Ever since it was founded, in 1972, the International Society for the Interaction of Mechanics and Mathematics has been nourishing the exchange of ideas between scholars working in the fields of Mathematics and Mechanics. Behind such undertaking is the idea that the cooperation between mathematicians and mechanicians, keeping other sciences in perspective, is fundamental for the advancement of both sciences. This idea turns often in the literature: the mutual influence of hydrodynamics, electromagnetism and elasticity on mathematics has been deeply investigated and has been the subject of much debate.

As of today, this point of view is very much topical: first, because new disciplines, such as materials science, biomechanics, and biology have been added to the above list; second, because we are in a quite special moment of the human adventure, where collaborative efforts in science are easier than some years ago and both mathematicians and mechanicians are more open to interdisciplinary research with a stronger vocation toward applications.

One of the activities of the Society has been to organize every other year the Symposium on Trends in Applications of Mathematics to Mechanics (STAMM): a meeting involving not only the members of the society, but also to further scholars working on mechanics or mathematics with a taste for both sciences. To enhance the activities of the Society, in the last four meetings, the ISIMM Prize (now ISIMM Medal) has been awarded to scholars who have been promoting the interaction between Mechanics and Mathematics, and an ISIMM Junior Prize for young researchers with a distinguished record in their early career.

The 2018 STAMM meeting (24-27th June) took place in the Mathematical Institute of Oxford University. This meeting was organized jointly with the Society of Natural Philosophy (SNP), whose aims and views are strongly related to ISIMM's. Such a joint meeting had been long hoped for by the members of the two societies, and it has to be considered an important accomplishment, given that ISIMM is based in Europe whereas SNP is based in the USA.

The meeting featured a special day in honour of Sir John Ball's 70th birthday. In this occasion, Professor Ball was awarded the 2018 STAMM medal in recognition of his exceptional contributions towards building a link between Mathematics and Mechanics. The 2018 ISIMM Junior Prize was awarded to Dr. Matthias Liero in appreciation for his contributions to the analysis of evolutionary partial differential equations with a view towards concrete applications in mechanics and physics.

The meeting featured 20 highly qualified speakers from the fields of elasticity, partial differential equations, composite materials, calculus of variations, mechanobiology, applied mathematics, homogenization, etc, and attracted more than 60 participants both from Europe, United States, and Japan.

Considering the definite success of this meeting, and the high scientific level of both speakers and participants, the decision was made to propose to gather a number of contribution in this special issue of the International Journal of Nonlinear Mechanics.

As can be read from the table of contents, the articles in this special issue cover: instability and bifurcations in elasticity, with applications to composites and dielectric elastomers; growth and remodeling; elastic singularities in thin

This list of topics may need to be enlarged according to the final list of papers. AS: I wonder whether we really want to have this paragraph.

shells; liquid crystals; cavities filled with compressible fluids; shape deformation; stochastic response of elastic bodies; morphing of biological structures; homogenization of dielectric composites and graphene sheets. Mathematically this covers existence of weak solutions, stability analysis, metric's transport, homogenization theory. In all these papers, new insights in mechanical problems are made possible with the aid of mathematics, or novel mathematical results are suggested by problems in mechanics.

This theme issue has 12 contributions that readily show the mutual interaction of mathematics and mechanics. The article by Cai & Fu investigates the effects of a pre-stretch on a bilayer structure. This structure represents a prototypical model problem for the understanding of pattern formation in soft materials. In the paper by Canevari, Harris, Majumdar & Wang, a special class of critical points to the Landau-de Gennes theory of liquid crystals is analyzed in the three-dimensional setting. The paper by Ciambella & Nardinocchi presents a model for magneto-elastic composites within the broad framework of nonlinear elasticity with growth and remodelling. Cicconofri, Arroyo, Noselli & DeSimone analyze the morphing of unicelluar organisms by applying Gauss' theorema egregium. They also discuss actuation of surface morphing by shearing or stretching. The paper by Davini, Favata & Paroni show that graphene can be modeled as a classical Föppl-von Kármán plate, where the constitutive constants depend on the atomistic interactions. Galdi, Mácha & Nečasová study a rigid body which contains a viscous compressible fluid. They prove existence of weak solutions to a corresponding system of partial differential equations. The topic of the contribution by Ghosh, Guo & Lopez-Pamies is the homogenization of dielectric composites that contain active or passive charges. They derive the effective equations and apply their results to polymer nanoparticle composites. The paper by Mihai, Woolley & Gorely re-visits the problem of combined stretch and torsion/inflation of a circular anisotropic cylinder and examine how likely are the inversion and perversion behaviors of the resulting deformation when the material parameters are given a probability distribution. The paper by Schweickert, Mihai, Martin & Neff present specific examples of inhomogeneous deformations for which a constant Cauchy stress is induced by a strictly rank-one convex elastic energy potential. The paper by Singh & Purohit deals with the problem of a circular elastic sheet subject to a living load acting in direction normal to the surface and supported at the center, in order to develop a conical shape. The paper by Su, Chen & Destrade focuses on the electromechanical instability of a dielectric elastomer subject to different electrical and mechanical boundary conditions and identifies paths to failure using Hessian criterion along the loading path. Finally, Teresi, Milicchio, Gabriele, Piras & Varano address the problem of shape reconstruction from intrinsic geometrical properties by studying morphing from a target metric and by considering the transport of metric between body manifolds.

In closing, our thanks go to all contributors that made the special issue possible, to Pol Spanos, the Editor in Chief of the International Journal of Nonlinear Mechanics, and to Alain Goriely, whose support was crucial during all stages of this endeavour.

The guest editors.

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