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HISTOPATHOLOGY OF THE PERIPHERAL AND CENTRAL NERVOUS SYSTEMS

BY

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WITH 325 ILLUSTRATIONS



Third Edition (Revised and Enlarged)

Haw Chan Jung M.D.



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Preface to the Third Edition

The necessity of incorporating in the text at least the latest most important advances in the field of neuropathology is the main reason for the delayed appearance of the third edition of the HISTOPATHOLOGY OF THE CENTRAL AND PERIPHERAL NERVOUS SYSTEMS. The chapters on progressive muscular atrophy and dystrophy; paramyoclonus multiplex; Landry's paralysis; amyotonia congenita; torulosis have been rewritten; new chapters (catabolic diseases, trauma of the cauda equina, histopathology of spina bifida) have been included; the chapters on the most important groups of encephalitis, degenerative conditions have been revised and rewritten; new illustrations have been added or replaced the old ones and both the bibliography and index have been modified and enlarged.

As no satisfactory arrangements could be made with even well-meaning medical publishers, and in order to avoid further delays, the author felt it expedient to dispense with the services of commercial houses and to have his book published privately. This was accomplished very adequately. In the technical make-up, the present edition compares most favorably with its predecessors, for which I must thank the splendid efforts and cooperation of The Hamilton Press. My thanks are due to my secretary, Miss Beatrice Kahn, for her competent handling of the manuscript.

George B. Hassin, M. D.

1948
Chicago

PREFACE TO THE SECOND EDITION

The arrangement of the subject matter in this, the second edition of "Histopathology", has followed the lines of the first edition which appeared almost seven years ago: a description of histologic changes in individual nervous diseases in their relationship to clinical manifestations. However, a number of changes have been made. I shall mention only a few—an introductory chapter on general fundamental features of normal and pathologic history of the central nervous system; a chapter on diseases of the cerebellum and an outline of changes in legal and accidental electrocution; a number of additions to the subjects of encephalitis, meningitis, demyelinating processes and other topics. Some chapters have been rearranged and practically rewritten; many new illustrations replace the old or borrowed ones, and the bibliography has been modified. This was necessitated by the great progress in neuropathology since the publication of the first edition; unfortunately, only a small portion of the publications could be utilized.

I wish to thank Drs. Howard Zeitlin, Percival Bailey and H. Douglas Singer for their help in arranging the illustrations and valuable advice in general; special thanks are due my secretary Miss Beatrice Kahn for valuable assistance in the preparation of the manuscript.

GEORGE B. HASSIN. M. D.

January 12, 1940.

PREFACE TO THE FIRST EDITION

Though neuropathology is essential to an understanding of clinical phenomena, it is given rather inadequate space in ordinary clinical manuals on neuro-psychiatry. To fill the gap, I have prepared the present volume. It embodies largely the results of twenty years of work in the field of histopathology of the nervous system. Diseases of the peripheral nerves, spinal cord and brain are described individually, from a histopathologic angle only, as they are in textbooks on *clinical* neurology. The frequent references to the clinical aspects of the subject have purposely been made very brief.

The remarkable growth of neuropathology, especially in this country, has given rise to many splendid contributions, of which only some could be quoted. The desire to make the book as concise as possible necessitated omission of any *general* review of types of pathologic changes in the nervous system; the fundamental features of such general reviews of the changes in inflammation and degeneration, for example, and of the normal structure of the nerve elements are considered in chapters dealing with special diseases. Repetitions are thus avoided.

I am indebted to former Directors of the Illinois State Psychopathic Institute, Drs. H. Douglas Singer, Charles F. Read and Alexander Hershfield and the present director Dr. Sidney D. Wilgus for friendly co-operation, while I was connected with the Illinois State Psychopathic Institute; also to Dr. Richard Jaffé, Director of the Department of Pathology, Cook County Hospital, for the continuous supply of important pathologic material and to Miss Beatrice Kahn for her splendid work as technician and for help as a secretary in preparing the manuscript. I also wish to thank the publishers for their attention to the technical features of the book and the Journal of the American Medical Association for permission to use the illustrations from their various publications.

GEORGE B. HASSIN, M. D.

Chicago, March 10, 1933.

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PART I
GENERAL CONSIDERATIONS

GENERAL CONSIDERATIONS

Only a cursory outline of the most important general histologic and histopathologic features of the nervous system is here presented, as this manual deals mainly with microscopic changes observable in *individual* morbid entities. More space is assigned to discussions of such general topics as degeneration, vascular, and other changes, for which the index—at the end of this book—should be consulted.

The gray and white substances of the brain, cerebellum and spinal cord and the sympathetic nervous systems consist of neurons—structural units, which are nothing but ganglion cells, or which is the same, nerve cells with their axons, dendrites and terminal arborizations. The bodies of the ganglion cells, the nuclei, nucleoli, and dendrites form the bulk of the gray substance of the cortex of the cerebral and cerebellar hemispheres, the basal ganglia and the nuclei of the cranial nerves, and the ganglia of the sympathetic nervous system. The axons and their prolongations constitute the white substance of the nervous systems, in which the neurons are not fused with one another but are independent structures. The terminal ramifications of an axon merely come in contact with those of the dendrites of a contiguous neuron forming what is known as a synapse. A neuron is thus synonymous with a ganglion cell. It is the organ of feeling, knowing, acting, and of all the psychic processes, the exact mechanism of which, however, is not known. The diseases of the nervous system—central and peripheral—may be considered anomalies of the neuron—its body or the axon. Structural changes in the neuron can be demonstrated in organic nerve diseases; in inorganic or functional disorders, structural changes cannot be ascertained under the microscope, but there may be chemical or metabolic changes,

The normal morphologic appearance of a ganglion cell varies, according to its localization. A giant Betz cell (fig. 1) of the motor cortex, for instance, differs in its appearance from a Purkinje cell of the cerebellum (fig. 2), or from an anterior horn cell of the spinal cord, or from a ganglion cell of the molecular layer of the cerebellum. It also varies, depending on the staining method used. When stained by the chrom-silver method of Golgi, a ganglion cell appears structurally different from that stained by the method of Nissl or Bielschowsky. The Golgi staining method exhibits a

wealth of processes and a rather small cell body emitting an axis cylinder and numerous ramifying dendrites or dendrons (fig. 2). When stained by the silver method of Bielschowsky, a ganglion cell discloses fewer ramifica-



FIG. 1. Giant Betz cell. The apical dendron shows neurofibrils. Bielschowsky stain.

tions but exhibits neurofibrils in both the cell body and its processes (fig. 3). Bielschowsky's method is extensively used in neuropathology, in contrast to the method of Golgi, which is of no value in neuropathologic research, because of the uncertainty of the staining and the inability to ascertain by this method the condition of the stainable substances. The method of Nissl and its modifications—in which aniline stains (methylene blue, toluidine blue, thionin, cresyl violet) are used—are the most popular in routine and research studies of normal and pathologic nerve tissues. This method reveals the stainable substance of the ganglion cell in the form of Nissl

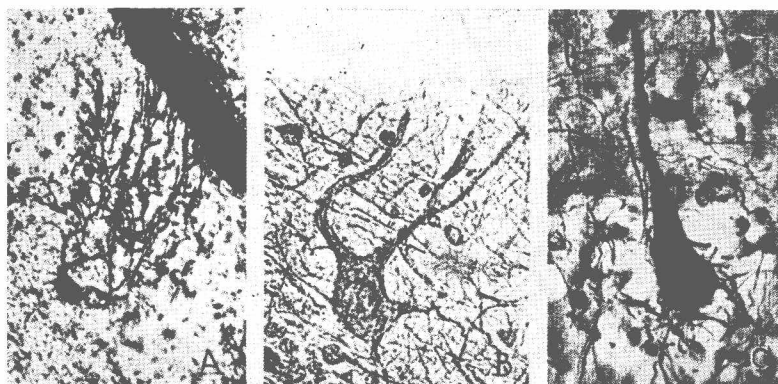


FIG. 2. Purkinje cells. *A*, Stained by the method of Golgi. *B*, Stained with toluidine blue. *C*, Stained by the method of Bielschowsky.



FIG. 3. Purkinje cell from a case of amaurotic family idiocy. At *A* and especially at *B* neurofibrils can be seen.

bodies (tigroid or chromophile substance) and the chromatin granules of the nuclei. The Nissl bodies (fig. 4), which are present in the dendrites, but not in the axons and the axon hillock (the place at which the axon

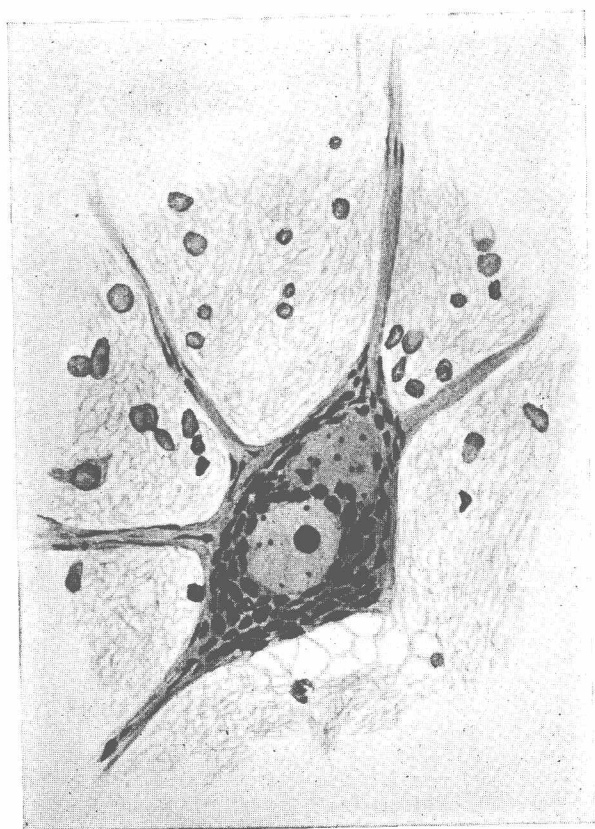


FIG. 4. Drawing of a normal ganglion cell showing Nissl bodies, processes and other features (Bielschowsky). See also Figure 9, the photomicrograph of a normal ganglion cell.

originates from the cell body), are chromophile substances scattered over the surface of the cell body in the form of granules, lumps of various sizes and shapes. They are often gathered around the nucleus and arranged in a definite form giving the cell body, its axon and dendrites a certain appearance, which is constant, and which Nissl called an equivalent picture. Any deviation from the equivalent is to be considered pathologic, according to Nissl.