1133-92-31 **Alan Paris*** (atparis@knights.ucf.edu), **Azadeh Vosoughi**, **George Atia** and **Stephen A. Berman**. *A Maximum Entropy Principle for 1/f-type Noises in Neurological Systems.*

Neurological signals have high noise at all scales, from ion channels to EEG. This noise is not mere interference: simple models of channel noise have supported breakthroughs yielding several Nobel prizes and it is likely that cognition depends on noise. Neurological noise signals are often of the $1/f$-*type*; i.e., with power spectra $S(f) \sim 1/f^{\theta}$ for a range of frequencies f and a *spectral exponent* $\theta > 0$. Unusual spectral exponents may be associated with diseases such as Alzheimer's. Also common are the *Lorentzian noises* with

$$S(f) \sim \int_{\mathrm{T}} \frac{\mathrm{d}w(\tau)}{1 + (2\pi\tau)^2},$$

where T is related to the eigenvalues and w to the eigenvectors of a *hidden Markov model*. But there has been no systematic principle to select these eigenvectors or relate the $1/f$ and Lorentzian families and it has been claimed that there can be no such principle. But we have shown that a maximum entropy optimization in a simple quantum mechanical setting can, in fact, give rise to Lorentzian noises with $1/f^{\theta}$ spectral characteristics in which θ is a *Lagrange multiplier*. The resulting family of noises shows superior performance in *brain-computer interface* algorithms. (Received June 02, 2017)