

Focal nature of pyramidal cell axons and patterns of synaptic inputs on pyramidal cells

Javier DeFelipe
Instituto Cajal, Spain

In studies based upon anterograde and retrograde axoplasmic transport, small punctate injections of tracer in one cortical area lead to equally small focal patches of terminal and/or cell labeling in two or more distant areas, with additional foci often in the area injected. This suggests a complex pattern of corticocortical connections. Comparable, multiple focal patches can be generated by the horizontally disposed intracortical collaterals of certain single pyramidal cell axons. In other words, the columnlike pattern of corticocortical connectivity is based upon the pattern of collateral terminations of individual cells. Furthermore, it seems clear that pyramidal cells located in different layers and/or areas participate in different synaptic circuits and, since pyramidal cells whose somata occupy different layers largely project to different sites, the projection site can be considered as one of the most important features for distinguishing between pyramidal cells. In addition, different classes of pyramidal cells receive characteristic proportions of their inputs from thalamocortical and other major afferent systems, and from GABAergic intrinsic neurons, a factor to consider in future cortical processing models.