1007-62-42 **Matthew B Kennel*** (mkennel@ucsd.edu), Institute for Nonlinear Science, UC San Diego, 9500 Gilman Dr, La Jolla, CA 92117, and **Jose M. Amigo** (jm.amigo@umh.es), Universidad Miguel Hernandez. *Estimating the entropy rate from observed time series, with confidence intervals.*

The entropy rate of a stochastic process or dynamical system quantifies the rate of new information, or "surprise" generated per unit time. In a neuroscience context, it is desirable to be able to estimate this quantity from time-series of observations, for example, from a time series of spike times discretized into a binary process. This may represent sensory input encoded via neural circuitry or spontaneous chaotic oscillations. Estimating the entropy rate from observations is more difficult than estimating the entropy of a random variable. Data compression algorithms adopted from information theory prompt ways to directly estimate the entropy rate without the necessity of estimating block entropies as an intermediate stage. We discuss two statistical estimators for the entropy rate, one, a very simple Lempel-Ziv complexity measure which formed the conceptual basis of their well known compression algorithm, and a novel rate estimator based on the more recent context tree weighting compression algorithm. Importantly for physical data analysis, as opposed to compression of individual messages, we derive statistical confidence intervals ("error bars") for the entropy rate estimate under reasonable assumptions, and verify with numerical simulation. (Received December 29, 2004)