HANDBOOK OF NEUROCHEMISTRY

Edited by Abel Lajtha

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STRUCTURAL NEUROCHEMISTRY

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VOLUME II

STRUCTURAL NEUROCHEMISTRY

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PREFACE

That chemicals (although not always called by this name) affect the brain and its functions, such as behavior, has been known for thousands of years. It is therefore surprising that the concept that chemical mechanisms are at least partially responsible for the complex functions of the brain is so recent. Investigation of the closely interlinked biophysical and biochemical properties of the nervous system has achieved many notable successes in recent years and is the most exciting development in 20th-century science.

Although all the morphology, the activity, and the alteration of the brain, whether bioelectric, biochemical, pathological, or structural, constitute an organic and indivisible whole, the ambition of the *Handbook* is to look at only a few aspects of this whole and to focus the discussions on the experiments that the neurochemists have performed.

Neurochemical study of the nervous system has, perhaps of necessity, gone through several phases: the first phase was more analytical and involved study of the composition of the tissue; the second, more recent phase clarified many of the metabolic sequences that occur in this tissue. Clearly, both were essential, but they showed that additional approaches are necessary. The present phase seems to be the study of control processes; present interest focuses on what determines, in a qualitative and quantitative fashion, the processes occurring in the nervous system. Perhaps the next phase will be the study of function, the study of the final stage of integration.

With the great speed of advance of knowledge in our field, it is difficult not to be an optimist. We now talk about things even as complex (and not so long ago seemingly unapproachable) as memory, learning, sleep, emotion, discrimination, and pain, and we not only talk about them but also devise meaningful experiments to study these extremely complex phenomena.

Not only can we study such complex phenomena as outside observers, but also we can manipulate them in a number of ways in order to understand them. It is hardly necessary to emphasize here that it may be too ambitious even at our present stage of knowledge to hope that this book will help in understanding the complexities of the nervous system; what we can hope is that it will help to formulate further research.

The divisions of the various volumes of the *Handbook* are not very sharp; still, the present volume emphasizes structural aspects of neurochemistry. Structural aspects are hardly more important or more complex in any other

organ than in the nervous system. This seems to be not only one of the most structurally complex organs, but also one whose structure obviously has great significance for its function and whose mechanisms clearly cannot be understood without understanding the various structures where these mechanisms proceed. Life in all its aspects has great unity, and the facts we learn not only are clearly important for brain research in particular, or for the function of the nervous system, but also have a broader meaning for our concepts of living organisms as a whole. Therefore, from structural as well as other aspects, the results of brain research are applicable to, and contribute to, other disciplines.

It was pointed out in the first volume of this *Handbook*—and, unfortunately, it can be pointed out in any of the future volumes as well—that because of the practical necessity to limit the size of the volumes a great many important contributions could be only very briefly discussed, some not at all. The decision of what to include or exclude was often somewhat arbitrary. For this, mostly the editorial scissors (or short-sightedness) can be blamed, but perhaps it will serve as an excuse that the book is planned as a starting point of, rather than a substitute for, the future search for the wealth of information that has been written in the original publications or in the many reviews.

Among the purposes of the *Handbook* is to attract new talent to the field of brain research by giving to the reader a brief look at what the workers in this area have found out and what questions have been asked, even in a tentative way. Hopefully, many will carry this work further, at times even proving that in the past the wrong questions were asked.

The task, of course, is formidable. The structure proves to be more complex the more we investigate it: the more we find out about the brain, the more we realize what there is to be found out. But what is most significant, the task ahead, which not so long ago seemed impossible, seems less forbidding. We still know very little, but all the facts that seem to be established seem to form a reasonable complex, where all the parts fit and where what we have found so far seems to make sense. There is very little, if any, evidence that would indicate that it is impossible to understand brain function in even its most intricate details. Obviously, the neurochemists who wrote the chapters of these volumes hope that their work will contribute to this understanding. The editor has no doubt that it will and that the fuller understanding of the brain will be one of mankind's greatest achievements.

Abel Lajtha

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