ture searches into the depths of the subject are thereby made easier. The fascinating questions outlined in this book will someday be answered at a more sophisticated level of integration. No one who attempts to do this can afford to ignore this bold and significant first step at synthesis.

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Nerve Tissue Culture

Tissue Culture of the Nervous System. GORDON SATO, Ed. Plenum, New York, 1974. xiv, 288 pp., illus. $19.50. Current Topics in Neurobiology, vol. 1.

"The impetus for compiling this book," writes the editor, "was the recent development of culture strains of neuroblastoma and glial cells and the immediate and enthusiastic way they have been taken up as model systems." This is a fair indication of its contents. The book consists of 11 chapters contributed mainly by recent recruits to the venerable field of nerve tissue culture who, in the '70's and late '60's, have been exploring the theoretical possibilities offered by cultures of dissociated cells, to which they have applied a variety of quantitative interdisciplinary techniques. Little attention is given in this compendium to other methods and fields of inquiry with which "tissue culture of the nervous system" has heretofore been identified, except for an informative chapter by Levi-Montalcini on her recent work with insect nervous and neuroendocrine systems. The book does not, moreover, include more than passing mention of the considerable current work by other investigators making use of cloned or dissociated nervous tissue in culture.

Tissue culture, like other experimental approaches, has its advantages and limitations. Paramount among the advantages is that it enables the experimenter to isolate a living microcosm from the organism as a whole and maintain it in generally normal form and function for considerable periods while observing its behavior directly at the cellular level. With primary explants, especially organotypic cultures, possibilities for quantitation are limited, the more so since the normal nerve cell cannot be propagated once it has developed beyond its early (neuroblast) stage. Concomitantly, mature glial cells divide sluggishly, if at all. Furthermore, in situ, differentiated neurons appear in a great variety of forms whose functions differ, and they exist in intricate relationships with glial cells and with each other that hamper attempts to deal separately with single factors.

On the chance of unraveling this tangled skein, the dedicated experimentalist will grasp at whatever appears to be a dangling thread. The availability of a transplantable mouse neuroblastoma (Jackson C1300) that can undergo even a limited degree of differentiation in culture and is not contaminated with supporting cells sparked this current onslaught. These neoplastic neurons were cloned in 1969 by Augusti-Tocco and Sato, who adapted methods introduced earlier by Sanford and by Puck for somatic cells. Clonal lines of neoplastic glial cells (for example, the C6 astrocytoma, which is here shown to elaborate the specific S-100 protein) were already available and under study in 1968. In its brief history this type of material has been extensively and intensively examined by these authors along biochemical and physiological lines; in addition, clonal lines of muscle cells have been presented to the neuroblastoma cells for their interaction. A neurotrophic effect is indicated, though synapses are not engendered. Genetic analysis of clonal lines has been attempted, in which hybridization has been performed between L-cells and C1300 cells. A substantial degree of aneuploidy and karyotypic instability is shown even by the cloned descendants of single neuroblastoma cells, a finding that is in keeping with the results of earlier exhaustive studies by others on HeLa and other neoplastic cell lines. Even though Sato has an enviable history of success in producing "minimally deviating" somatic cell lines, the hoped-for analysis of development has not materialized in these strains. There are indications here, especially in chapters by Seeds, Rosenberg, and Nelson, of a retreat from the cell lines to prepared positions involving primary cultures from normal brain. In these cultures the whole range of cell forms is present, and reaggregation takes place.

The data gathered together in this tour de force, though somewhat repetitiously presented, are interesting in themselves, as is the ingenuity that has gone into designing the experiments that permit a rigorous application of interdisciplinary methods to cultured nervous tissues. The ultimate value of this work in illuminating present concepts of nervous system function is still open to question because of the stubborn aberrancy, or inadequacy, of the biological material. Perhaps ways may be found to overcome this. In any case, it is evident that these research workers have been having a lot of fun, which their readers may share.

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Excited States

Organic Molecular Photophysics. Vol. 1. JOHN B. BIRKS, Ed. Wiley-Interscience, New York, 1973. xviii, 600 pp. illus. $37.50. Wiley Monographs in Chemical Physics.

The subjects covered in this volume include some of the most exciting and significant fields of current investigation in photophysics and photophysical chemistry. These include both theoretical and experimental studies of the nature of electronic excitation and of the decay of electronic excited states and some related topics concerned with the chemical and physical properties of excited states. The volume to some extent updates Birks's *Photophysics of Aromatic Molecules*, and in any event it fills a definite gap in the literature in this rapidly expanding field. The balance between theory and experiment is nicely maintained within chapters as well as in the book as a whole. The subjects treated include absorption and emission spectroscopy of organic compounds, radiationless transitions, lasers, excimers, diffusion-controlled rate processes, and exciton interaction in solids. The authors have generally achieved a high scientific as well as stylistic level in their contributions. The literature of each subject has been critically examined, and many tables and figures from the original papers are included in the book. Most chapters include citations of 1972 papers, which is as up to date as seems possible these days.

The book is aimed primarily at scientists with an active interest in photophysics, whether they are theoreticians or experimentalists, and a good background in spectroscopy and photochemistry is assumed. Such scientists will probably want to have this book in their personal libraries and will undoubtedly return to it again and again. Photochemists with a physical bent will be interested in much of the