Editorial: Mechanics of soft materials, structures, and systems

Chaofeng Lü,1 Wen Chen,2 Jinxiong Zhou,3 Shaoxing Qu,4 and Weiqiu Chen4,a)
1) Soft Matter Research Center and Department of Civil Engineering, Zhejiang University, Hangzhou 310058, China
2) Institute of Soft Matter Mechanics, College of Mechanics and Materials, Hohai University, Nanjing 210098, China
3) State Key Laboratory for Strength and Vibration of Mechanical Structures, School of Aerospace, Xi’an Jiaotong University, Xi’an 710049, China
4) Soft Matter Research Center and Department of Engineering Mechanics, Zhejiang University, Hangzhou 310027, China


The concept of soft matter was first introduced by P. G. de Gennes in his acceptance speech for the Nobel Physics Prize in 1991. In mechanics community, however, people usually prefer using soft material instead of soft matter to describe the material whose energy associated with thermal motion is comparative to the interaction energy. Unlike in the conventional condensed matter, entropy plays an important and even determinative role in soft materials. This particular characteristic of soft material gives birth to very complex and kaleidoscopic systems, such as liquid crystals, polymers, colloids, granular materials, and biological systems. Soft materials have many vagarious properties, including strong reaction to weak stimulus, nonlinear response, self-assembly, to name a few, which fully embody the complexities and particularities in multi-scale compositions, structures and interactions. The luxuriant multi-discipline nature and wide applications of soft materials have successfully intrigued both scientists and engineers worldwide.

Recent years have witnessed wide research interests in and great endeavor to mechanics of soft materials, as evidenced by several newly emerging international journals, e.g. Soft Matter and Soft Materials, as well as special topics in journals of physics, chemistry, biology, and mechanics, etc. It is not surprising since mechanics, both fundamental to deep understanding of complex behavior of soft materials and instructive to their applications, is a strong link between science and technology. We can even say that mechanics will play a central role in soft materials, structures and systems, just as in the conventional mechanical systems. To strengthen this point, we may simply cite the words in de Gennes’ speech — “... Here, we see another fascinating aspect of soft matter — the amazing coupling between mechanics and conformations.”

Researchers from mainland China have made significant contributions to the related topics on mechanics of soft materials, structures and systems. In particular, several important conferences, workshops or minisymposia have been organized in recent years. As part of the 2013 Chinese Congress on Theoretical and Applied Mechanics (CCTAM2013) held in Xi’an, China (August 19–21, 2013), the Second Workshop on Mechanics of Soft Materials was jointly organized by Zhejiang University, Hohai University, and Xi’an Jiaotong University. The hot topic attracted about forty original submissions, for which the rejection rate is about 25% and nearly thirty interesting lectures have been delivered during the workshop. Ten full-length papers from the presented talks are recommended for publication in this special issue after a routine but rapid review process. These papers cover a wide range of research topics, from biology to nanotechnology, from analytical modeling to numerical simulation, and from constitutive law to experiment, etc. The results and conclusions provide a strong basis for the understanding of complex behaviors of various soft materials, structures and systems. We would like to congratulate all authors for their wonderful works, and last but not least, express our greatest appreciation of their effort and time, which makes this special issue available.

a)Corresponding author. Email: chenwq@zju.edu.cn.