

7th International Conference on Structural Integrity (ICSI2027)
29 August – 2 September 2027 · Funchal, Madeira, Portugal
Thematic Symposium

Integrity of Biological Structures: Cardiovascular Biomechanics and Beyond

This thematic symposium of ICSI2027 brings together researchers working where structural integrity, experimental mechanics and biomechanics meet.

Biological tissues and hierarchical natural materials, including arteries, heart valves, bone and wood, exhibit anisotropy, heterogeneity and complex damage and failure mechanisms; soft tissues also undergo large deformations. These features challenge characterisation and design and inspire biomimetic structures. Cardiovascular biomechanics is a central theme, from aortic tissue characterisation to patient-specific rupture risk assessment. Aneurysm rupture and aortic dissection exemplify failure in layered, fibre-reinforced tissue.

The symposium welcomes experimental, theoretical and numerical contributions from academia, clinical partners and industry. It emphasises full-field measurements, inverse identification, image-based modelling, fracture, fatigue and physics-informed methods, with applications to clinical assessment, biomedical devices and bio-inspired engineering. Other biological tissues, hierarchical natural materials and bio-inspired structures are equally welcome where they address mechanical integrity, damage or failure.

Topics include, but are not limited to:

- Cardiovascular biomechanics: arteries, aortic aneurysms (including ascending thoracic aortic aneurysm) and dissection, heart valves; hyperelastic and anisotropic constitutive modelling
- Fluid–structure interaction and patient-specific modelling; clinical imaging (CT, MRI) for biomechanics
- Bone, wood and other hierarchical biological materials: mechanical behaviour, damage and fracture
- Full-field measurements (Digital Image Correlation, including deep-learning DIC), inverse identification (Virtual Fields Method), and heterogeneous testing within Material Testing 2.0
- Bio-inspired and biomimetic materials and structures
- AI, data-driven and physics-informed methods in biomechanics (surrogate models, digital twins, uncertainty quantification)
- Structural integrity of biomedical devices, bio-implants, endovascular devices and prostheses, including mechatronic prostheses
- Fatigue and dynamic response of biological tissues and biocompatible materials

One-page abstracts will be peer reviewed by the ICSI2027 Scientific Committee. Authors of presented contributions may submit full papers for consideration in the open-access Springer proceedings, “Proceedings of the 7th International Conference on Structural Integrity (ICSI2027)”. Selected contributions may also be invited to submit full manuscripts to journals affiliated with the event.

Subject to agreement with the conference organisers and the journal, authors of eligible cardiovascular contributions may be invited to submit to the Special Issue “Cardiovascular Biomechanics: Bridging Experimental, Computational and Clinical Perspectives” in *Bioengineering* (MDPI). Journal submissions must be full research manuscripts, rather than extended abstracts, and meet the journal's scope and originality requirements. They will be subject to its editorial screening and independent, rigorous peer-review process. An APC reduction is under consideration and remains subject to confirmation.

Keywords: structural integrity; biomechanics; cardiovascular biomechanics; aortic aneurysm; soft tissues; hierarchical materials; fracture; digital image correlation; Virtual Fields Method; bio-inspired materials; physics-informed machine learning.

Symposium Organiser

José Xavier

UNIDEMI, Department of Mechanical and Industrial Engineering (DEMI), NOVA School of Science and Technology, Universidade NOVA de Lisboa, Portugal – jmc.xavier@fct.unl.pt

