



Several Topics on the Mechanics of Flexible Materials and Structures

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Flexible structures and materials often undergo highly nonlinear deformation, which can be harnessed to generate a variety of novel mechanical functions. In this talk, I will briefly introduce several examples from our research on the distinctive nonlinear mechanics of such systems. The topics include: (i) the mechanics of knitted fabrics; (ii) the design, fabrication, and mechanical properties of metamaterials inspired by kigumi, a traditional Japanese wooden interlocking technique; (iii) tension–torsion coupling in cylindrical kirigami chiral structures; (iv) woven-paper techniques for constructing curved surfaces; (v) the tendrils of climbing plants; and (vi) soft jumper systems designed using mechanical instability. Finally, I will introduce our recent work on (vii) topology optimization for soft materials involving contact and friction, based on the Material Point Method.

Ryuichi Tarumi received my Ph.D. in Materials Science from the Tokyo Institute of Technology in 2003. Since then, he has been working at the University of Osaka, where he was appointed Assistant Professor in 2003, Associate Professor in 2008, and Professor in 2018. In 2009, he stayed at the Mathematical Institute of the University of Oxford to study continuum mechanics from a variational perspective.