

SES11-2011-000012

Abstract for an Invited Paper
for the SES11 Meeting of
the American Physical Society

How Do Songbirds Produce Precise Vocalizations?

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Many species of songbirds do not sing instinctively but learn their songs by a process of auditory-guided vocal learning that starts with a kind of babbling that converges over several months and through tens of thousands of iterations to a highly precise adult song. How the neural circuitry of the songbird brain learns, generates, and recognizes temporal sequences related to song are important questions for neurobiologists and also interest an increasing number of physicists with interests in biophysics, statistical mechanics, nonlinear dynamics, and networks. I will discuss some interesting questions posed by recent experiments on songbirds, especially in regard to extremely sparse neuronal firing associated with song production. I will then discuss a theoretical model known as a synfire chain that my group and others have invoked and analyzed to explain some features of the experimental data.