RIBAK, Charles E., Charles D. WOODY*, Mahmud NAHVI* and Eric TZEBELIKOS*, Department of Anatomy, Unversity of California, Irvine, California; and Departments of Anatomy and Psychiatry, University of California, Los Angeles, California. A glomer-ular-like dendro-dendritic relationship exists between Purkinje and Golgi II cells in the cat cerebellum.

Previous studies have reported characteristic electrophysiological properties of identified neuronal types in cat cerebellar cortex. When horseradish peroxidase (HRP) was injected into an individual Purkinje cell for its morphological identification following intracellular recording, light microscopic preparations have revealed the presence of two neurons containing HRP-positive reaction product. In these cases, either entirely or partially labeled dendrites of Golgi II cells were directed into the area of HRP-containing Purkinje cell dendrites. The site of intersection between these dendrites was examined in electron microscopic preparations in order to determine a basis for the multiple staining of neurons. A serial thin section analysis revealed HRP-containing dendrites forming a complex of interdigitating processes that were ensheathed by glia. The dendrites were characterized by their synaptology outside the glomerulus, and were identified as dendrites from Purkinje and Golgi II cells. Within the glomerulus, Purkinje cell spines branched so that some spines encapsulated the Golgi II cell dendrite while others invaginated that dendrite. Within the center of the glomerulus, the dendrites from the two respective cells were closely apposed to each other without any glial intervention. At this point of direct apposition a 2nm space was observed between these dendrites, and therefore, the presence of a gap junction may be indicated. This finding supports physiological data which suggest electrical coupling between Purkinje and Golgi II cells. Reconstructions of Purkinje cell spines which participated in the glomerulus showed that they are different from other spines in that they do not form synapses with axons. A probable function for these unusual spines may be to place the dendritic shafts of Purkinje and Golgi II cells into close approximation in order to form a gap junction. These results also demonstrate the usefulness of combining intracellular electrophysiology with HRP staining for the morphological investigation and identification of recorded neurons.

Supported by funds by the U.C.I. College of Medicine Research Committee.