Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Predictive filtering in the phototransduction cascade ILYA NEMENMAN, Coulmbia University — Animals gather sensory information to guide their actions. But acting takes time, and sense data are useful only to the extent that they carry predictive information, that is, information about the state of the world at the time of the actions. We suggest that efficient maximization, extraction, and transmission of such predictive information, rather than maximization of the overall channel capacity, may be the correct optimization principle responsible for designs of some sensory systems. We support these arguments by analyzing information transmission in the enzymatic amplifier in the phototranducstion cascade, were maximization of predictive information seems to explain various experimentally observed properties, such as time scale and gain adaptation. Further, we emphasize that some standard filters used in signal processing can be viewed as (implicitly) maximizing predictive information as well.

Ilya Nemenman
Columbia University

Date submitted: 01 Dec 2004 Electronic form version 1.4