

# **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 of Civil Engineering, Shantou University, Shantou-China, 2023-**

## **PREVIOUS POSITIONS**

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

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

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

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

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

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

**Vice-president of the National Research Institute of Metrology (INRIM), Turin-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, Milan-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**

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

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

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

**Nominator, Japan Prize, 2016-**

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

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

**Member of the Editorial Board of ten 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**

## **FELLOWSHIPS**

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

**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-**

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

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

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

## **INTERNATIONAL AWARDS AND RECOGNITIONS**

**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**

**NATO Senior Research Fellowship, Lehigh University, Bethlehem-Pennsylvania, USA, 1982**

**NATO Senior Research Fellowship, Northwestern University, Evanstone-Illinois, USA, 1985**

**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**

**Frocht Award, Society for Experimental Mechanics (SEM), Indianapolis-Indiana, USA, 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**

## **INTERNATIONAL HONORARY TITLES**

**Honorary Professorship, Tianjin University, Tianjin-China, 2017**

**Honorary Professorship, Northeastern University, Shenyang-China, 2024**

**Doctorate Honoris Causa in Engineering, Russian Academy of Sciences, Moscow-Russia, 2016**

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

## **SUPERVISION OF PhD AND MSc DISSERTATIONS**

**Supervisor of 35 PhD Candidates. Presently, most of them are taking University Faculty positions in Italy or abroad (17/35): Six Full Professors, nine Associate Professors, two Assistant Professors, five Post-doctoral Fellows, one PhD Student, whereas the remaining twelve are managers or officers in public or private enterprises**

**Supervisor of 121 Master Candidates**

## **EDUCATIONAL 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-**

## **ORGANISATION OF MAJOR SCIENTIFIC EVENTS**

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

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

**Organizer and Chairman of the Scientific Committee, IUTAM**

**Symposium on “Size-Scale Effects in the Failure Mechanisms of Materials and Structures”, Turin-Italy, 1994**  
**Organizer and Chairman of the Scientific Committee, 11<sup>th</sup> International Conference on Fracture (ICF11), Turin-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) = 94**  
**Total Citations (Google Scholar) = over 35,000**

**H-Index (Scopus) = 66**  
**Total Citations (Scopus) = over 16,000**

**H-Index (Web of Science) = 54**  
**Total Citations (Web of Science) = over 10,000**

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

**D-Index = 81**  
**Total Citations = over 24,000**  
**n. 3 in Italy**  
**n. 243 in the World**

**Author of over 1,000 publications, of which more than 500 appear in Refereed International Journals, and 59 are authored or edited volumes, on the following research topics:**

**Structural mechanics, fracture mechanics, fatigue resistance and fatigue crack growth, thermo-elasticity, seismic structures, reinforced concrete, structural health 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, next-generation reinforced concrete, high-performance prestressed concrete, FRP-bar reinforced concrete, fibre-reinforced concrete, hybrid-reinforced concrete, size-scale ductile-to-brittle transitions

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**

Several 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) and definition of the dimensionless Brittleness Number in the scaling competition between plastic collapse and brittle fracture, which are failure mechanisms governed by generalized forces with different physical dimensions

(2) Interpretation of the phenomena of mechanical instability such as brittle crack propagation, frictional stick-slip, and buckling in thin shells in the framework of Catastrophe Theory by René Thom

**(3) Multi-fractal Scaling Laws (MFSL) for tensile strength (lacunar fractals) and fracture energy (invasive fractals) in concrete-like and metallic materials**

**(4) Application of Fractional Calculus to field and boundary equations of elastic bodies deformable only in fractal sub-sets**

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

**(6) Scaling and fractality of Fatigue Limit (Woehler's Curve) and Fatigue Threshold (Paris Law): Solution to the Short Crack problem in the framework of Fractal Geometry**

**(7) Acoustic, electromagnetic, and subatomic particle emissions from fracture and earthquakes: Fracto-emissions as seismic precursors**

**((8) 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 35 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, Hong Kong**

**Opening 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 Wiegaardt 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”, 22nd 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, Rome-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 “Compressive failure in rocks: Fracture 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**

**Acceptance Speech for the ASTM Irwin Medal on “Fracture & Complexity”, 21<sup>st</sup> International ASTM /ESIS Symposium on Fatigue and Fracture Mechanics, Washington-DC, USA, 2023**

**Opening Lecture on “Fractals in strength, fracture, and fatigue”, Silk Road International Symposium, Xi’an, China, 2023**

**Invited Lecture on “Fracture & Complexity”, Northwestern Polytechnic University, Xi’an, China, 2023**

**Invited Lecture on “Scale effects on the ductile-to-brittle transition in plain and reinforced materials”, The Hong Kong University of Science and Technology, Hong Kong, 2024**

**Invited Lecture on “Fracture emissions as seismic precursors”, City University of Hong Kong, Hong Kong, 2024**

**Invited Lecture on “Scale effects on the ductile-to-brittle transition in plain and reinforced materials”, Northeastern University, Shenyang, China, 2024**

**Invited Lecture on “Scale effects on the ductile-to-brittle transition in plain and reinforced concrete structures”, Tsinghua University, Beijing, China, 2024**

**Invited Lecture on “Scale effects on the ductile-to-brittle transition in plain and reinforced concrete structures”, Tianjin University, Tianjin, China, 2024**

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

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

(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

(6) Shantou University, Shantou-China: “Next-generation reinforced concrete structures: Brittle behaviour and fracture mechanics assessment”, 2023-2026

June 2024