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Sinusoidal to helical buckling of a thin rod under a cylindrical constraint JAMES MILLER, Massachusetts Institute of Technology, ARNAUD LAZARUS, MIT, NATHAN WICKS, JAHIR PABON, Schlumberger-Doll Research, PEDRO REIS, MIT — We investigate the buckling and post-buckling behavior of a thin, elastic rod loaded under cylindrical constraint. Our desktop experiments consist of compressing a hyper-elastic rod inside a transparent acrylic pipe with a motorized linear actuator. Under imposed displacement, the initially straight rod first buckles into a sinusoidal mode and eventually undergoes a secondary instability into helical buckling. This buckling and post-buckling behavior is found to be highly dependent on the systems' geometry, namely the rod length and the aspect ratio of the rod to pipe diameter. We quantify the wavelength and pitch of the period patterns through direct digital imaging and record the reaction forces at both end of the pipe. The observed behavior is rationalized through scaling arguments.

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