By placing a mirror in front of a semiconductor laser diode, one can induce a rich variety of complex dynamics depending on the operating parameters of the system. Such external-cavity semiconductor lasers are of interest as they are a model system for high-dimensional chaos in addition to exhibiting fast dynamics on the sub-nanosecond timescale. This later property makes external-cavity semiconductor lasers of interest for a range of high-speed applications in communications and computing. In this talk, I discuss our experimental investigations of the sequence of dynamical regimes or the bifurcation cascade, though which an external-cavity semiconductor laser passes as the feedback strength varies. We unambiguously identify key bifurcations and obtain an understanding of the bifurcation cascade based on the system dynamics. In addition, I discuss some recent applications of such systems for ultrahigh rate random-bit generation.