publishers:

**A. Carpinteri: Mechanical Damage and Crack Growth in Concrete: Plastic Collapse to Brittle Fracture, Martinus Nijhoff Publishers, Dordrecht (1986), XIII + 234**

**A. Carpinteri: Structural Mechanics: A Unified Approach, Chapman & Hall, London (1997), XV + 761**

**A. Carpinteri: Structural Mechanics Fundamentals, CRC Press (Taylor & Francis), Boca Raton (2014), XIV + 498**

**A. Carpinteri: Advanced Structural Mechanics, CRC Press (Taylor & Francis), Boca Raton (2017), XIII + 531**

**A. Carpinteri: Fracture and Complexity, Springer Nature, Heidelberg (2021), XXXI + 949**

## **RESEARCH TOPICS AND CUTTING-EDGE RESULTS**

Different specific topics have been considered, always giving them a personal and original contribution. In some cases such a contribution resulted to be also innovative, anticipating even by years the trends in cutting-edge research. Among these peculiar aspects, it is significant to recall the following ones.

**(1) Application of Dimensional Analysis (Buckingham's Theorem for physical similitude and scale modelling) to the scaling competition between plastic collapse and brittle fracture, which are failure mechanisms governed by generalized forces with different physical dimensions. Definition of the dimensionless Brittleness Number**

**(2) Interpretation of brittle crack propagation, of stick-slip friction instability, and of buckling instability in thin shells in the framework of Catastrophe Theory by René Thom**

**(3) Application of Fractional Calculus to field and boundary equations of an elastic body deformable only over a fractal sub-set**

**(4) Solution to the problem of propagation stability of cracks bridged by reinforcements and/or fibres based on rigorous conditions of static equilibrium and kinematic compatibility**

**(5) More recent papers deal with fundamental aspects, like the size effects on the friction coefficient and the criticality of rock slopes, the nonlinear and chaotic dynamic behaviour of cracked or damaged bodies, the fatigue limit and threshold with their related scaling laws, the energy emissions from fracture phenomena and earthquakes**

(6) Dynamics and stability of elastic structures: from mega-structures (long-span bridges and high-rise buildings) to nano-structures (proteins and macromolecular structures)

## **MAJOR INVITED PRESENTATIONS AT INTERNATIONAL MEETINGS, INSTITUTIONS, AND ADVANCED COURSES (LAST FEW YEARS)**

**Several Invited Courses and Lectures at Conferences, Universities, and Research Institutions, in the following countries: Italy, Republic of San Marino, Switzerland, Austria, France, Spain, Germany, The Netherlands, United Kingdom, Hungary, Poland, Greece, Denmark, Russia, Portugal, Finland, Sweden, Serbia, Turkey, Czech Republic, Belgium, USA, Mexico, South Africa, India, Japan, Australia, China, Malaysia, Canada, Brazil, Korea, Norway, Thailand**

**Plenary Lecture on “Fracture mechanics and complexity sciences”, 16<sup>th</sup> European Conference on Fracture, Alexandroupolis-Greece, 2006**

**Invited Lecture on “Asymptotic analysis in Elasticity: From the pioneering studies by Wieghardt until today”, Karl Wiegaard and George Irwin Centenary Conference on Structural Integrity, Vienna-Austria, 2007**

**Introductory Lectures as the principal Organizer for the two following courses, International Centre for Mechanical Sciences (CISM), Udine-Italy:**

**“Non-linear Fracture Mechanics Models”, 2008, and “Fractals and Fractional Calculus in Continuum Mechanics”, 1996**

**Introductory Lecture, Mini-Symposium on “Cohesive Zone Models of Fracture and Failure”, 22<sup>nd</sup> International Congress of Theoretical and Applied Mechanics, Adelaide-Australia, 2008**

**Keynote Lecture on “The mitigation of stress-singularities in linear elasticity”, 12<sup>th</sup> International Conference on Fracture, Ottawa-Canada, 2009**

**Opening Lecture on “Application of nonlinear fracture mechanics to the assessment of rotational capacity in reinforced concrete beams”, 51<sup>o</sup> Congresso Brasileiro do Concreto (IBRACON-51), Curitiba-Brazil, 2009**

**Plenary Lecture on “Energy emissions from fracture of concrete: Acoustic, electromagnetic, piezonuclear”, 7<sup>th</sup> International Conference on Fracture Mechanics of Concrete and Concrete Structures”, Jeju-Korea, 2010**

**Opening Lecture on “Evidence of piezonuclear fission reactions: Neutron emissions, microchemical analysis, geological**



**transformations”, 9<sup>th</sup> Youth Symposium on Experimental Solid Mechanics, Trieste-Italy, 2010**

**Honorary Lecture on “Dimensional analysis and fractal modelling of fatigue crack growth”, ASTM Fracture and Fatigue Conference, Anaheim-California, USA, 2011**

**Closing Lecture on “Piezonuclear reactions produced by brittle fracture: From laboratory to planetary scale”, 19<sup>th</sup> European Conference on Fracture, Kazan-Russia, 2012**

**Opening Lecture on “Failure mode scaling transitions in reinforced concrete beams in flexure: Tensile, shearing, crushing”, 8<sup>th</sup> International Conference on Fracture Mechanics of Concrete and Concrete Structures, Toledo-Spain, 2013**

**Honorary Presidential Lecture on “Piezonuclear fission reactions due to fracture and earthquakes: From the chemical evolution of our planet to the so-called cold fusion”, 13<sup>th</sup> International Conference on Fracture, Beijing-China, 2013**

**Invited Lecture on “Piezonuclear fission reactions from fracture and turbulence: The chemical evolution in the planets of the Solar System”, European Academy of Sciences, Toulouse-France, 2013**

**Distinguished Lecture in Solid Mechanics on “Acoustic, electromagnetic, and neutron emissions from brittle fracture and earthquakes”, California Institute of Technology, Pasadena-California, USA, 2014**

**Invited Lecture on “Hydrogen embrittlement, microcracking, and piezonuclear fission reactions at the Ni and Pd electrodes of electrolysis “cold fusion” experiments”, 12<sup>th</sup> International Conference on Nanostructured Materials, Moscow-Russia, 2014**

**Invited Seminar on “Acoustic, electromagnetic, and neutron emissions from brittle fracture and earthquakes”, Perm State University, Perm-Russia, 2014**

**Keynote Lecture on “Opto-acoustic and neutron emissions from fracture and earthquakes”, Annual Conference and Exposition on Experimental and Applied Mechanics, Costa Mesa-California, USA, 2015**

**Opening Lecture on “Static-kinematic duality in beams, plates, shells and its central role in the Finite Element Method”, International Conference on Shells, Plates, Beams, Bologna-Italy, 2015**

**Invited Lecture on “LENR induced by nanomechanics instabilities and vibrations: From the geochemical evolution of the planet to cold fusion”, Seminario ENEA sulle Reazioni Nucleari a Bassa Energia, Roma-Italy, 2016**

**Invited Lecture on “Nano-scale fracture phenomena and TeraHertz pressure waves as the fundamental reasons for geochemical evolution”, 14<sup>th</sup> International Conference on Fracture, Rhodes-Greece, 2017**

**Honorary Professorship Lecture on “Fracto-emissions as seismic precursors”, Tianjin University, Tianjin-China, 2017**

**Invited Lecture on “Size-scale transition from plastic collapse to brittle fracture”, Tianjin University, Tianjin-China, 2018**

**Opening Lecture on “Scaling and fractality in fatigue crack growth: Implications to Paris Law and Woehler’s Curve”, 2<sup>nd</sup> Structural Integrity Conference and Exhibition (InSIS), Hyderabad-India, 2018**

**Invited Lecture on “Nano-mechanics instabilities and THz vibrations: Their strong correlations to low energy nuclear reactions (LENR)“, Southern University of Science and Technology, Shenzhen-China, 2018**

**Plenary Lecture on “Earthquake neutrons and Earth-Crust LENR: From seismic precursors to geochemistry evolution“, 22<sup>nd</sup> International Conference on Condensed Matter Nuclear Science (ICCF-22), Assisi-Italy, 2019**

**Plenary Lecture on “Correlation between nano-mechanics instabilities, THz phonons, and sub-atomic particle emissions: Implications to geo- and electro-chemistry”, 14<sup>th</sup> International Workshop on Anomalies in Hydrogen Loaded Metals (IWAHLM-14), Assisi-Italy, 2021**

**Plenary Lecture on “Calorimetric measurements and heat generation in electrolysis experiments: Correlations to electrode microcracking, chemical changes, and sub-atomic particle emissions”, 15<sup>th</sup> International Workshop on Anomalies in Hydrogen Loaded Metals (IWAHLM-15), Assisi-Italy, 2022**

**Plenary Lecture on “Renormalization group and Catastrophe theory in Geomechanics: From universal (fractal) material properties to scale-invariant constitutive laws”, Sustainable Industrial Processing Summit (SIPS), Phuket-Thailand, 2022**

**Plenary Lecture on “Correlation between nano-mechanics instabilities, TeraHertz phonons, and sub-atomic particle emissions: Implications to Geophysics and Geochemistry”, Sustainable Industrial Processing Summit (SIPS), Phuket-Thailand, 2022**

**Plenary Lecture on “Highly correlated phenomena in Geo-physics and Geo-chemistry: Nano-mechanics instabilities, THz phonons, sub-atomic particle emissions, compositional changes”, International Forum on Condensed Matter Physics, Porto-Portugal, 2023**

**Induction Speech on “Fracture & Complexity”, Academy of Athens, Athens-Greece, 2023**

**Invited Lecture on “Fracture and Complexity”, Shantou University, College of Engineering, Shantou-China, 2023**

**Opening Lecture on “Micro-damage instability mechanisms in composite materials: Cracking coalescence versus fibre ductility and slippage”, 4<sup>th</sup> International Conference on Damage Mechanics, Baton Rouge-Louisiana, USA, 2023**

**Keynote Lecture on “Compressio failure in rocks: Fracto-emissions and related stoichiometric balances”, 15<sup>th</sup> International Conference on Fracture (ICF15), Atlanta-Georgia, USA, 2023**

**Opening Speech on “Remembrance of Takeo Yokobori by Alberto Carpinteri”, Memorial Session, 15<sup>th</sup> International Conference on Fracture (ICF15), Atlanta-Georgia, USA, 2023**

## **MAJOR RESEARCH GRANTS (LAST FEW YEARS)**

The following research grants exceeding Euro 400,000 were coordinated as Project Leader.

**(1) Italian Ministry of Education, Research and University, “Process Development, Innovative Methods of Implementing, and Design of Composite High-tech and Coating Ceramic Materials” (PROMOMAT), 2002-2005**

**(2) Italian Ministry of Education, Research and University, “Fracture Mechanics Advanced Applications to Ductility and Durability of Reinforced or Retro-fitted Structural Elements” (PRIN), 2010-2012**

**(3) Regione Piemonte, “Preservation, Safeguard, and Valorization of Masonry Decorations in the Architectural Historical Heritage of Piedmont” (RE-FRESCOS), 2010-2013**

**(4) MetalWork S.p.A. (Private Company), “Hydrodynamic cavitation, nano-bubble implosion, THz vibration, and correlated energy aspects”, 2015-2019**

**(5) European Union, “Clean Energy from Hydrogen-Metal Systems” (CleanHME), 2020-2024**

**February 2024**