Large strain elasticity: geometry, instability, and brains

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We are all familiar with the prototypical elastic instability: the buckling of a slender column under a compressive load. Soft elastic solids, such as rubbers, gels, and biological tissues, are united by their ability to sustain very large shape changes, and consequently undergo a range of more exotic elastic instabilities underpinned by the non-linear geometry of large strains. I will discuss several such instabilities, including fingering in soft solid layers under tension, beading in solid cylinders subject to surface tension, and a brand new “peristaltic” instability in inflated cylindrical channels. In the second half of the talk, I will discuss the buckling of a growing layer adhered to a soft substrate. I will argue on symmetry grounds that such buckling will inevitably produce patterns of hexagonal dents near threshold, and then make a biological case that this buckling process leads to the folded shape of the human brain.

Wednesday, April 10th at 1:30 p.m. in Duane Physics G126