

LACE IN SPACE

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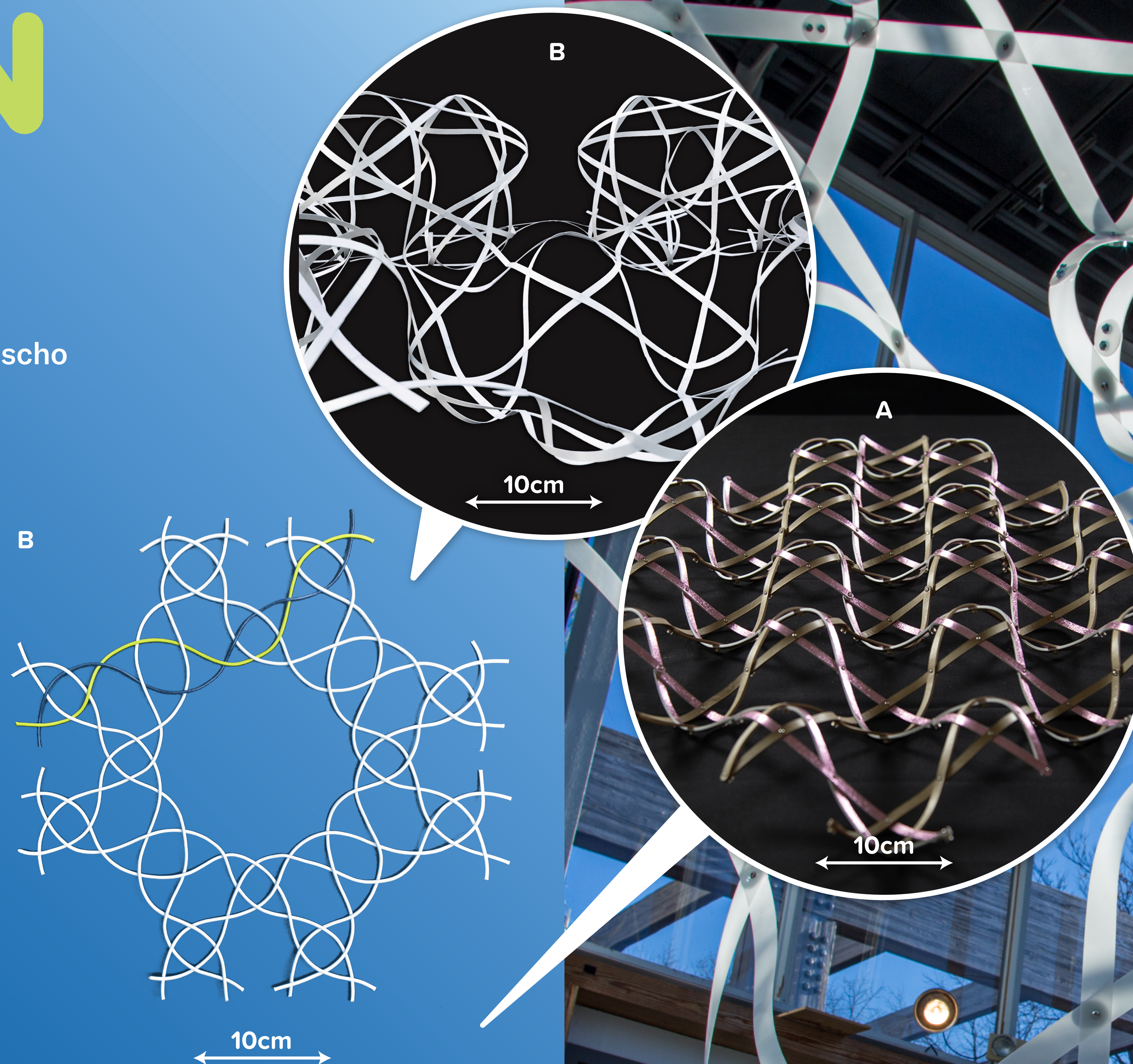
Bobbin lace is a textile made of intricately braided, continuous threads often found on the cuffs and collars of royalty since the time of its invention in the 16th century. Historically, the value of bobbin lace was determined by the size of the textile rather than the cost of its material, which was typically white cotton or linen thread. In this project, we reinterpret the limits of scale and material of bobbin lace, leading to semi-rigid structures with interesting out-of-plane geometries and mechanical behaviors. By introducing anisotropy, preventing sliding, and increasing stiffness of the strands, lace networks are driven out of plane as they seek a minimal energy state. We take this system to the meter scale, where gravity becomes a dominant force. To do so, our window of possible materials narrows as we require both a large bending stiffness and a small cross section to reduce weight and prevent material failure when largely deformed. We distort the network into a free-form shape to explore the range of this system, touching the limits of elastogravity length scale, material constraints, as well as reaching the four walls, floor, and ceiling of our exhibition space.

This work was completed with the help of many assistants including Laura Fegley, Alla Alsahli, Sean Rucewicz, Yinog Tao, and many others along the way. Special thanks to Sigrid Adriaenssens and Tian Yu of Princeton's Form Finding Lab and Veronika Irvine for their valuable support and insights.

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Two lace patterns are comprised of the same stitches but worked in a different order, leading to different out-of-plane geometries. Strand continuity allows one to switch freely between patterns in a given design, which we demonstrate in our large structure.

