53.3

NEUROANATOMICAL MODEL OF INTRINSIC HIPPOCAMPAL CIRCUITRY IN THE RAT. A. Roskies, B. Armstrong, D.G. Amaral, and T.J. Sejnowski. Salk Institute, La Jolla, CA 92037.

Qualitative studies have revealed orderly gradients in connectivity density within and between various subfields of the rat hippocampus along the septotemporal, transverse, and radial axes (Amaral and Witter, Neuroscience 3, 1989). We have developed a method for quantifying these projections and are using these data to develop a probabilistic 3-D model of Shaffer collateral projections between CA3 and CA1. Such a model will be useful for large-scale simulations and analysis of *in vivo* and *in vitro* electrophysiological results.

We first performed densitometric analysis of projections arising from small injections in CA3 of the anterograde tracer *phaseolus vulgaris leucoagglutinin* (PHA-L). Optical density was sampled in volumes of 50μm x 50μm x 30μm. Natural coordinates of sampled areas were transformed into a coordinate system corresponding to a planar representation of an unfolded hippocampus. The modified coordinate system has major axes originating in the cell fields, corresponding to the CA2/CA1 border longitudinally, the transverse axis, and stratum oriens and stratum radiatum radially. This transformation allows mathematical analysis of connectivity in a rectangular coordinate system. A computational model based upon data from several injection sites is sufficient to predict projection probabilities from novel sites in CA3. Modeling of the connectivity density between areas CA3 and CA1 will provide the basis for predicting complex interactions between populations of cells in various portions of CA3 and their effects on cells in CA1.