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Packing with a twist: from Wrinkles to Scrolls ARSHAD KUDROLLI, JULIEN CHOPIN, Department of Physics, Clark University — We discuss an experimental investigation of a thin elastic sheet in the form of a ribbon with clamped boundary conditions at both ends which is then subjected to a twist by rotating the ends through a prescribed angle. We find that a wrinkling instability appears even at a small twist angle which depends on the aspect ratio of the ribbon, its bending modulus and initial tension. Using x-ray tomography, we show that the pattern of this first instability has an impact on the folding at larger twist angles which can result in ordered configurations including Fermat scrolls. Still further twisting results in a highly compressive packing as in wringing a towel without application of direct radial compression. Implications for developing yarns with novel mechanical and transport properties [Lima, et al., Science 331, 51 (2011)] will be discussed.

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