

LABORATORY MANUAL

OF STRUCTURE AND FUNCTION IN MAN

FOURTH EDITION

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1978 W. B. SAUNDERS COMPANY

Philadelphia

London

Toronto

W. B. Saunders Company: West Washington Square Philadelphia, PA 19105

1 St. Anne's Road

Eastbourne, East Sussex BN21 3UN, England

1 Goldthorne Avenue

Toronto, Ontario M8Z 5T9, Canada

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, Rio de Janeiro, Brazil

Spanish (3rd Edition) - Neuva Editorial Interamericana, S.A., Mexico 4 D.F. Mexico

Laboratory Manual for Structure and Function in Man

ISBN 0-7216-5099-6

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Last digit is the print number:

Preface to the Fourth Edition

In this edition a number of illustrations have been redrawn, several practical exercises revised to bring them up to date, cumbersome references eliminated, and an experiment on counting red and white blood cells added.

We trust that the student will find the Fourth Edition helpful and stimulating in facing the challenge of securing a firm foundation for understanding the physiology and anatomy of the human body.

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

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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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.

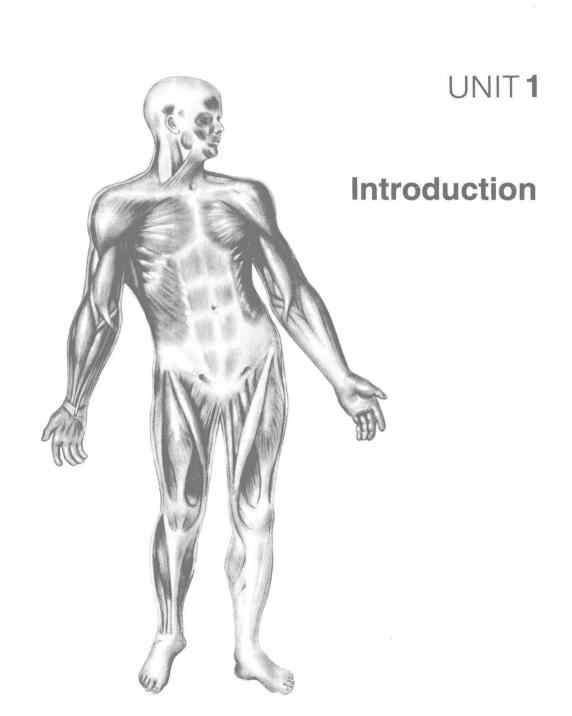
Suggested Time Allotment

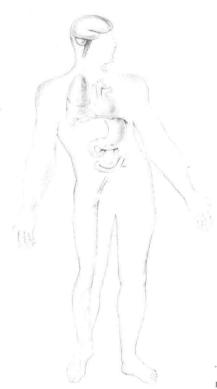
UNIT 1:	INTRODUCTORY	5-10 hrs.
	The Body as a Whole The Cell Tissues	2 hrs. 4–6 hrs. 2 hrs.
UNIT 2:	FRAMEWORK OF THE BODY	5-10 hrs.
	SKIN THE SKELETAL SYSTEM THE ARTICULAR SYSTEM THE MUSCULAR SYSTEM	1/2 hr. 4 hrs. 11/2 hrs. 4 hrs.
UNIT 3:	INTEGRATION AND METABOLISM	18-37 hrs.
	THE NERVOUS SYSTEM SPECIAL SENSES THE CIRCULATORY SYSTEM THE LYMPHATIC SYSTEM THE RESPIRATORY SYSTEM THE DIGESTIVE SYSTEM THE URINARY SYSTEM THE ENDOCRINE SYSTEM FLUIDS AND ELECTROLYTES	8½ hrs. 5½ hrs. 7½ hrs. ½ hr. 4½ hrs. 3 hrs. 2 hrs. 3 hrs. 2 hrs.
UNIT 4:	REPRODUCTION	4–7 hrs.
	THE REPRODUCTIVE SYSTEM	7 hrs.
TOTAL:		32-64 hrs.

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chapter 1

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 EXPERIMENT B: Cavities and Organs of the Human Torso

EXPERIMENT C: Dissection of Small Laboratory Animal

PRACTICAL EXERCISES

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.

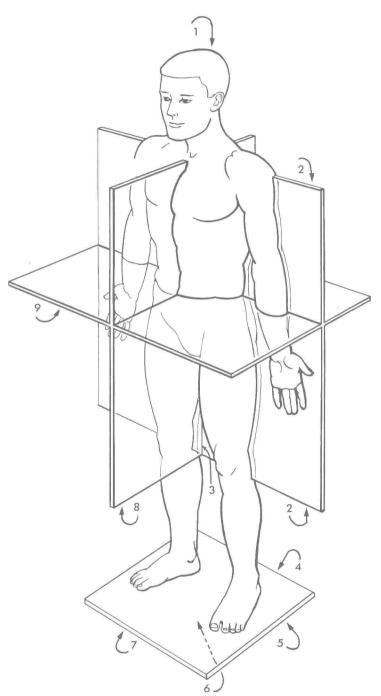


Figure 1. Planes of organization,

EXPERIMENT B: Cavities and Organs of the Human Torso

References:

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.

ORGANS

Procedure:

CAVITY

- 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:

SECRET SE
Cranial
Spinal
Thoracic
Abdominal
Pelvic

3. Label Figure 2 with the following terms:

Cranial cavity (dorsal)
Thoracic cavity (ventral)
Spinal cavity (dorsal)

Abdominal cavity (ventral) Pelvic cavity (ventral) Respiratory diaphragm

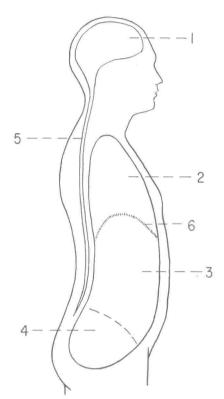


Figure 2. Cavities of the body.

EXPERIMENT C: Dissection of 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.)
 - 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.

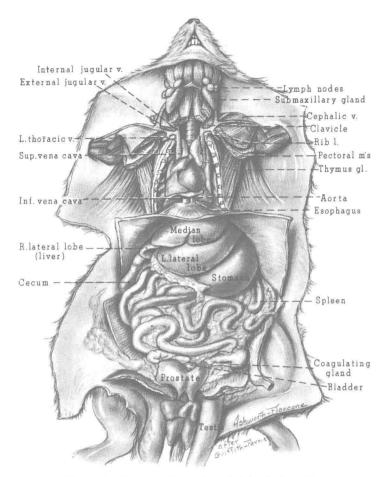


Figure 3. Organs of thoracic and abdominal cavities.

- e. Large intestine: Lift the large intestine; note its size, position, and relationship to other organs. Observe the cecum and the ascending, transverse, and descending colon.
- f. Spleen: Identify this elongated, reddish brown organ situated below and to the left of the liver.
- g. Pancreas: Locate this small pinkish mass of tissue, irregular in shape, and located in the mesentery between the stomach and intestine.
- h. Kidneys: Locate the kidneys, one on either side of the vertebral column, fastened to the posterior body wall retroperitoneally. Note color and shape of kidneys, renal vessels, and ureters.
- Suprarenal glands: These are small pink bodies lying above each kidney.
- 4. The pelvic cavity:
 - a. Ureters: Carefully lift the ureters with forceps and follow them to the bladder.
 - b. Urinary bladder: Observe the shape, color, and relationship to other organs.
 - c. Urethra: Gently pull on the bladder and notice the location of the urethra. With scissors cut the tissues surrounding it so that relationship may be observed.