

BOOK REVIEWS

edited by: H. PETSCHÉ and JOHN R. HUGHES

The dominant focus. Electrophysiological investigations. — V. S. Rusinov (Transl. edited by R. W. Doty). (Plenum, New York, 1973, 220 p., \$32.50).

Although the theory of the dominant in brain function (Ukhtomskii 1911) has been an important area of brain research in Soviet laboratories, probably few Western neuroscientists know much about the theory. This monograph should fill that gap.

The dominant focus concept is best explained by a specific example. An indwelling electrode is placed on a rabbit's "motor cortex" and weak anodal current is applied at the site where, if the current were greater, foot flexion would result. After a period of time and even minutes after the anodal polarization is turned off, an auditory or photic stimulus produces foot flexion. The dominant focus is characterized as having increased and prolonged excitability, a stable level of excitability and it shows summation of excitation. Rusinov's theme is that for the brain a dominant is a general principle and various dominants control activity of the nervous system. His book is a compilation of direct and all too frequently indirect research results and ideas to support this thesis. He examines how foci of excitation are converted into dominants, the relationships between cortical and subcortical dominants and a number of problems relating to electrophysiological investigations of dominants.

It is not possible to find in Rusinov's writing a precise and satisfying explanation of the basic mechanisms underlying a dominant. This picture seems to be sketched: Anodal polarization of the cortex affects apical dendrites and interneurons in the upper layer as well as far removed afferent-receiving areas, but for the latter no mechanism is described. Cell bodies are depolarized as well as dendrites but he cites evidence, which to this reviewer is unconvincing, that a more likely route to increased excitability in the dominant is via synaptic mechanisms (undefined). Neurons increase their firing rate in a dominant and develop temporary interconnections. But because slow potential (DC) shifts occur within a dominant, Rusinov believes extracellular electrotonic fields exert electrical effects upon neurons to produce temporary connections. His theory is unclear on this point. Although an electrical field surrounding a discharging neuron may effect the excitability of a neighboring neuron this reviewer knows of no evidence that synchronous potential changes (DC) within a population of neurons may be a means of communication among the neurons. Something

may have been lost in translation and it is not clear exactly how Rusinov proposes temporary connections are established.

Rusinov's temporary connection is an important idea for his theme since it is invoked as the basis for a mechanism of memory. Further, what happens in the formation of a dominant, namely excitability changes and developed temporary connections, is proposed as an analogy for what takes place in a pathological focus in human cortex. However, at least in the Western literature and considering Rusinov's references, much more is known about the electrical and excitable properties of neurons in and around pathological foci than is known about a dominant.

The citing of experimental support for (and against) the basis of the concept of a dominant focus is nowhere nearly as comprehensive as it could be. Rusinov's theme could have been made stronger (or weaker) if he had brought to bear data from morphological studies of cerebral cortex, especially electron microscopic work, electrophysiological investigations on excitability properties of cortical neurons, work on afferent convergence into cortex and studies on cortical areal interrelationships. Some of this work is probably not familiar to Soviet neuroscientists but since an English translation was made for Western readers, one wonders about the amount of serious attention which will be given to Rusinov's monograph by those Western neuroscientists who are most active in research on cortical excitability, foci, memory, and plastic phenomena and who may need convincing that Rusinov's theme of the dominant focus is worth serious study.

It is a pity that when the occasional scientific book in the Russian language appears in English translation it is expensive. This one is over 16¢ page of text and figures. But the worth of this book must be judged by the basis of its science, especially in terms of whether or not the theories and ideas presented contribute to the understanding of brain function and to the generation of critical experiments. Rusinov's monograph with its provocative theme deserves to be read by Western neuroscientists. Some will find stimulating ideas, others will at least appreciate being informed about the research interests and approaches of a highly regarded Soviet neuroscientist.

L. T. RUTLEDGE
University of Michigan,
Ann Arbor, Michigan 48104 (U.S.A.)