

A TEXTBOOK OF HUMAN ANATOMY

ROGER C. CRAFTS

THIRD EDITION

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HUMAN
ANATOMY

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UNIVERSITY OF CINCINNATI
COLLEGE OF MEDICINE

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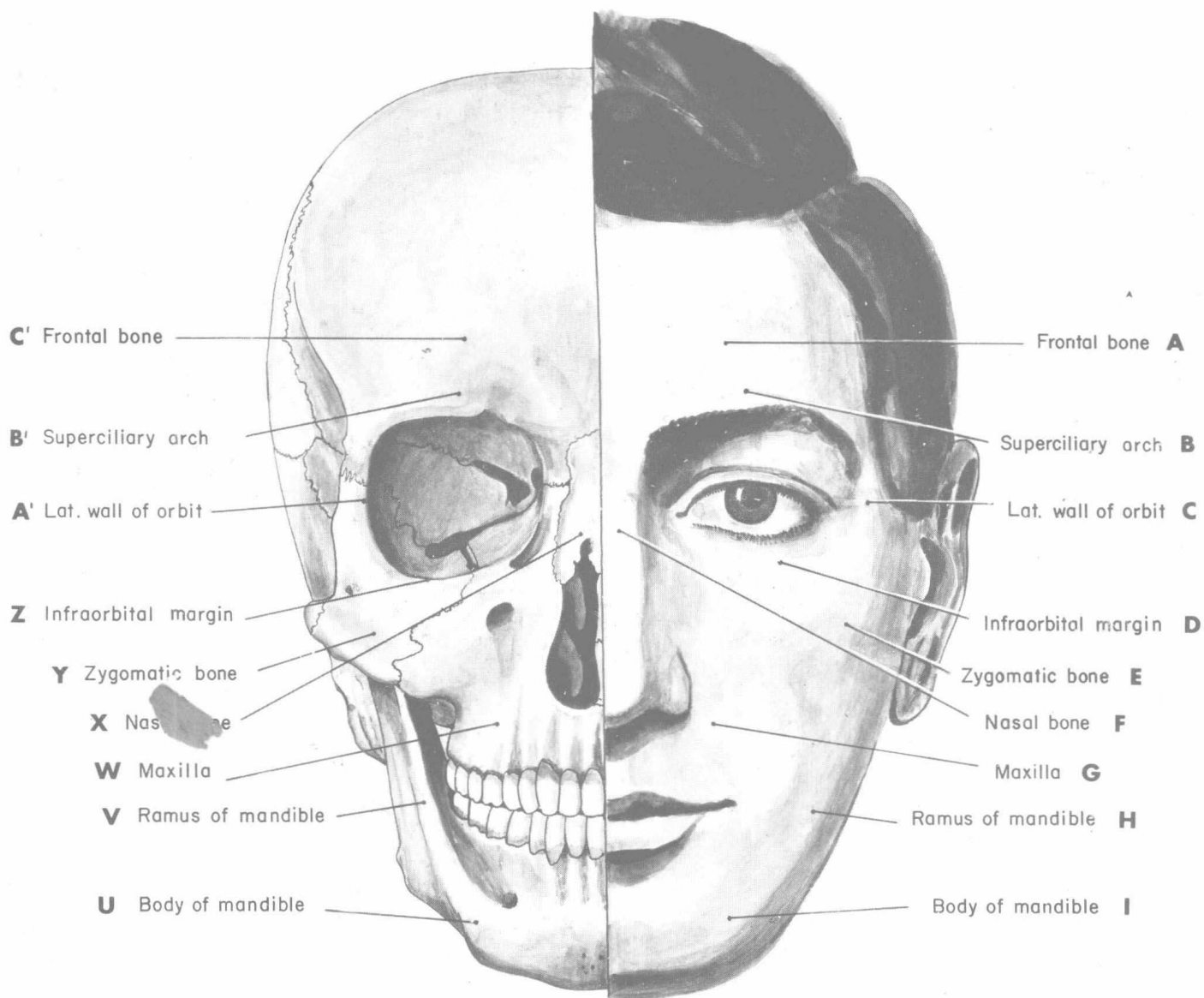
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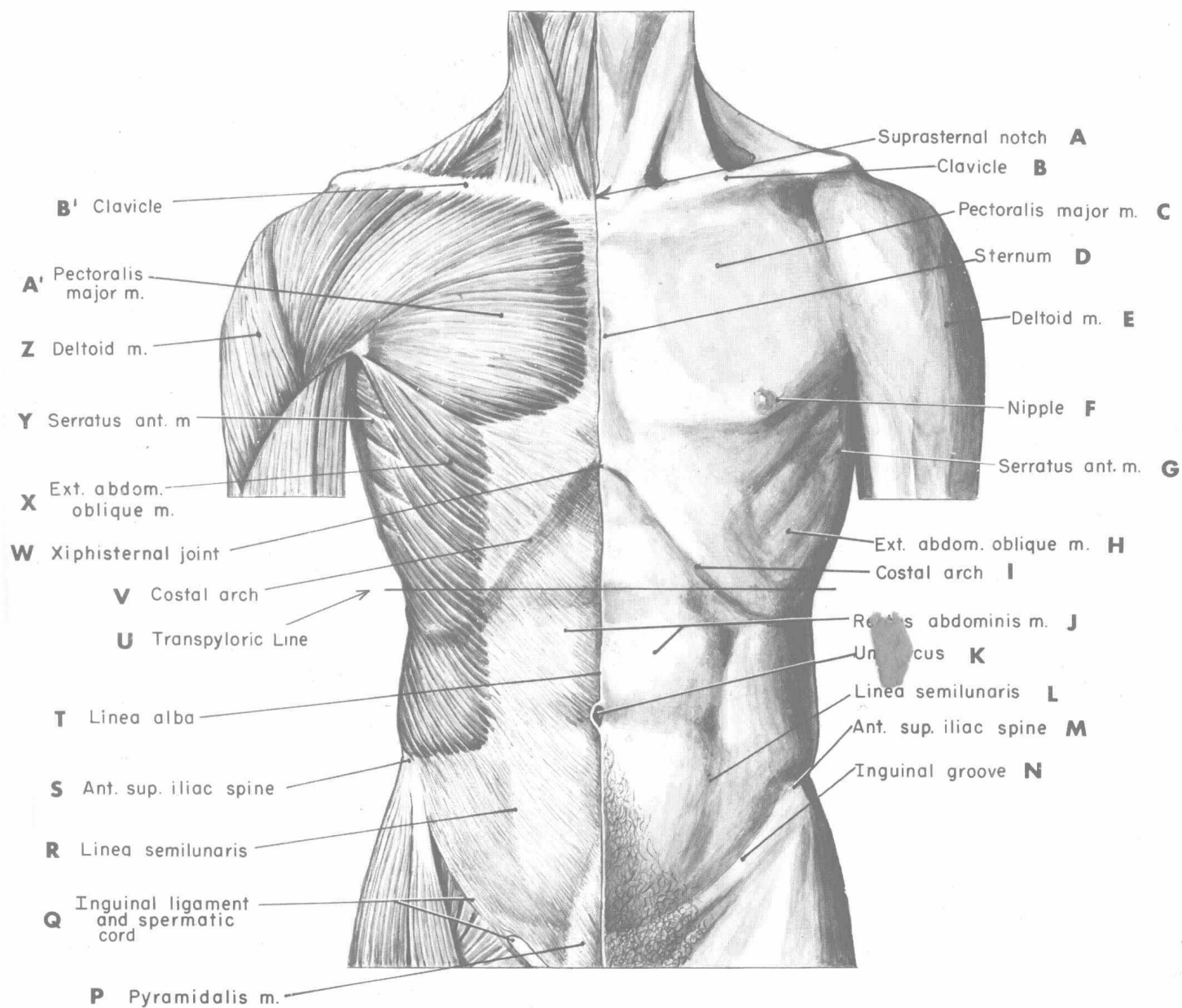
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A TEXTBOOK OF
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ROGER C. CRAFTS, Ph.D., obtained his doctorate from the Columbia University College of Physicians and Surgeons. He is the Francis Brunning Professor Emeritus of Anatomy at the University of Cincinnati College of Medicine. He taught at the Boston University School of Medicine for nine years before moving to Cincinnati in 1950 to head the Department of Anatomy there, a position he held for twenty-nine years. Among the societies of which Dr. Crafts is a member is the American Association of Anatomists.

To the Students

*YOU WILL REMEMBER A LITTLE OF WHAT YOU HEAR,
SOME OF WHAT YOU READ,
CONSIDERABLY MORE OF WHAT YOU SEE,
BUT ALMOST ALL OF WHAT YOU UNDERSTAND.*

PREFACE

TO THE THIRD EDITION

The enthusiastic response from those who have used this textbook has been very encouraging. However, there comes a time for updating, a time to take advantage of suggestions from students and colleagues, a time to make this book even more useful to students.

The format of this third edition does not depart greatly from that used in the first and second editions. General descriptions of each region have been followed by more detailed presentations of the structures in the same region. The description of each major area of the body ends with a systemic summary of that area.

Clinical correlation has been increased but no attempt has been made to create a clinical or surgical text. A judicious amount of such material has been added, particularly when such a description would aid in learning the anatomy. Moreover, the chapters on the limbs have been rearranged to fit clinical thinking.

To help the many students entering medical college with a limited biological background, additional material entitled "Beginning Embryology" was added to Chapter 1 in the second edition; this has been maintained. The brief descriptions of embryology presented in each subsequent chapter spring from this beginning and should give the student an understanding of why the body has its definitive arrangement. As a further aid to the student, the labels on most illustrations are alphabetized in a clockwise direction. This allows reference to a specific structure and locates it at the same time, thus saving time and preventing frustration on the part of the students in

their first reading. When a mental picture of the anatomy has been obtained, the text can be read omitting these letters as well as references to the illustrations. Furthermore, several questions have been added at the end of each major area of the body entitled "Sense or Nonsense." These have been enjoyed by my students for several years; they serve as a check on whether one can use the anatomy learned. Lastly, cross sections have been added to aid students in their future work with CAT (computer assisted tomography) and NMR (nuclear magnetic resonance) scanning.

This textbook has been written with the following in mind. There are three ways one can learn anatomy. First, one can attempt to memorize the material, but any knowledge obtained in this manner will be maintained for three or four days at most. Second, one can visualize the anatomy, determining the function of each structure based on this visual picture; knowledge obtained in this manner is quite lasting. But third, and most important, one can understand not only the functional anatomy but also how this structure or area developed; knowledge obtained in this manner is difficult to forget.

I wish to thank Dr. Mary Jane Showers for many helpful suggestions for this third edition; my wife, Peggy, for many hours of proofreading; and those in the Medical Division of John Wiley & Sons for their enthusiastic support.

Roger C. Crafts

PREFACE

TO THE FIRST EDITION

The crowded medical curriculum has made it necessary to cover some subjects in less detail than in the past. Acceleration has also increased the importance of a text as a teaching instrument; compactness, functional organization, and clarity are now imperative. This text was developed to provide the student with such a teaching tool.

A textbook on gross anatomy should emphasize visualization and understanding. As an aid to visualization, therefore, this book describes the body regionally. At the beginning of each region the anatomy involved is described as one sees it on the cadaver; these portrayals are given the title of "General Description" and are accompanied by halftone illustrations resembling those in a regional atlas. Frequently, the illustrations are presented as a series depicting deeper and deeper views of the particular region under study. The "General Descriptions" are followed by more detailed presentations of muscles, nerves, blood vessels, and lymphatics found in that region. These sections of the text are accompanied by many diagrammatic line drawings, which should make comprehension of these structures easier.

Systemic summaries have been provided after part of the body has been described in its entirety. Although repetitious, they should help the student review the part as a whole.

Thus, this text combines features usually found in separate sources. It contains descriptions of dissected regions reminiscent of some dissecting guides, illustrations of regions from surface to depth typical of regional atlases, shortened descriptions and line drawings of individual body parts similar to the shorter works on this subject, and summaries that bring in the better features of the books developed around a systemic plan.

The body is described in the following order: (1) back, (2) thoracic and abdominal walls, (3) thoracic cavity, (4) abdominal cavity, pelvic cavity, and perineum, (5) lower limb, (6) head and neck, and (7) upper limb. This order has been found to possess certain advantages. It allows students to start their dissection on a region where their inadequate technique does relatively little harm, and it gives them contact with the spinal cord at an early stage; this is very helpful to their learning of the peripheral nervous system. Study of the thoracic and abdominal walls immediately after the back brings the entire trunk into focus. Exposure to the cavities relatively early in the course allows the student to learn the gross anatomy of viscera before most microscopic anatomy classes, if taught simultaneously, have started on organology. This study leads very nicely, via the blood vessels and nerves, into the lower limb. By this time the student has become

more expert, and the study of the head and neck is made easier than if presented earlier. The neck leads naturally into the upper limb.

There is no general agreement on the proper order in which a cadaver should be dissected. Although the order in this text may not be the same as the one used in dissection in a particular course, each part of the body is described in its entirety, and the student should have no difficulty using the text for any order of dissection. Some repetition was required to achieve this flexibility.

References to the literature have been used sparingly, and no attempt has been made to give credit to the hundreds of anatomists from whom the information was drawn. Those given credit are ones substantiating material that is not presented in the usual manner, aiding the student in understanding the structure involved, or challenging the usual concept of the structure.

The Parisian International Nomenclature, adopted in 1955, has been used throughout this text, with the traditional terms in parentheses when considered important.

The success of an anatomy text is dependent upon the illustrations. To Mr. Herbert W. Fall goes my profound gratitude for a job well done. He performed his art with great patience and welcomed the author's exacting suggestions. Similar thanks go to Mr. Barney Pisha for his guidance. I also thank Mrs. Robert T. Binhammer for her many hours of typing. And great appreciation goes to Dr. Robert T. Binhammer for devoting many hours to reading the text and checking the pictures. I owe a debt of gratitude to Mr. Ellsworth Cochran, Professor of Medical Illustration, and his staff for much of the labeling done on the illustrations, to Dr. Robert D. Mansfield, for his willingness to check all clinical statements, and to Dr. Harold J. Schneider for the x-ray films.

Roger C. Crafts

A TEXTBOOK OF
HUMAN
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1

GENERAL REVIEW

Because many students studying human anatomy have taken preparatory courses in college, textbooks in this discipline are written in a manner that assumes a certain amount of knowledge on the part of the reader. The following sections, under the heading of General Review, should be a part of a student's armamentarium before attempting study of the more detailed aspects of human anatomy. If you have studied embryology and comparative anatomy, the first chapter should serve to refresh your memory; if you have not taken such courses, this chapter should be read quite carefully. This text presumes such knowledge on the part of the student.

TERMINOLOGY

Anatomy is the science of the structure of the animal body and the relations of its various parts. The term **anatomy** is derived from a Greek work meaning "to cut up"; in the past the word "anatomize" was frequently used instead of the more modern term "dissect." This term "anatomy" was formerly limited to structures seen with the naked eye, but with the invention of the microscope and other techniques for observing structure, the

term has spread to encompass much more than can be seen with the eye alone.

Microscopic anatomy is that which can be seen with the microscope and includes the study of cells (cytology), tissues (histology), and organs (organology). The **electron microscope** has provided much greater detail than can be seen with a light microscope, and histochemical techniques have related microscopic structure to chemistry. **Vital microscopic techniques** allow a study of living anatomy, particularly of the vascular system, and **tissue culture** also has provided a knowledge of living cells. The central nervous system is usually treated separately in a special course of study called **neuroanatomy**, and study of development of the embryo is called **developmental anatomy** or **embryology**. Although references will be made to microscopic, developmental, and neuroanatomy, this book concentrates on the gross anatomy of the human body.

Gross anatomy can be related to specific fields of endeavor: **applied anatomy** links anatomy to medicine in general, whereas **surgical anatomy** is the same study in reference to the field of surgery. **Comparative anatomy** is concerned with the structural relations of one animal to another. **Pathologic anatomy** is a description of the effects of disease on structure. Gross anatomy itself can be studied by region (**regional anatomy**), whereby a definite region of the body is investigated no matter what systems are present, or by system (**systemic anatomy**).