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THE CIBA COLLECTION  
OF  
MEDICAL ILLUSTRATIONS

VOLUME I

NERVOUS SYSTEM

FRANK H. NETTER, M.D.



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## VOLUME I

A Compilation of Paintings on the  
Normal and Pathologic Anatomy of the

# NERVOUS SYSTEM

With a Supplement on  
THE HYPOTHALAMUS

Prepared by  
FRANK H. NETTER, M. D.

With a foreword by  
JOHN F. FULTON, M. D.  
Sterling Professor of the History of Medicine  
Yale University School of Medicine

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Commissioned and published by

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## FOREWORD

In the early texts of anatomy the central nervous system of human beings was seldom adequately depicted because, although the art of embalming was known, this procedure was rarely used for the preservation of the brain and spinal cord. The result was that by the time the anatomist or the pathologist came to expose the brain, it was generally soft and disintegrated and not well suited for anatomical study. The first adequate illustrations of cerebral structure are those found in the *Fabrica* of Andreas Vesalius, published in 1543. His plates representing the nervous system show many of the major structures, but the sulci are flattened and the hemispheres themselves have the appearance of being more or less collapsed. However, Vesalius had depicted the major gross structures of the human brain, including the cerebellum, the cerebral ventricles, and the majority of the cranial nerves.

It was discovered later that the cerebral ventricles had been much more clearly portrayed some years earlier in the manuscript notebooks of Leonardo. He injected the ventricular system with wax and, on macerating the surrounding cortical tissue, he emerged with an accurate cast of the ventricles which he had drawn in his notebook; but unfortunately these excellent drawings did not become public property for nearly four centuries.

There were many other anatomists in the sixteenth century who made anatomical illustrations of various parts of the central nervous system — Eustachio, whose plates of the cranial nerves, including the vagus, represent a conspicuous advance over the Vesalian portrayal of corresponding structures. And then the Florentine Guidi, better known as Vidius (the Latin form of his name), grandson of Ghirlandajo, made good use of the artistic talent which he inherited and published an illustrated anatomical and also a surgical text. Vidius' contemporary, Costanzo Varolio, in 1573, issued a monograph on the optic nerves which contains a plate illustrating the base of the brain that was more accurate than anything before him and was only matched by the celebrated plate which Thomas Willis issued in 1674 in his *Cerebri anatome*. The latter plate, showing the vascular circle which still bears Willis' name, was designed by the young Christopher Wren, who had learned the art of injection of blood vessels in London while working as an assistant in the anatomical theatre of Sir Charles Scarborough. Wren introduced the new technique at Oxford, and I have always suspected that it was Wren rather than Willis who discovered the arterial circle.

In the seventeenth and eighteenth centuries there were a number of other notable illustrations of the brain and spinal cord in monographs such as those of Vieussens (1685) and Ridley (1695). In the eighteenth century the most remarkable plates of the nervous system were the colored portrayals of Jan Ladmiral and Jacques Fabian Gautier d'Agoty. The color process employed by these artists, although they claimed it as their own invention, was probably that of the German Le Blon, since they had both worked with him as assistants.

There was little progress in anatomical illustration of the nervous system during the nineteenth century, although note should be made of the plates published by Charles Bell who was as much artist as he was anatomist and of whom it is generally said that he colored his anatomical plates by hand. Those of Cruveilhier should also be mentioned. His plates depicting tumors of the central nervous system are as fine as anything that had appeared before or has been published since.

With the advent of the modern period, hand coloring has largely disappeared and in its place we have the three-color process employed by the German anatomists such as Spalteholz. The present volume, composed of the beautiful plates of Dr. Frank H. Netter, makes use of every modern device to present the structural relations of the nervous system with care and precision. At a time when a high value is placed on visual aids as an accompaniment to the written word in the educational process, these exquisite and highly accurate illustrations commend themselves to all who are either teaching or learning the functions of the nervous system. Although there have been a number of artists throughout medical history who have achieved lasting acclaim for the excellence of their work even though they were not themselves physicians, this collection of drawings well illustrates the happy result of artist and physician being combined in one person. Dr. Netter's knowledge of function cannot but lend clarity to his plates.

The legends and descriptions to the illustrations as provided by Doctors Kaplan, Kuntz and von Bonin of course do not substitute for a textbook but are comprehensive and yet masterpieces of conciseness. Both illustrations and text together are quite obviously the result of a most cheerful and successful cooperation. The consultant experts have left their imprint also on the pictures and in the method of demonstrating a variety of details, since one may readily recognize traces of their own scientific contributions in their respective fields.

One common source of confusion to students — the position of the Island of Reil — is beautifully resolved in one of Dr. Netter's diagrams to be found in Plate 17. His portrayal of the Circle of Willis in Plate 16 is probably the clearest that one will find in any modern anatomical text. His diagram of the relations of the cerebellum in Plate 44 is also highly illuminating and the diagram in Plate 72 of the innervation of the female genital system is excellent.

These are but a few selections from a work of consistently high quality. Ciba Pharmaceutical Products Inc., in offering this new volume in their series of anatomical illustrations, adds another to their enviable list of contributions to the progress and the history of medicine.

JOHN F. FULTON, M.D.

New Haven, March, 1953



## PREFACE TO THE FIRST EDITION

Five years ago a number of illustrations by Dr. Netter were published in book form and made available at cost to the medical profession. No attempt was made to organize the material; THE CIBA COLLECTION OF MEDICAL ILLUSTRATIONS was simply a compilation of the same drawings which had been distributed in loose-leaf portfolios over a 10-year period. Despite the fact that the book contained no new illustrations, the demand for copies was so great that a second printing became necessary.

The enthusiastic response encouraged an expansion of the program. It is our intention now to portray, in desirable detail, the major anatomy and pathology of all the systems comprising the human organism and to devote a separate volume of THE CIBA COLLECTION OF MEDICAL ILLUSTRATIONS to each system.

This book, dealing exclusively with the nervous system, represents the first step in the new direction.

## PREFACE TO THE FIFTH PRINTING

For the fourth time since 1953, because of a continuous demand, it becomes necessary to reprint this volume. The combined supply from the first and second printings lasted only 2 years. Because of the popularity of this book, consideration was seriously given to the issuance of a completely revised and broadened second edition, including those topics under the peripheral nervous system that have been proposed in the many suggestions received from readers of the book. The over-all program and the importance of completing new volumes with as little delay as possible do not permit Dr. Netter to devote his activities to a new version of Volume 1.

However, it seemed feasible to add to the third and subsequent printings of the first edition a supplement concerned with the hypothalamus, which will be found, following the Index, on pages 145 to 168. This series of illustrations, prepared with the collaboration of Dr. W. R. Ingram, appeared in the July-August, 1956, number of

the CIBA CLINICAL SYMPOSIA and received such an immediate response that 3 months later our large stock of this issue was exhausted. The incorporation of this series into Volume 1, distributing the pictures among the various sections according to the anatomic or functional aspects and calling the book a revised edition, was felt to be unwarranted, essentially because of the rather one-sided type of revision that would have resulted. The best solution, thus, appeared to be to add this series as a supplement to this volume.

In order to avoid confusion, it seems appropriate to draw attention to the fact that the color scheme for the hypothalamic nuclei in the supplement (pages 147 to 151) is different from the one used in the earlier illustrations on pages 76 and 77. The difference is obvious, and the legends in both the pictures in Volume 1 proper and in those of the supplement (with far more details) are clear, so that no further explanations are necessary.







### ABOUT THE ARTIST

Frank H. Netter has been practicing his talent for illustration as long as he can remember, progressing from youthful attempts during his days in New York public schools to illustrations for university publications while a student at the College of the City of New York. He also studied at the National Academy of Design and attended courses at the Art Students' League. While in medical school, New York University and Bellevue, he illustrated medical books and articles.

Following graduation from medical school and completion of his internship, during which time he was married to Dr. Mary MacFadyen, a classmate, Dr. Netter entered private practice in New York City, believing he was through with art. But demand for his medical illustrations continued and he was persuaded to accept more and more art assignments. Soon he was spending most of his time at the drawing board and finally, realizing that his career lay in medical illustration, he decided to devote himself entirely to this field.

During World War II, Dr. Netter was an officer in the Army Medical Corps, responsible for illustrating many of the Army training manuals. The war over, he and his family, which now includes four children, moved to their present home at Oyster Bay, Long Island, and he took up where he left off.

The high regard the medical profession has for his illustrations adds much pleasure to Dr. Netter's work. He receives correspondence from the city specialist as well as the rural practitioner, complimenting him on his talent for combining vividness with accuracy in illustrating anatomy and pathology.

Many correspondents ask what art method or medium is used in this work. The early illustrations were made in pure water color but lately Dr. Netter has employed casein paint and egg tempera as well as poster color in conjunction with water color. For shading and to bring out fine details, he frequently uses colored pencils or pastels.

Dr. Netter belongs to both medical and art societies. A Fellow of the New York Academy of Medicine, he is also a member of the Society of Illustrators, the Salmagundi Club and the Artists' Guild. But, he complains, doctors insist on regarding him as an artist and artists think of him as a doctor.



## ACKNOWLEDGMENTS

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## INTRODUCTION

For many years the teaching of the anatomy, physiology, and pathology of the nervous system was conducted in an atmosphere of academic discipline. It was the custom to capture the imagination of the medical student with the more striking natural phenomena and the more dramatic pathologic manifestations, even though their clinical incidence lagged far behind the importance that was accorded them in the lecture hall. Such stress on minutiae tended to lend to this field a character of remoteness in the mind of the student. By the same token the general practitioner and the nonneurologic specialist, pressed for time while meeting the demands of a busy practice, have been relatively impatient with the labyrinthine complications of neurology and have, as a consequence, left the full command of this body of information to specialists in neurology and neurosurgery.

Allowing for recent advances in medical education and for the increasing recognition of neurologic factors in all kinds of illness, the present group of illustrations is offered as a leavening agent. To the end that the intricacies of the nervous system may be more easily comprehended, the most important and clinically useful facts are herein "compressed" and so arranged that one can readily refer to the plates and their accompanying text when confronted by a neurologic problem. The index is designed to further this aim and to anticipate the needs and reference habits of any reader.

The backbone of this collection is, of course, generally accepted information. While minute details and controversial theories have been avoided, this was not done at the expense of accuracy or completeness. Clinical significance has been the guiding principle. In many instances certain anatomic structures are either deliberately omitted or deemphasized in order to stress points that have broader clinical application.

A section on the anatomy of the spine is included instead of being reserved for another volume covering bones and ligaments in general, because an understanding of spinal anatomy is fundamental to a proper appreciation of spinal cord injuries, the compression effects of spinal tumors, the significance of intervertebral herniations, and numerous other clinical conditions. It is for this same reason that a practicing neurosurgeon was chosen as collaborator in selecting and discussing the illustrations concerned with anatomy of the spine. The descriptive text by Dr. Abraham Kaplan in three sections—"Anatomy of the Spine," "The Central Nervous System," and "Pathology of the Brain and Spinal Cord"—exemplifies again the principal aim of this atlas, to serve the practicing physician and the student in their efforts to understand the underlying reasons and conditions of diseases and clinical syndromes.

In view of the considerable individual variations of the spine, the prominence of the tubercles and processes, etc., efforts have been made to portray an average form and to illustrate all the processes so that they might be easily recognized and remembered. The plates show not only the detailed configuration of the individual vertebrae but also the manner in which these articulate. The principal ligaments were also included in such a way as to illustrate their functions, the structures which they bind together, and the motility permitted by them. Different viewing angles are used to foster complete understanding.

In the plates illustrating the basic anatomy of the brain and the spinal cord, the physician will doubtless recognize that a great many details have been omitted. This was done deliberately. The complexity of the central nervous system is such that one must be guided by the fundamental requirements of simplicity if effectiveness in presentation is to be achieved. Only as much of the gross anatomy has been selected as was thought necessary to provide a clear apprehension of the principles developed in the sections dealing with functional neuro-anatomy and, to a degree, the autonomic nervous system.

(continued)