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Abstract for an Invited Paper  
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**The Extreme Mechanics of Soft Structures<sup>1</sup>**

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I will present a series of experimental investigations on the rich behavior of soft mechanical structures, which, similarly to soft materials, can undergo large deformations under a variety of loading conditions. Soft structures typically comprise slender elements that can readily undergo mechanical instabilities to achieve extreme flexibility and reversible reconfigurations. This field has come to be warmly known as Extreme Mechanics, where one of the fundamental challenges lies in rationalizing the geometric nonlinearities that arise in the post-buckling regime. I shall focus on problems involving thin elastic rods and shells, through examples ranging from the deployment of submarine cables onto the seabed, locomotion of uniflagellar bacteria, crystallography of curved wrinkling and its usage for active aerodynamic drag reduction. The main common feature underlying this series of studies is the prominence of geometry, and its interplay with mechanics, in dictating complex mechanical behavior that is relevant and applicable over a wide range of length scales. Moreover, our findings suggest that we rethink our relationship with mechanical instabilities which, rather than modes of failure, can be embraced as opportunities for functionality that are scalable, reversible, and robust.

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