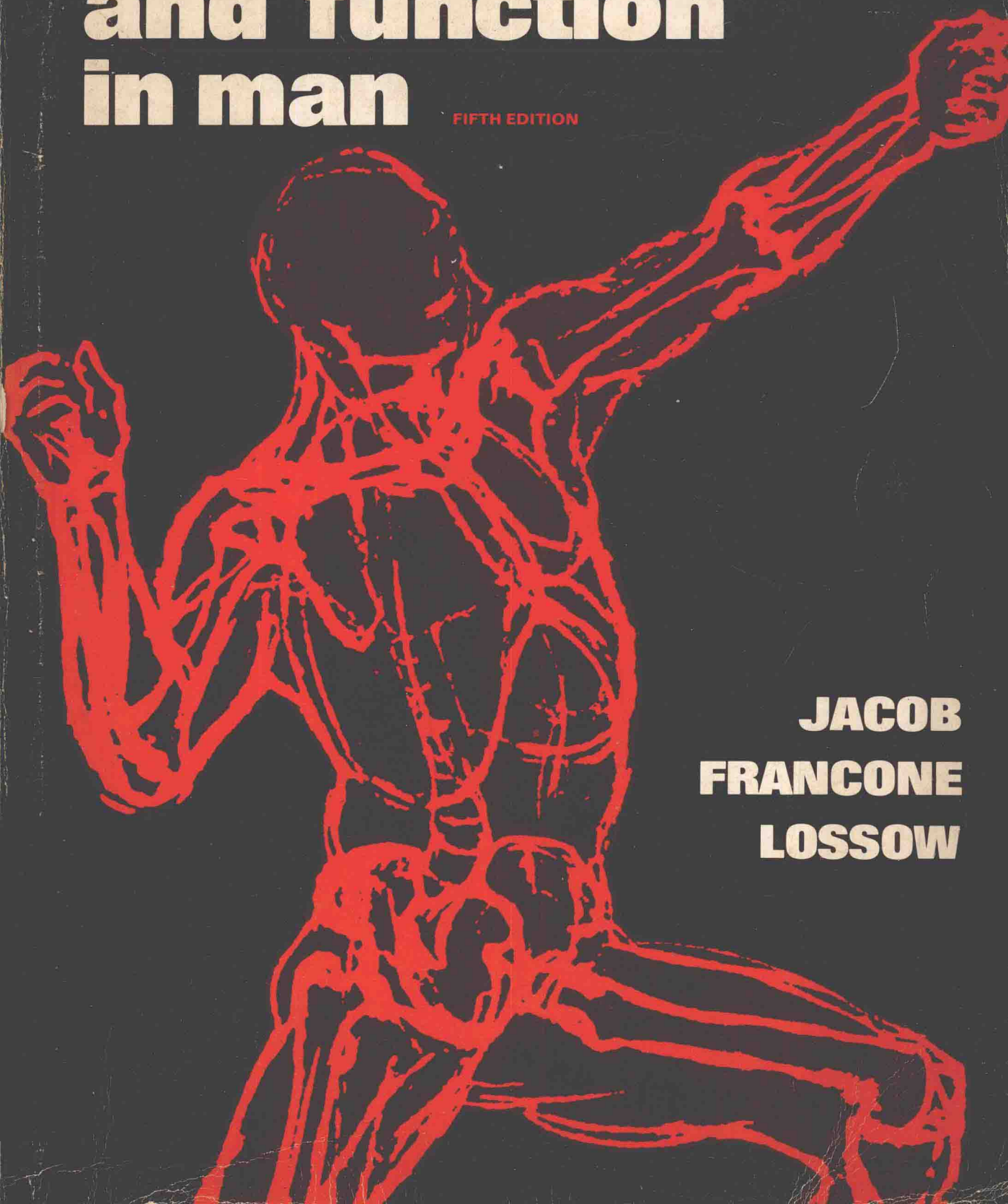
laboratory manual for structure and function in man

FIFTH EDITION



JACOB
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Laboratory Manual for
STRUCTURE AND FUNCTION IN MAN

FIFTH EDITION

1982

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Listed here is the latest translated edition of this book together with the language of the translation and the publisher.

Portuguese (*3rd Edition*) – Editora Interamericana LTDA,
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Preface to the Fifth Edition

The laboratory manual has been rewritten to conform to the fifth edition of the text *Structure and Function in Man*. A number of illustrations have been either completely redrawn or modified, minor changes have been made in several experiments, and many of the practical exercises have been revised to bring them up to date.

STANLEY W. JACOB
CLARICE A. FRANCONE
WALTER J. LOSSOW

Suggestions to Students

It is important that each student read the laboratory experiments to be performed and review lecture material pertinent to the experiments before coming to the laboratory. Always record collected data immediately after an experiment has been completed. Handle all laboratory materials carefully, and promptly report broken equipment. When the laboratory period is completed, put away all materials, wash glassware, clean desk top, and dispose of all used papers.

It is essential to understand that animals can feel pain. Since you would demand an anesthetic during a surgical operation, be certain that the experimental animal experiences no suffering or discomfort during dissection.

Preface to the First Edition

In the following laboratory exercises, the authors have utilized a variety of general approaches employed in modern biological research. These approaches should enable the student to study the structure and function of an animal part by scientific observation and manual manipulation, and so provide better correlation of function with structure.

The major reason for performing laboratory experiments is to make it possible for a student to become personally identified with the problems of a field by direct engagement in scientific approach and solution. A man working with his hands acquires an understanding that is far more rewarding than rote textbook memory.

The organization of this laboratory manual is similar to the text *Structure and Function in Man*. The directions to the student and instructor are explicit. Busy work has been excluded. The experiments have been constructed to enable the student to think, study, do research and draw independent conclusions. Practical exercises are included at the end of each chapter.

The contributions of many individuals are responsible for this manual. The authors would particularly like to express appreciation to Michael Davis, DeWayne Ditto, Larry Stinson and Frances Kemper.

It is expected that the student will look upon laboratory work as an opportunity to observe phenomena described in the text and lecture; as a chance to test the truth of the statements he has read; and as a means to gain knowledge of the factors involved in producing an end result; in summary, to actually see and study so that he might better comprehend the living, functioning animal body.

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NOTE

Instructors and students may want to correlate laboratory assignments with readings in the textbook written by the same authors (*Structure and Function in Man, 5th edition*); to make this easier, tables of contents from both books are listed below.

TEXTBOOK

LABORATORY MANUAL

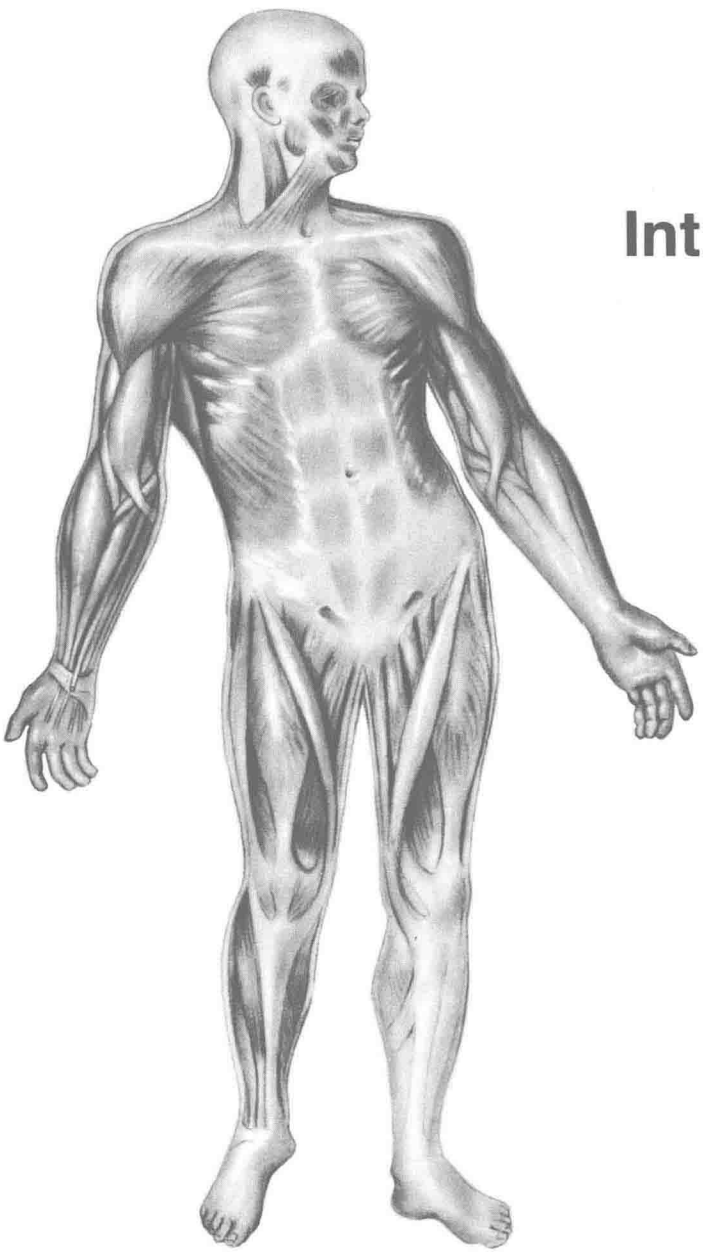
Contents

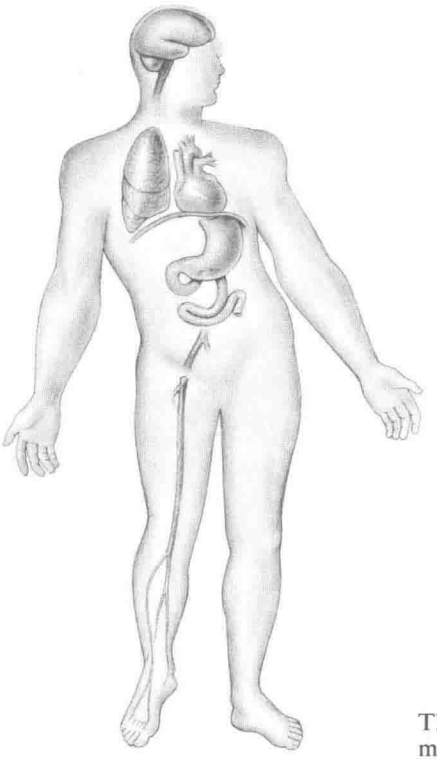
Suggested Time Allotment

UNIT 1:	**INTRODUCTORY**	5–10 hrs.
	The Body as a Whole	2 hrs.
	The Cell	4–6 hrs.
	Tissues	2 hrs.
UNIT 2:	**FRAMEWORK OF THE BODY**	5–10 hrs.
	Skin	½ hr.
	The Skeletal System	4 hrs.
	The Articular System	1½ hrs.
	The Muscular System	4 hrs.
UNIT 3:	**INTEGRATION AND METABOLISM**	18–37 hrs.
	The Nervous System	8½ hrs.
	Special Senses	5½ hrs.
	The Circulatory System	7½ hrs.
	The Lymphatic System	½ hr.
	The Respiratory System	4½ hrs.
	The Digestive System	3 hrs.
	The Urinary System	2 hrs.
	The Endocrine System	3 hrs.
	Fluids and Electrolytes	2 hrs.
UNIT 4:	**REPRODUCTION**	4–7 hrs.
	The Reproductive System	7 hrs.
TOTAL:		32–64 hrs.

UNIT **1**

Introduction





The Body as a Whole

The human body is a complex machine and, like any machine, is an assembly of parts organized to function as a whole. To understand the body it is necessary to understand its components, their function, and their relationship to one another.

EXPERIMENT A: Planes of Organization of the Body

Reference: Jacob, Francone and Lossow (hereinafter to be called J, F and L). Ch. 1.

Objective: To understand the terminology employed in locating structures of the body.

Procedure:

1. Familiarize yourself with the following terms:

Sagittal plane	Anterior (ventral)
Coronal plane	Cranial (superior)
Transverse plane	Lateral aspect
Medial	Caudal (inferior)
Posterior (dorsal)	

2. Label Figure 1 with the above terms.

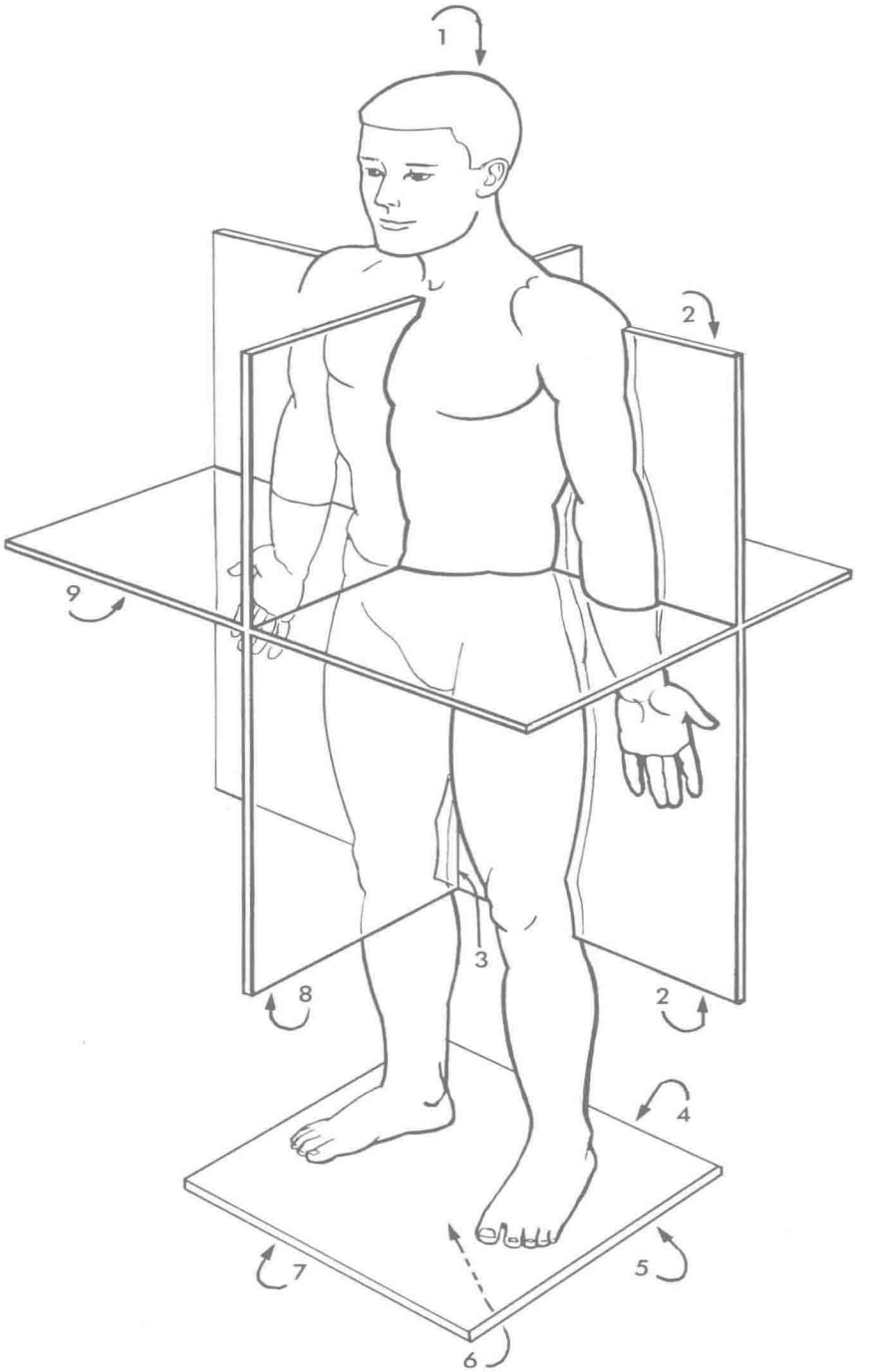


Figure 1. Planes of organization.

EXPERIMENT B: Cavities and Organs of the Human Torso

Reference:

J, F and L. Ch. 1.

Materials:

1. Model of human torso
2. Anatomic charts of human body

Objective: To develop a working knowledge of the positions of organs and systems within the body.

Procedure:

1. Remove and identify all the body organs in the model of the human torso, noting their size, position, shape, and the cavity (see below) in which each is located.
2. List the organs found in the following cavities:

CAVITY	ORGANS
Cranial	
Spinal	
Thoracic	
Abdominal	
Pelvic	

3. Label Figure 2 with the following terms:

Cranial cavity (dorsal)	Abdominal cavity (ventral)
Thoracic cavity (ventral)	Pelvic cavity (ventral)
Spinal cavity (dorsal)	Respiratory-diaphragm

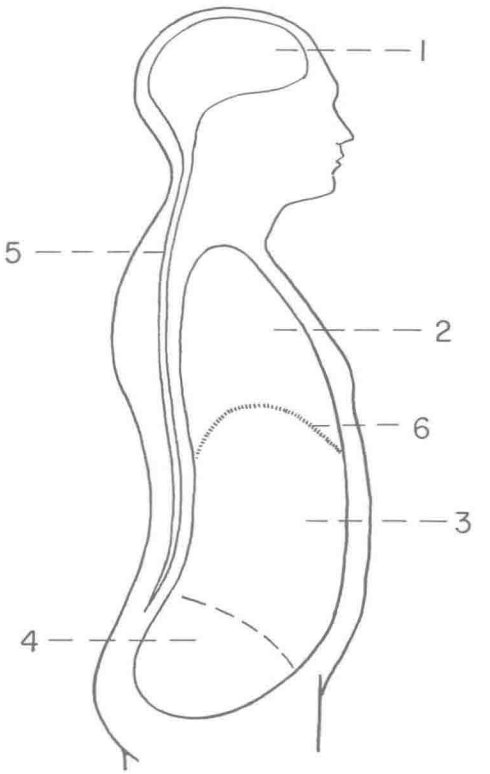


Figure 2. Cavities of the body.

EXPERIMENT C: Dissection of Small Laboratory Animal

Materials:

1. Laboratory animal
2. Ether or, preferably, Nembutal
3. Dissecting instruments and trays:
   a. Large scissors (about 5½ in., one sharp-pointed blade, and one round-pointed blade)
   b. Small scissors (about 3 in.)
   c. Scalpel (one with replaceable blade if possible)
   d. Forceps (smooth and toothed)
   e. Probes (blunt, bent tip, and needle type)
   f. Pins
4. Normal saline solution (see appendix)
5. Gauze sponges

Objective: To become familiar with the relationships between the organs and systems in the living animal.

Procedure:

1. Anesthetize a laboratory animal by placing it and an ether-saturated gauze sponge in a glass jar with a tightly fitting lid. When the animal appears to be anesthetized, take the lid off the jar and pinch the animal with forceps. If it does not respond it is sufficiently anesthetized.

A *preferable* anesthetic to use for animal dissection is Veterinary Nembutal (60 mg per ml). Inject 1 ml per 200 gm of animal body weight intraperitoneally. A dose of around 2 ml per 200 gm will usually kill the animal. Since Nembutal may not be readily available, ether may be used.

If ether is used, keep an ether-saturated gauze sponge over the nose and mouth of the animal dissected *at all times* to avoid having the animal awaken during dissection.

2. After anesthetization, place animal ventral side up and pin to dissecting board. With a scalpel carefully make a midsagittal incision from pubis to sternum. When making the incision, be certain to cut only the skin. Next make lateral incisions on either side of pubis and sternum to lay the skin back and expose the abdominal muscles. Use a scalpel to free skin from underlying tissue. Keep animal moist with normal saline.

3. The abdominal cavity. Open the abdominal cavity by lifting the muscular attachment to the pubis and cutting from the pelvis to the sternum. Without disturbing the viscera, observe the position of the organs in the abdominal cavity (see Fig. 3). Note the color and position of the following visceral organs:

   a. Liver: Note size, color, location, and relationship to the diaphragm.
   b. Gallbladder: (Note that the rat has no gallbladder.)
   c. Stomach: Note position, shape, size, and relationship to other organs and diaphragm.
   d. Small intestine: Gently lift the small intestine; note the mesentery and its method of attachment to the dorsal body wall. Follow along the length of the intestine and observe the vessels present in the mesentery. Note the junction of the small intestine and large intestine.