

**PHYSIOLOGY PRACTICUMS: EXPLICIT
DIRECTIONS FOR EXAMING PORTIONS
OF THE CAT, AND THE HEART,
EYE, AND BRAIN OF THE SHEEP AS AN
AID THE STUDY OF ELEMENTARY
PHYSIOLOGY WITH THIRTY FIGURES**

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Physiology Practicums: Explicit Directions for Examining Portions of the Cat, and the Heart, Eye, and Brain of the Sheep as an Aid the Study of Elementary Physiology with Thirty Figures by Burt G. Wilder

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BURT G. WILDER

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"I have been in the habit of advising my students to dissect the CAT as a convenient preliminary to practical Human Anatomy."—*Joseph Leidy.*

"It seems to me that the first dissections should be made on CATS and dogs until a good technique has been acquired, so that the supply of human cadavers, which is always insufficient, can be fully utilized to the best advantage."—*J. S. Billings.*

"There is so close a solidarity between ourselves and the animal world that our inaccessible inward parts may be supplemented by theirs. A SHEEP'S heart or lungs or eye must not be confounded with those of man; but so far as the comprehension of the elementary facts of the physiology of circulation and of respiration and of vision goes, the one furnishes the needed anatomical data as well as the other."—*Huxley.*

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PHYSIOLOGY PRACTICUMS

EXPLICIT DIRECTIONS FOR EXAMINING

PORTIONS OF THE CAT, AND THE HEART, EYE,
AND BRAIN OF THE SHEEP

AS AN AID IN THE

STUDY OF ELEMENTARY PHYSIOLOGY

SECOND EDITION, REVISED

WITH THIRTY FIGURES

BY

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In Preparation: How to Prepare Specimens for Physiology Practicum.

By the author: Dissection of the Sheep's Brain: being part IV of Physiology Practicum, with Plates XVIII-XXV and an Appendix on the Removal and Preservation of the Brain. Price 40 cts., post-paid.

By the author and S. H. Gage: Anatomical Technology as Applied to the Domestic Cat: an Introduction to Human, Veterinary, and Comparative Anatomy. Third, from the second revised, edition. Pp. 600, 120 figs, 4 lithograph plates. A. S. Barnes & Co., New York, 1892. \$4.50.

By Simon Henry Gage, Professor of Anatomy, Histology and Embryology in Cornell University: The Microscope and Microscopical Methods. Fifth edition, rewritten, greatly enlarged, and illustrated by 103 figures in the text. Price \$1.50 post-paid. Comstock Publishing Co., Ithaca, N. Y., U. S. A.

PREFACE TO THE FIRST EDITION.

About ten years ago, in the effort to enable the members of the general class in Physiology at Cornell University (150-180 in number) to study for themselves intelligently certain parts of the cat and sheep as an aid to the comprehension of the functions and relations of the corresponding human organs, I put alcoholic specimens before them and wrote on the blackboard brief directions which were orally amplified and illustrated. A few years later these directions were written upon cloth sheets that were suspended before the class. They were amplified and printed in the fall of 1889 and issued in their present form in 1892.

The separation of the sheets and plates has obvious inconveniences but upon the whole the practical advantages are greater.

From the first the assistants and students have cordially cooperated toward increasing accuracy and explicitness.

It is to be hoped that ere long as much as is here included may be required for admission to this and other universities, so that the instruction therein may commence upon a foundation both higher and more substantial than at present.

Ithaca, N. Y., December 26, 1893.

PREFACE TO THE SECOND EDITION.

The text has been revised and largely rewritten. An effort has been made to correct the errors and omissions detected during the three years' use of the work at Cornell University and elsewhere. For helpful suggestions I am particularly indebted to my assistants, Dr. P. A. Fish and Dr. B. B. Stroud.

The changes in the illustrations comprise new figures of the cat's skeleton, and of the sheep's heart and brain. Two outlines have been introduced into the text.

The order has been modified so as to bring the examination of the head and neck just before that of the eye and brain. The eleven practicum are combined so as to form four Parts, each dealing with a natural group of subjects.

A teaching experience of twenty-seven years leads me to believe that explicitness should be a main feature of directions for beginners. To credit them with unlikely knowledge, judgment and skill, or with inspiration that will serve in place of those attributes, may compliment them and simplify the task of the writer. But there result perplexities, the formation of faulty methods, and the waste of time and material.

When, however, there has once been established a sound basis of fact and manipulation, the student may safely and profitably venture upon unfamiliar ground. He may either apply the directions to different forms, or re-examine the same forms in different ways. For example, the brain of the cat, dog, monkey or man may be compared with that of the sheep, and the sheep's brain may be explored in ways other than that presented in the following pages.

September 20, 1895.

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PHYSIOLOGY PRACTICUMS.

PART I.

PRACTICUM I: THE CAT: ITS FORM AND CERTAIN PARTS OF ITS STRUCTURE.

PLATES REQUIRED: I—IV.

§ 1. *Comparison of the Cat with Man.*—At one of the earlier lectures of the course the cat's form, attitude and mode of progression, and the main features of its skeleton, were compared with those of man. Examine the mounted skeleton. Manipulate the specimen. Press upon the regions where bony prominences exist. Move the limbs as wholes and at their joints. Verify the statements made at the lecture and note additional points of resemblance and difference if possible.

a. The preserved specimen is less well-adapted for these topographic observations than the freshly-killed animal. Still more may be learned from the living cat, provided it and the observer are on such confidential terms as to permit unrestricted manipulation.

§ 2. *The Leg.*—Recognize the three JOINTS, proximal, the HIP, distal, the ANKLE, and intermediate, the KNEE, demarcating as many segments, *viz.* the THIGH with its single bone, FEMUR; the LEG proper (sometimes called *crus*) with its two bones TIBIA and FIBULA, and the FOOT (*pes*) composed of several small bones.

§ 3. One or both of the heels should retain a piece of the *tendo Achillis*, seen on the right in Fig. 1. Also at the knee should be retained the PATELLA or "knee-pan" (Pl. I and Fig. 1) a movable bone attached by a strong ligament to the head of the tibia, and giving insertion to the muscles on the "front" of the thigh.

§ 4. At the sides of the left patella cut carefully into the knee joint. Then cut transversely so as to separate the leg proper from the thigh. Note that the apposed ends of the femur and tibia present a bluish white covering of CARTILAGE (gristle). This forms an elastic cushion like a buffer, to lessen the shock in moving and especially in alighting from a height.

a. Shave off a thin slice of cartilage; hold it to the light and note its translucence.

b. In a freshly killed animal the interior of the joints would present a moist surface due to the SYNOVIA secreted by the lining membrane.

§ 5. *Removing the Thigh.*—a. Move the left thigh to and fro so as to indicate where its bone, the FEMUR, joins the pelvis. On Pl. I observe

the irregular form of the pelvis. Use the *scissors* to carefully cut away the muscles that have been left attached to the femur and pelvis.

a. After the flesh about the proximal end of the femur is mostly removed, moving it will show that it has a HEAD imbedded in a socket, and that there is a fibrous CAPSULE extending from the margin of the socket over part of the head.

b. Push the femur as far as it will go in any direction; this will render the capsule tense at the opposite side; cut it here and continue till the head may be extracted slightly from the socket.

c. Note that its complete removal is prevented by a fibrous cord connecting it with the bottom of the socket; this is the ROUND LIGAMENT of the hip joint, present also in man and many animals but absent in the orang which uses its short leg freely as an arm. Cut the ligament.

§ 6. Compare the two ends of the femur. The subspherical head, on the constricted neck, enters into the composition of a "ball-and-socket joint;" the distal end forms at the knee a "hinge-joint." The patella (knee-pan) has been removed. The movements at either end are similar to those in man.

§ 7. *The Periosteum.*—Near the distal end of the bone note the covering of fibrous membrane, the PERIOSTEUM. Divide it at any point, preferably with a pocket-knife or arthrotome. Insert the tracer between it and the bone; strip it from the bone for a considerable area. Near the ends of the bone there may be seen vessels passing from it into the bone; in the dried bone the small orifices for these vessels may be detected.

§ 8. *The Marrow.*—Transect the femur with saw, nippers or hatchet. The shaft of the bone forms a tube whose cavity is filled with a kind of fat, the MARROW. The ends are solid but of a spongy texture.

§ 9. Remove the right leg at the hip. Trim off remnants of flesh with the scissors and preserve for use at Pr. II.

§ 10. *The Skin Muscles.*—On Pl. II, the irregular lines crossing between the words THORAX and ABDOMEN indicate the cut edge of a thin muscle the caudal part of which is supposed to have been removed with the skin; the cephalic part narrows to be attached to certain muscles of the arm.

a. In the cat, as in most quadrupeds, in addition to the ordinary muscles of the limbs and those of the trunk which are attached to bones, there is a nearly continuous sheet of muscle in close relation with the skin; this enables the horse, for instance, to shake off a fly, while the attachment to the arm increases the efficiency of that limb in ordinary locomotion or climbing. In man the skin muscles are present only on the neck and head, mainly as organs of expression.

§ 11. At about the middle of the left side of the thorax, as indicated on Fig. 1, make two incisions crossing one another at right angles and about 5 cm. (2 in.) long. Together they constitute a *crucial incision*.

a. These first incisions should divide only the skin, an apparently single, tough layer.

§ 12. There are thus established four triangular flaps of skin. With the forceps grasp the corner of one of these flaps, lift it and with the scalpel dissect it from the subjacent parts. Even if the incisions have divided more than the skin the latter may be isolated by taking care to lift only a *single layer* of tissue, the ental surface of which is white or dark, but not red or pink.

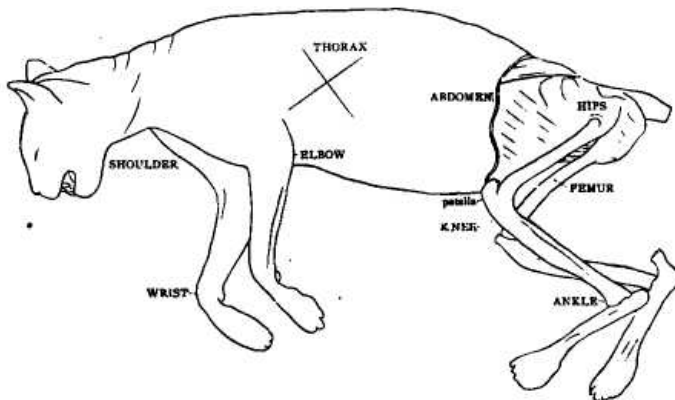


Fig. 1. Diagram of a Cat as prepared for practicum purposes. The hair was removed by immersion in water at about 80° C. (176° F.). The skin and most of the flesh have been cut from the legs and hips, and the tail abbreviated. At the right heel is seen a part of the *TENDO ACHILLIS*, the large tendon by which the muscles of the "calf of the leg" were inserted. The special object of the figure is to indicate the crucial incision by means of which the skin muscle is to be exposed.

a. When the four flaps of skin have been lifted they may be cut off with the scissors. There will then be exposed a quadrangular area of the *SKIN-MUSCLE*, recognizable by its pale red color and from the sparseness of its fascicles (bundles of fibers). Even if it has been divided by the crucial incision it may be cut out as a thin sheet, separated by *FAT* and *CONNECTIVE TISSUE* from an ental, thicker muscle, the *LATISSIMUS*, whose fascicles run in nearly the same direction; see Pl. II, just dorsad of the word *ABDOMEN*.

b. If the foregoing operations fail on the left side, repeat on the right with additional precautions.

c. On the neck, from a point about midway of its length and dorso-ventral diameter (on Pl. II coinciding nearly with the dorsal end of the line between the *E* and the *C* of *NECK*), cut caudad along the middle of the left side to the root of the tail, or to the cut margin of the skin in case it and the flesh have been removed from the hips and legs. This incision should divide both the skin and the skin-muscles. On the neck and shoulder no great harm would result from cutting too deeply, but on the thorax care should be taken not to cut the *latissimus*, and on the abdomen there is danger of opening that cavity prematurely.

d. Grasp the cut edge of skin and skin-muscle, at the dorsal side of area exposed in (*a*), and dissect them up from the *latissimus*, remembering that the latter has a free margin extending obliquely toward the arm in continuation of the line shown in Pl. II. On the neck and shoulders some irregularities and adhesions will be encountered, but no serious difficulties. In this way "skin" the left side dorsad as far as the meson.

§ 13. Do the same for the ventral half of the left side, noting three features: (1) The *MAMMARY GLAND*, a whitish, lobulated organ, quite large in nursing females, and extending the whole length of the abdomen and upon the thorax; (2) the series of *NIPPLES* connected therewith; (3) the narrowing and thickening of the *latissimus* near the arm; (4) the *PECTORAL MUSCLES*, thicker and darker than the skin-muscles and having a direction from the meson latero-cephalad (Pl. III).