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Lessons from Biology: How Patterns Control Adhesion EDWIN CHAN, ALFRED CROSBY, TINA THOMAS, University of Massachusetts — Polymer adhesion impacts applications from biomedical devices to semiconductor processing, yet our fundamental control of this property remains a challenge. Nature has shown us through numerous examples (e.g. gecko to lotus leaf) that a powerful strategy for tuning adhesion lies in the development of hierarchal structures at an interface. Although nature has demonstrated this solution, our understanding on using this approach effectively is relatively unexplored. In this work, we seek to understand the inter-relationship between material structure, patterns, and performance (i.e. adhesion) for soft, polymer materials. We present an overview of the importance of length scales in adhesion, our overall strategy, and results on the adhesion of soft elastomers to inorganic surfaces. Through these results, we explain critical scaling relationships that demonstrate the potential for using patterns to tune adhesion, while also illustrating the wide range of mechanisms through which patterns can interact with a polymer interface.

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