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Plant tendrils: Nature's hygroscopic springs SHARON GERBODE, Harvey Mudd College, JOSHUA PUZEY, ANDREW MCCORMICK, L. MAHADEVAN, Harvard University — Plant tendrils are specialized climbing organs that have fascinated biologists and physicists alike for centuries. Initially straight tendrils attach at the tip to an elevated rigid support and then winch the plant upward by coiling into a helical morphology characterized by two helices of opposite handedness connected by a helical perversion. In his renowned treatise on twining and tendril-bearing plants, Charles Darwin surmised that coiled tendrils serve as soft, springy attachments for the climbing plant. Yet, the true effect of the perverted helical shape of a coiled plant tendril has not been fully revealed. Using a combination of experiments on Cucurbitaceae tendrils, physical models constructed from strained rubber sheets, and numerical models of helical perversions, we have uncovered that tendril coiling occurs via anisotropic shrinkage of a strip of specialized cells in the interior of the tendril. Furthermore, variations in the mechanical behavior of tendrils as they become drier and "woodier" adds a new twist to the story of tendril coiling.

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