1053-37-57 **Evelyn Sander*** (esander@gmu.edu), Dept. of Math. Sci. MS-3F2, George Mason University, 4400 University Dr., Fairfax, VA 22030, and **James A. Yorke**. *Period-doubling cascades galore.*

Period-doubling cascades are a familiar topic, since they arise naturally in many unrelated experimental and numerical systems. Yet little is known about why they exist. In a bifurcation diagram with an initial cascade as a parameter varies, secondary cascades occur within every periodic window. Thus there are an infinite number of cascades whenever there is one. In work with Jim Yorke, we show that the amount of chaos in the system as the parameter grows determines which cascades exist. We can characterize the chaos as the parameter grows for certain N-dimensional systems, where N is arbitrary but finite, giving rise to an explanation of its pattern of cascades. Furthermore, we have proved that the pattern of cascades is robust; namely that large local perturbations cannot destroy any cascades. Rather, a perturbation simply shifts the position of each cascade. (Received July 29, 2009)