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Flow between Rotating Cylinders as a Model of Instability in Nonequilibrium Systems BRUCE RODENBORN, HARRY L. SWINNEY, Center for Nonlinear Dynamics, Dept. of Physics, UT Austin — The study of flow between rotating concentric cylinders (Couette-Taylor flow) began over a century ago and has been conducted by giants in the fields of fluid mechanics and astrophysics such as Lord Rayleigh, G.I. Taylor, and S. Chandreshekar. The system still yields seminal findings in fluid turbulence, hydrodynamic stability theory, plasma physics and chaos theory. It is also a model system for instabilities that arise in proto-planetary and proto-solar disks, the earth's core and other important applications. Simple geometry makes the base fluid state at low rotation rates analytically solvable at an undergraduate level, which belies the zoo of instabilities and patterns that develop for higher rotation rates. Low-cost cameras and open source software make a well-instrumented experiment possible for a few hundred dollars. Just as the Couette-Taylor system provides a valuable model for instability in systems driven away from thermodynamic equilibrium, it also serves as a valuable model experiment that builds important scientific abilities including: instrument control, data acquisition, image analysis, Fourier spectral analysis and other experimental skills. I use a Couette-Taylor system in annual winter schools on experimental physics, "Hands-On Research in Complex Systems" conducted in developing countries to stimulate interest in low-cost, table-top experimental physics.

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