TEMPORAL DECORRELATION: A THEORY OF LAGGED AND NONLAGGED RESPONSES IN THE LATERAL GENICULATE NUCLEUS (LGN). Dawei W. Dong and Joseph J. Atick*. Computational Neuroscience Lab., The Rockefeller Univ., 1230 York Ave., NY, NY 10021.

Natural time-varying images possess significant temporal correlations which persist even after retinal processing and hence, under natural activation conditions, the signal sent to the LGN is temporally redundant or inefficient. We explore the hypothesis that the LGN is concerned, among other things, with improving efficiency of visual representation through temporal decorrelation of the retinal signal much in the same way that the retina improves efficiency by spatially decorrelating incoming images. Using some recently measured statistical properties of motion pictures, we predict the spatio-temporal receptive fields that achieve this decorrelation. It is shown that, because of neuronal nonlinearities, temporal decorrelation requires two response types, the *lagged* and *nonlagged*, just as spatial decorrelation requires *on* and *off* response types. The tuning and response properties of the predicted LGN cells compare quantitatively well to what is observed in recent physiological experiments as shown below. The solid curves are the theoretical predictions and the data points are from Saul and Humphrey (1990). (Supported by Seaver Institute.)