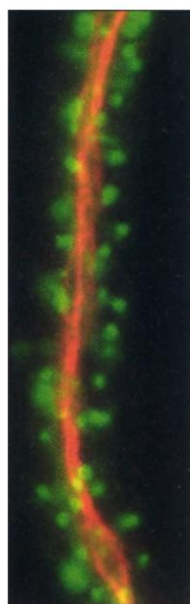


# Beautiful, Complex, and Diverse Specialists

**N**euroscientists have been fascinated by the beauty and the complexity of dendrites in the nervous system ever since the days of the great Spanish neuroanatomist Ramón y Cajal. Over the years, it has become clear that dendrites play a crucial role in processing and integrating the signals received by nerve cells. Due to the lack of adequate equipment, however, many of the particulars of the underlying mechanisms by which dendrites accomplish these tasks remained unclear for a long time. Except for a few pioneering individuals, neuroscientists tended to focus on more easily accessible structures and assumed that they could extrapolate those findings to explain dendrite function as well. But this situation has recently changed dramatically. Aided by new technology, neuroscientists are now able to study the function of dendrites at a detailed level that seemed almost beyond reach a generation ago. This special issue of *Science* takes a look at some of their key findings.



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In their Review, Häusser, Spruston, and Stuart (p. 739) discuss how, in the past decade, improved techniques such as patch-clamp recordings in brain slices or two-photon microscopy have led to a better understanding of the dynamics of dendritic computation and its contribution to neuronal signal processing. They explain that the diverse range of dendritic forms and shapes, with their unique electrical and chemical properties, enables neurons to perform a number of specialized tasks, depending on the functional requirements of their particular location in the brain. Segev and London (p. 744) survey the efforts of dendritic modeling, emphasizing the intricate interplay between experimental and modeling studies. New experimental approaches have initiated the development of new and refined models and vice versa. Indeed, the modelers were often ahead, predicting results that would be confirmed experimentally only years later.

The main purpose of dendrites is to process signals that are generated at the thousands of synapses on them. Kennedy (p. 750) reviews our knowledge of the machinery at the postsynaptic density, which receives incoming signals, and discusses recent findings concerning the structure, function, and regulation of these protein complexes. In addition, most synapses are located on dendritic spines, which are important sites for the plastic changes that are thought to underlie adaptation, learning, and memory. Matus (p. 754) looks at the role of actin dynamics in dendritic spines and synaptic plasticity.

Finally, the News component of this special issue deals with current discoveries about protein synthesis in dendrites and how it might contribute to learning and memory.

—PETER STERN AND JEAN MARX

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