

UNIVERSITY OF GRONINGEN

PHYSIOLOGICAL INSTITUTE

(PROFESSOR F. J. J. BUYTENDIJK, DIRECTOR)

BY

J. DE HAAN, M.D.

HEAD OF DEPARTMENT, LECTURER IN GENERAL BIOLOGY

The Physiological Institute of the University of Groningen, described in the following pages, was erected in 1911 to replace the institute built in 1866, which at the time was the first Dutch laboratory devoted exclusively to physiology. The three other Dutch universities soon followed suit. In view of the enormous development of physiology in ensuing decades, it is no surprise that this modest building soon became inadequate. Shortly after the late Professor Hamburger accepted the chair of physiology at Groningen in 1901, he succeeded in convincing the

government of the total insufficiency of the facilities available at that time, and moneys were voted for the building of a new institute on magnificent lines. The Director spared no pains to make the new building a model research institute. During the preparatory years, numerous existing institutes were visited and the entire staff gave its whole-hearted co-operation in constructing and equipping the building. On April 7, 1911, it was opened and has therefore been in use for almost fourteen years. During this time there has been plenty of opportunity to

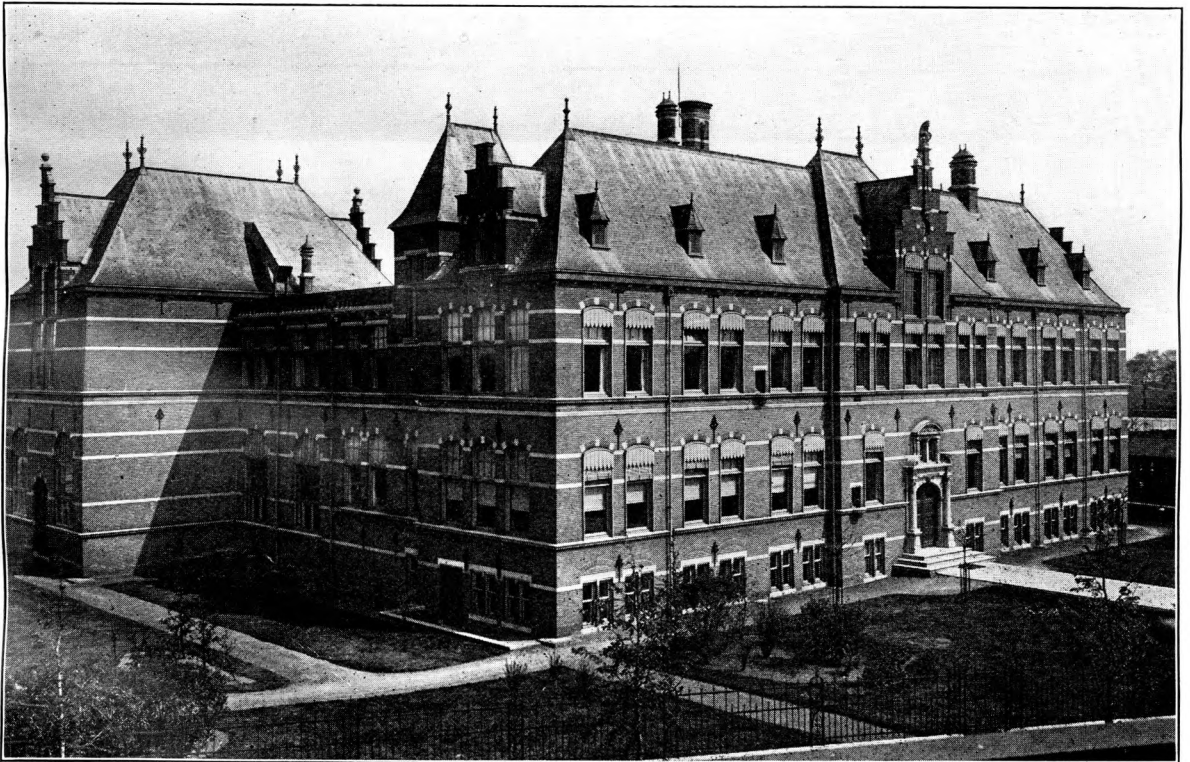


FIG. 1.—PHYSIOLOGICAL INSTITUTE

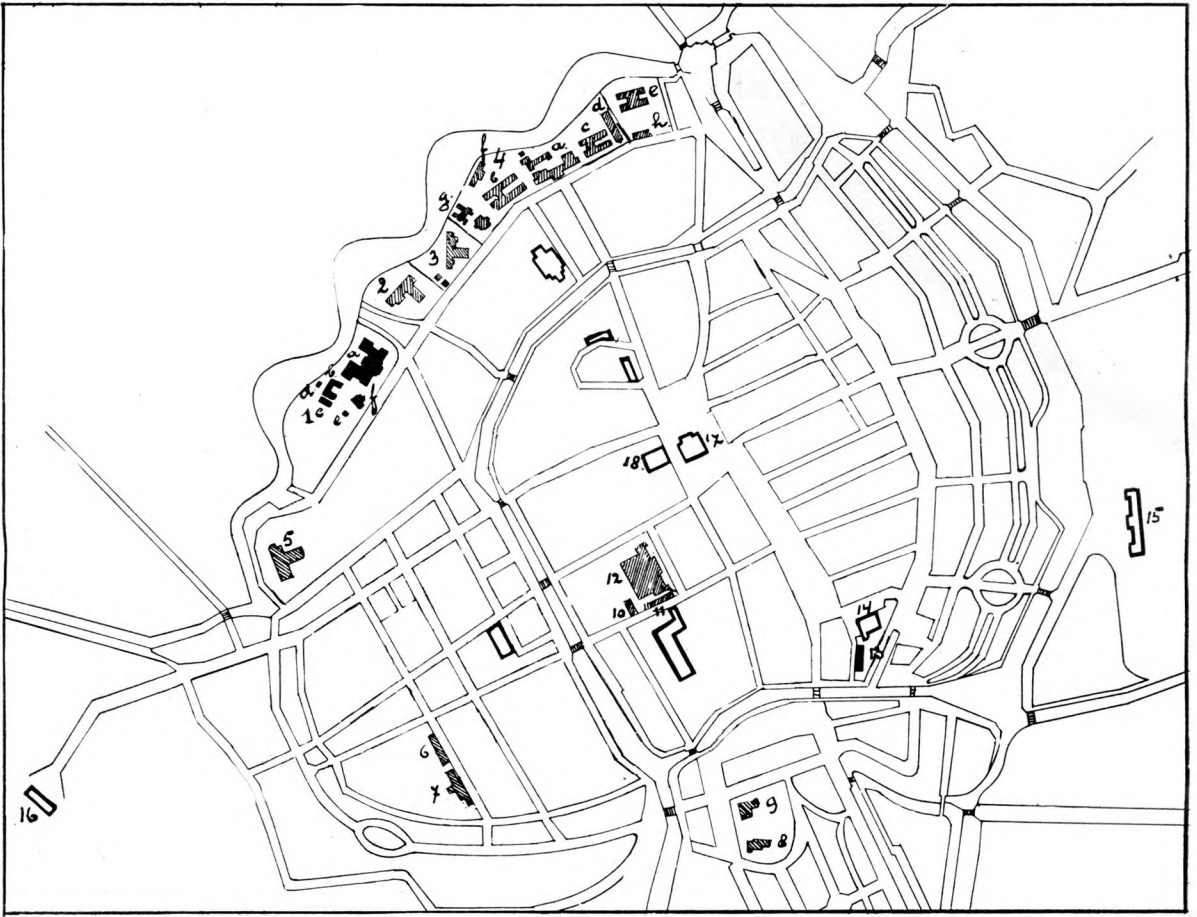


FIG. 2

- | | |
|---|------------------------------|
| 1. Physiology—(a) Main building, (b) Stable, (c) Storage, (d) Rabbits, (e) Glass room, (f) House for custodian | 7. Botany |
| 2. Anatomy and embryology | 8. Mineralogy |
| 3. Pathology | 9. Physics |
| 4. University hospital—(a) Main building, (b) Medicine, (c) Surgery, (d) Gynecology and midwifery, (e) Neurology and psychiatry, (f) Otorhinology, (g) Infectious diseases, (h) Radiology | 10. Astronomy |
| 5. Chemistry | 11. Bacteriology and hygiene |
| 6. Pharmacy | 12. University building |
| | 13. Zoology |
| | 14. Postoffice |
| | 15. Railway station (south) |
| | 16. Railway station (north) |
| | 17. Town hall |
| | 18. Students' club |

be grateful to the founder for the unusually generous provisions for research. Many scientists have worked in the Institute and made use of its facilities. During the course of the years certain shortcomings have naturally come to light, but on the whole it can be said that Groningen, as the first of the Dutch universities, has been enriched with an institution that from a great many points of view can still be considered a model one.

As the instruction and research work in physi-

ology, physiological chemistry, and histology, including microscopic anatomy, is united under one professor at the University of Groningen, the Institute has necessarily to mold itself to some extent on the requirements of each of these subjects, both as regards instruction and research work.

DESCRIPTION OF THE BUILDING

The main building is a three-story structure composed of a central section and two wings. It

is located on fairly extensive grounds which, by furnishing a pond for frogs, pasturage for large experimental animals, hutches and feed for rabbits, as well as other conveniences, are made to contribute toward meeting some of the needs of the Institute. The general layout of the buildings and grounds is given in the accompanying plot plans (see Figs. 2 and 3).

The first story comprises a lecture room, a class histological laboratory, a demonstration theater, and a number of smaller laboratories and rooms. The lecture room (1) and the histological

home. Each of these libraries has a separate, carefully prepared card catalogue.

The demonstration theater (7) is built on the usual plan, with seats rising in tiers each one-half meter above the other. Facilities are provided to permit the microscopic and other preparations to be viewed by students who cannot do so sufficiently during the demonstration period.

There are three laboratories for general research purposes—one (9) for general workers and for those working for their doctor's degree,

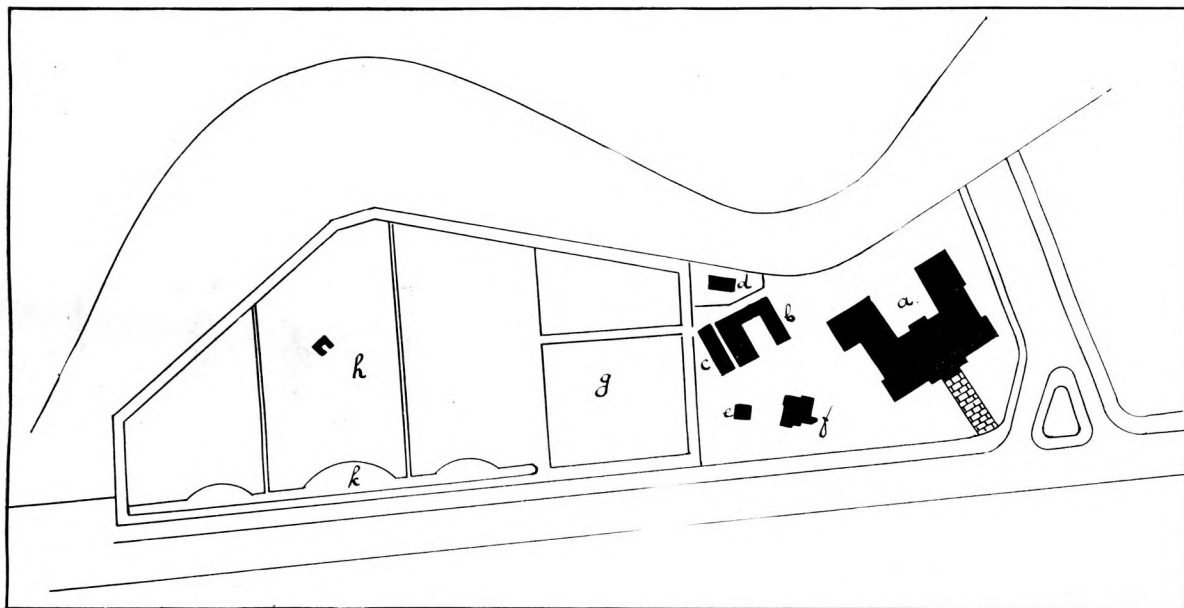


FIG. 3

- | | |
|------------------|------------------------|
| a. Main building | f. House for custodian |
| b. Stable | g. Greens and clover |
| c. Storage | h. Pasture |
| d. Rabbits | k. Pond |
| e. Glass room | |

laboratory (12) are lighted from three sides. The former is especially adapted for instruction by cinematograph, a device which serves excellently to demonstrate all kinds of living movements including those observed under the microscope. The films are developed on the premises. Adjoining the lecture hall is a small room for preparing the material to be shown at the lecture (2). On this floor there is also a library (5), forming a department of the University Library. There is also in the balance room (6) a modest collection of books, periodicals, pamphlets, and prints, most of them belonging to the Director. By keeping them here they can be made of wider use than they would be in the professor's

another small laboratory known as an assistants' laboratory (10), and the Director's private laboratory (4). Each of these contains such facilities as centrifuges, air pressure and suction, and ovens for various temperatures, so that they can be used for researches of every kind.

The ground floor has a students' laboratory for physiology (17) and another for physiological chemistry (14) and between the two a dark room (16) for spectroscopic examinations of the blood, ophthalmoscopy, and other uses, and a glass-washing room (15). These connecting rooms are used for both laboratories. One corner of this floor is taken up by two rooms for making

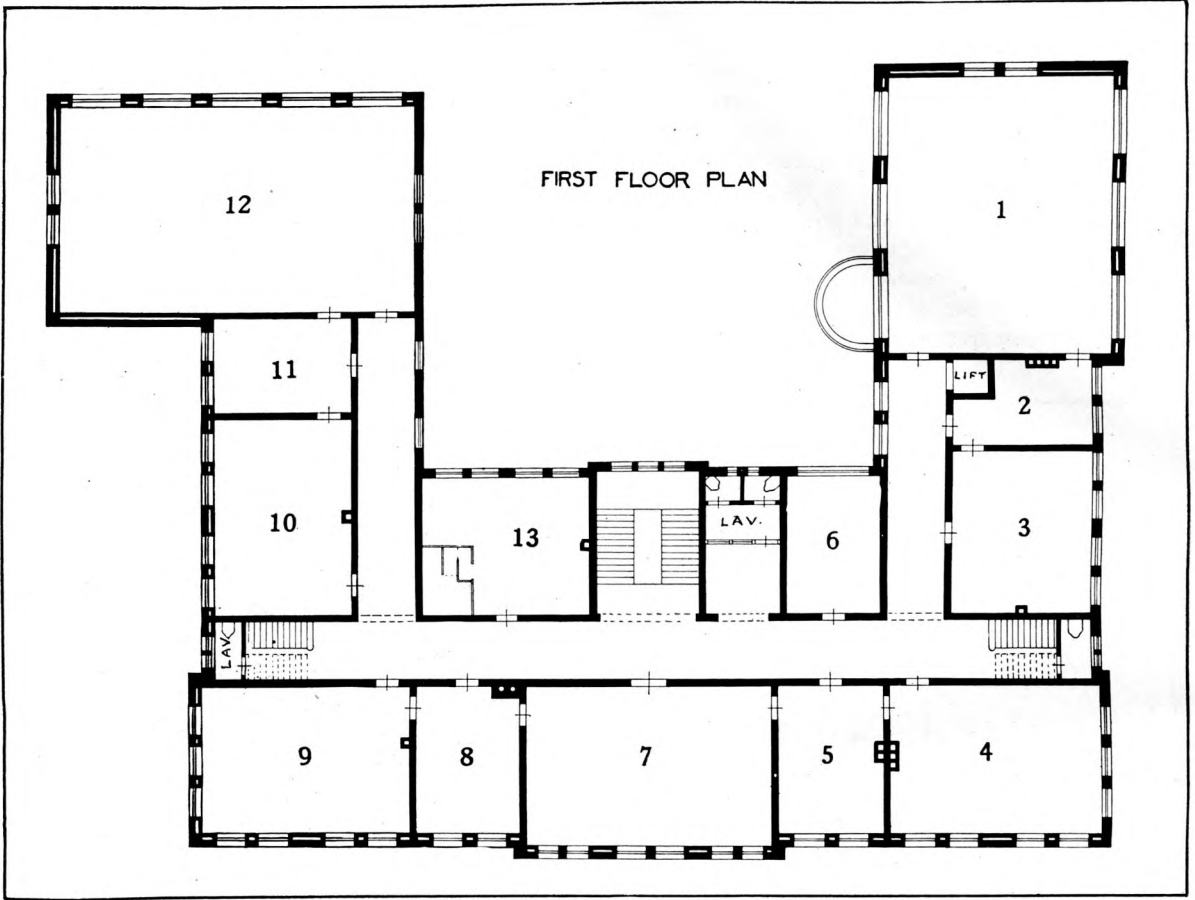


FIG. 4

- | | |
|-----------------------------|--------------------------------------|
| 1. Lecture room | 8. Assistant director's private room |
| 2. Lecture preparation room | 9. General laboratory |
| 3. Professor's private room | 10. Assistants' laboratory |
| 4. Professor's laboratory | 11. Histology preparation room |
| 5. Library | 12. Histology classroom |
| 6. Balance room and library | 13. Drawing and photography |
| 7. Demonstration theater | |

instruments (18, 19). These are well equipped for constructing both heavy and light apparatus. Grinding and polishing machinery, an electric bath for plating, and other facilities are provided. Other corner sections are taken up by the bacteriology laboratory (24) and a large room used for operations and experiments upon both small and large animals (28). The latter has a special apparatus for fastening large animals, such as horses, in any given position without danger to operator or animal. A 7,000 c.p. electric illumination makes possible cinematographic reproduction of vivisection and other experiments. Adjoining is a room for sterilization and bandages (29), another for preparing animals for operations (27), and next to this a third for observation of animals under research (26).

There is also on this floor a room (30), which can be completely darkened, for optical researches such as spectroscopy and polarization. It is also meant to be used for researches on animals with X-rays. The enormous progress in Röntgen technique renders it possible to study the movements of the intestinal tract, heart, lungs and other organs cinematographically, before and after operations, and thus to submit them to an analytical investigation. The funds necessary to equip this room were not available until recently.

The basement, in addition to the engine room (39), refrigerating plant (37), and various storerooms, contains three laboratories, one for electrophysiology (34), one for low temperatures (38), and one for body temperature (40).

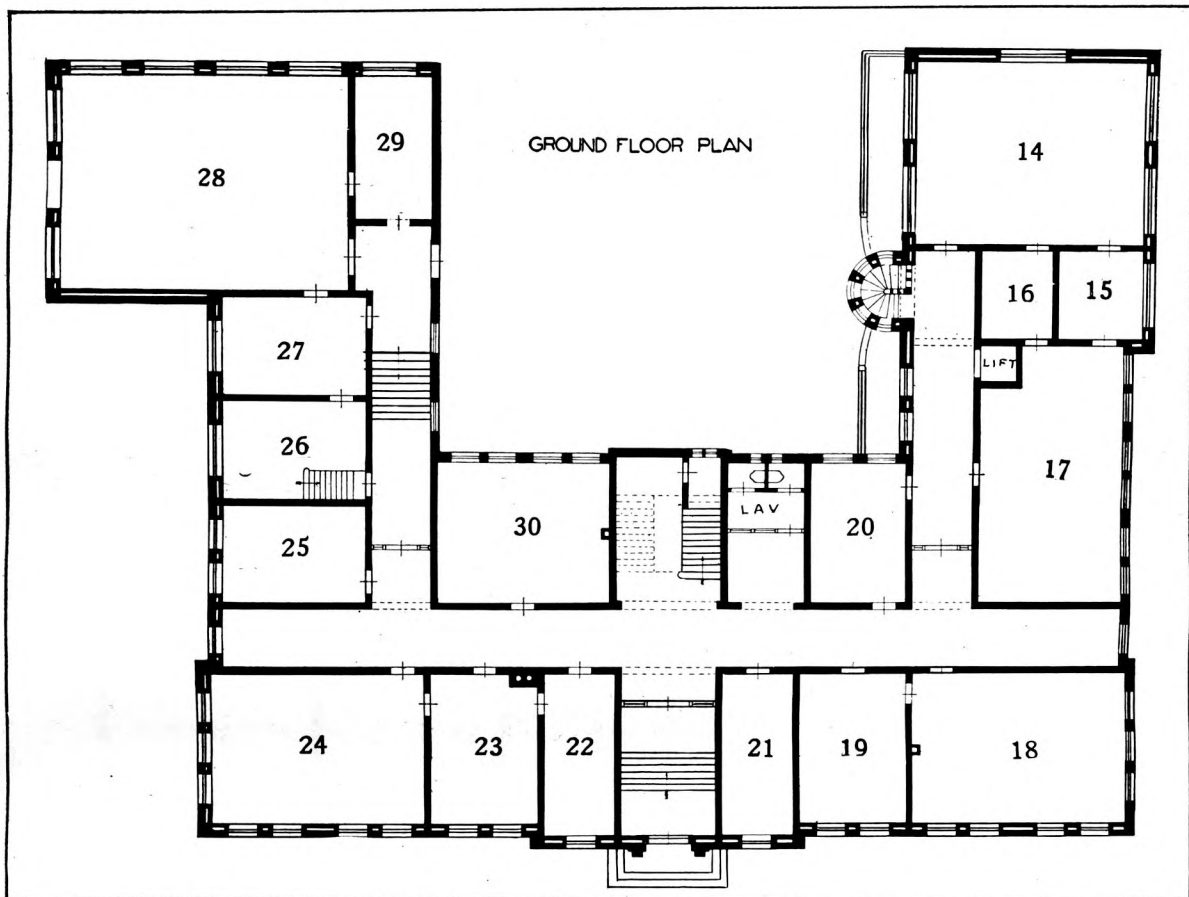


FIG. 5

- | | |
|--|--|
| 14. Class laboratory for physiological chemistry | 23. Assistant's private room |
| 15. Glass washing | 24. Bacteriological laboratory |
| 16. Dark room | 25. Physicochemical research room |
| 17. Laboratory for physiology class | 26. Observation room for animals |
| 18 and 19. Shop for making apparatus | 27. Preparing animals for operation |
| 20. Assistant's private room | 28. Operations and physiological experiments |
| 21. Reception room | 29. Sterilization and bandages |
| 22. Storeroom and glass washing | 30. Optical researches |

The low temperature laboratory has facilities for preserving serums and organic materials that cannot be used immediately. It also contains a refrigerating machine for making the ice used in the laboratory for various purposes. The chief use of the room, however, is to carry on experiments at low temperature; this is especially useful in connection with enzymes which decompose more rapidly at room or body temperature than at one of about 0° C. The study of chemical reactions at a given low temperature would be impossible if the precipitates, obtained at low temperature, were removed by centrifugation at the ordinary room temperature. An electrical centrifuge has therefore

been provided, as well as various other auxiliary apparatus.

A large room across the corridor (41) contains various kinds of centrifuges, a large installation for ultrafiltration, a Buchner press for making juices, an apparatus for distilling water, and the machines for the general suction and pressure systems, taps for which are found in various rooms. Adjoining this room is a smaller one (41a) which serves as a store for various objects required for experiments with the large machines in room 41; it also offers an opportunity of studying results without being troubled by the noise and stamping of the machines. A printing machine for the prompt printing of

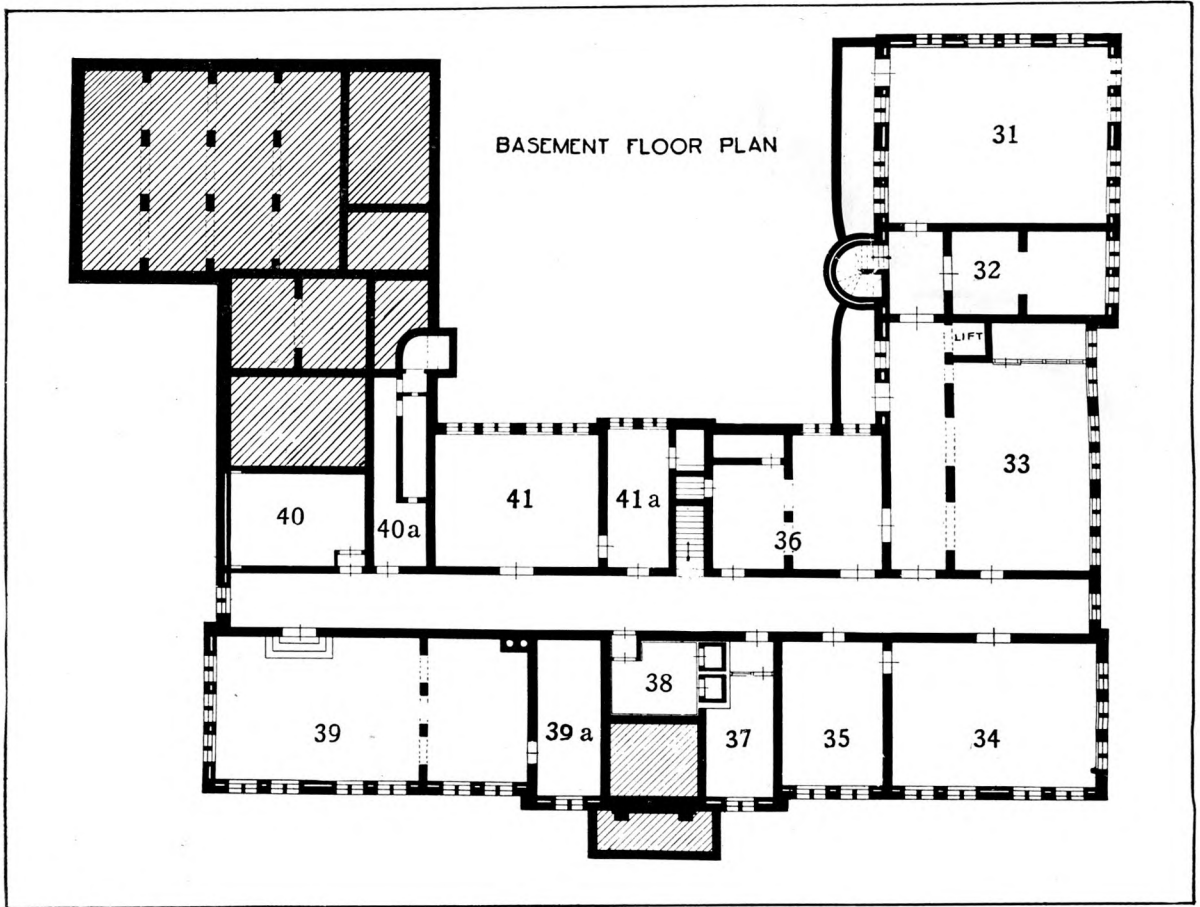


FIG. 6

- | | |
|---------------------------------------|-------------------------------------|
| 31. Bicycles | 38. Low temperature laboratory |
| 32. Storeroom | 39. Engine room |
| 33. Storeroom for glass and chemicals | 39a. Carpenter shop |
| 34. Electrophysiology | 40. Laboratory for body temperature |
| 35. Gas, water, and electric meters | 40a. Engine room for room 40 |
| 36. Packing rooms | 41. Centrifuge room |
| 37. Refrigeration machine | 41a. Annex of room 41 |

labels, and so forth, is also located in this room.

It is well known that vital processes, and chemical processes in general, are in a high degree dependent upon temperature. In the laboratory for body-temperature (40) the temperature can be minutely regulated and, if necessary, kept at a given point. This room, which is provided with taps for compressed air and suction, electric centrifugal apparatus and a current transformer, has also been found of service in studying the organs of warm-blooded animals after they have been taken from the body. If the isolated organ is to be kept alive it is absolutely necessary that the temperature should not fall below that of the body. Apparatus for this purpose, which is difficult to devise, is rendered superfluous by this

room. The way in which constancy of temperature is obtained has been very much simplified since the building was put into use. Other temperatures between 20° and 40° C. may also be obtained in this room.

A large corner room (34) on this floor is designed for electrophysiological researches and is equipped with the necessary apparatus such as a string galvanometer, etc.

Near the main building and standing by itself is a small building known as the glass room (see Fig. 3) which may be used for experimenting with the effects of sunlight on life.

One wing of the stable (see Fig. 3) is reserved for small animals, the rest being used for horses, cows, sheep, goats, etc. It has a

separate heating system and is lighted by electricity. Near the stable is a rabbit burrow with appropriate grounds enclosed by a fence. The custodian, who is at the same time chief clerk, lives in a detached house (see Fig. 3). This arrangement was thought preferable to providing living quarters in the main building.

The grounds attached to the laboratory have an area of 1.3 hectares and include a clover field, a field for cultivating vegetables for small animals, and a pasture for the large ones which are kept in good hygienic condition. Inside the grounds is a pond in which fish can live throughout the winter, a part of it being reserved for frogs. Thus the laboratory has a constant supply of aquatic flora and fauna in natural condition.

TEACHING METHODS AND FACILITIES

To prevent loss of time in searching for apparatus and material or getting them from other rooms every room is well provided with all the ordinary supplies and appliances, including the equipment necessary for simple vivisection and the preparation of microscopical slides. Filter paper of different sizes and degrees of hardness is kept in the drawers of the work table in flat

round boxes made of zinc fastened to the bottom of the drawer. These boxes are fitted with lids to keep the filters in place and clean.

The cinematographic facilities, the instrument shop, the regulated temperature rooms and the extensive grounds which in various ways are made to contribute to the needs of the Institute have already been mentioned.

The card catalogue of the two libraries embodies a principle that has been applied to all objects on the premises. This system it is believed contributes a great deal to the orderliness and neatness of all the rooms. The cupboards and every shelf in them are provided with white enamelled plates bearing black letters or numbers which give a fixed place to all objects. Everything, if possible, bears the number of its room, the letter of its cupboard, the number of its shelf, and the place number on this shelf. When anything is taken from its place a printed card is substituted on which is recorded the borrower's name and the room to which it has been removed. When the object is returned a record is made on the card, which is then put in a box kept for this purpose.

Each room has an inventory book in which are entered alphabetically the contents of the room

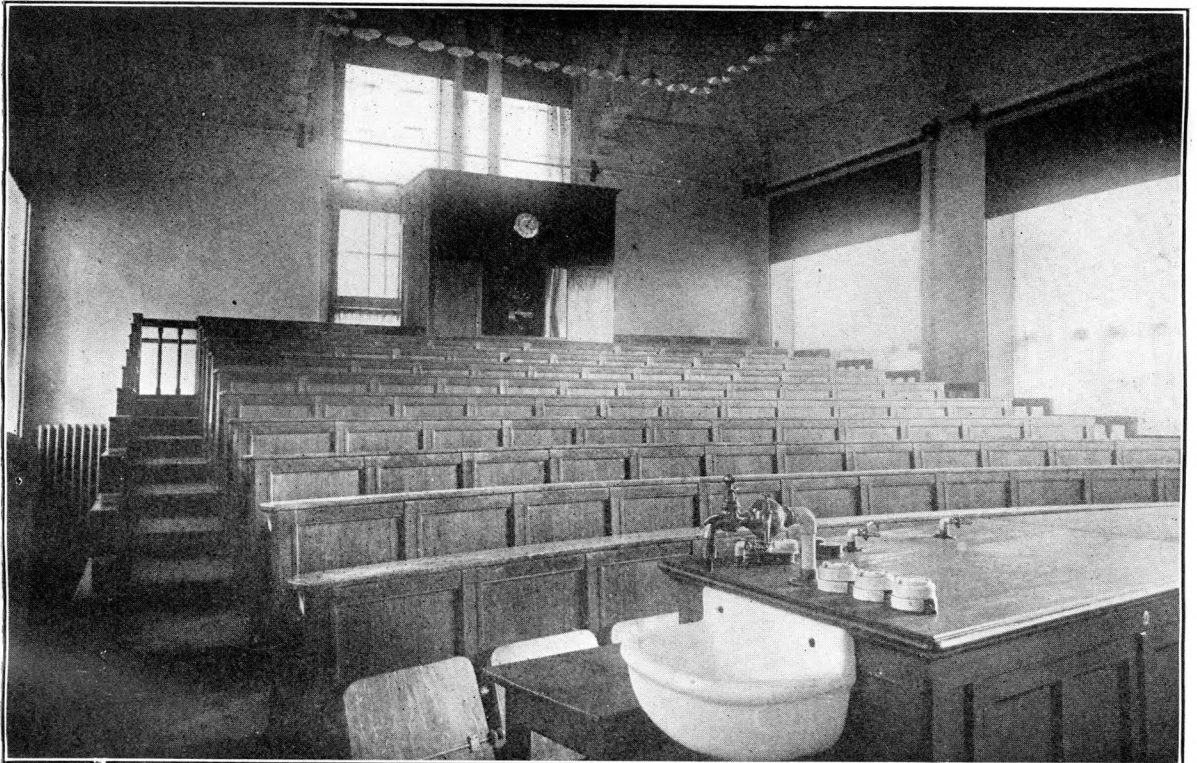


FIG. 7.—LECTURE ROOM

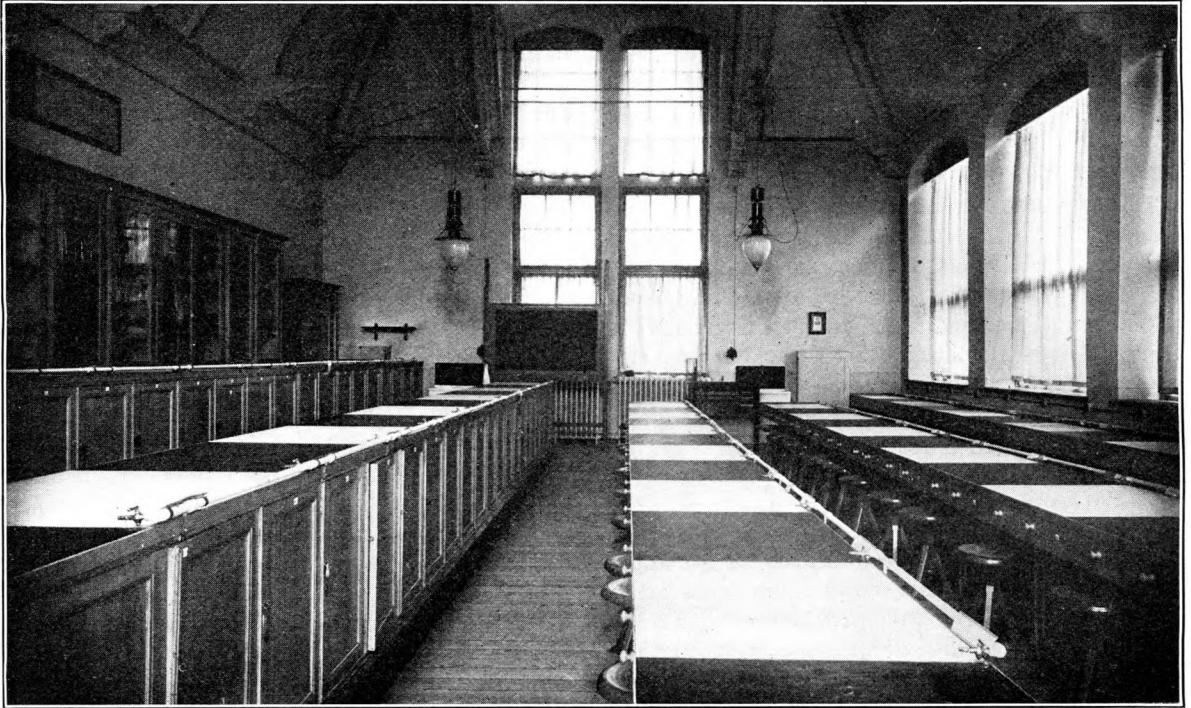


FIG. 8.—HISTOLOGY CLASSROOM

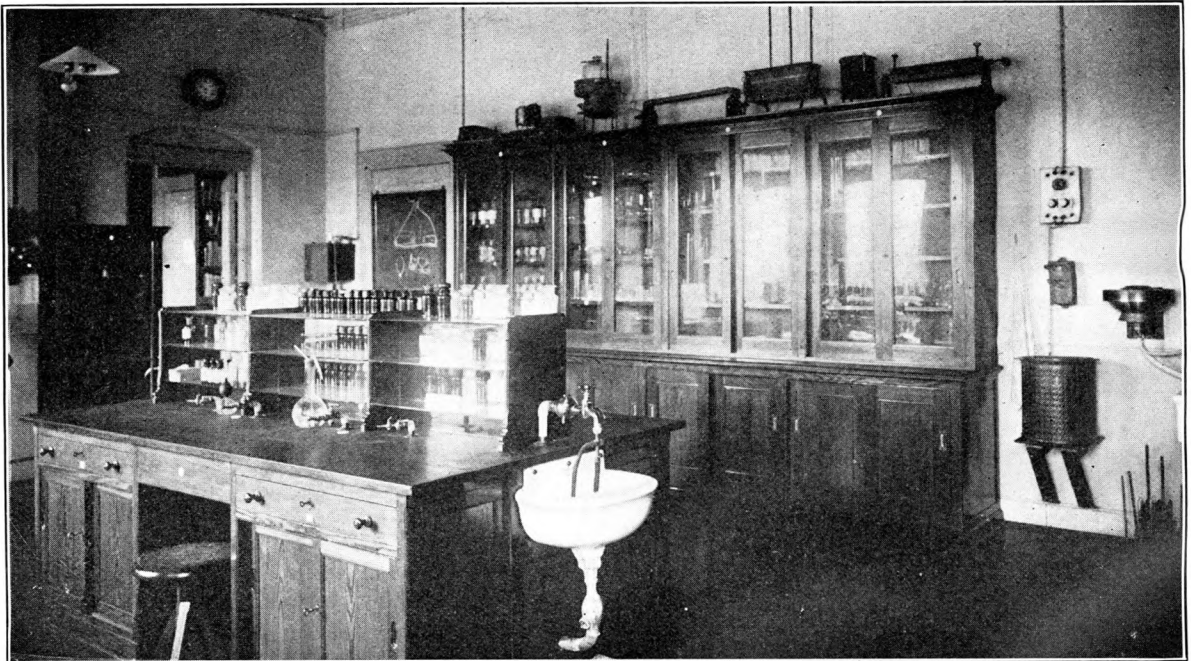


FIG. 9.—PROFESSOR'S LABORATORY

with indications of their proper places. Every room also has a so-called breakage book, in which students and personnel make a record of what has been broken so that it can be replaced as soon as possible from the central store.

To further facilitate the finding of objects there is a complete inventory in card catalogue form on each floor, so that every worker can find his way about perfectly from the first day he enters the laboratory. A clerk is provided to attend to the work of keeping up these card catalogues.

The fact that all laboratory necessities are liberally provided and that everything has been done

ant, he sounds the combination of tones assigned to him. These particular tones are simultaneously reproduced by the thirteen other telephones distributed over the building. No matter what part of the building he may be in he will know that he is wanted and will go to the nearest telephone. A special tone or combination of tones is assigned to every member of the scientific and technical staff and a list of these signals hangs at the side of each telephone. It might be supposed that the frequent ringing of these telephones and the necessity of being on the lookout for calls would be annoying. Experience has shown, however, that this is not the case. In such rooms as

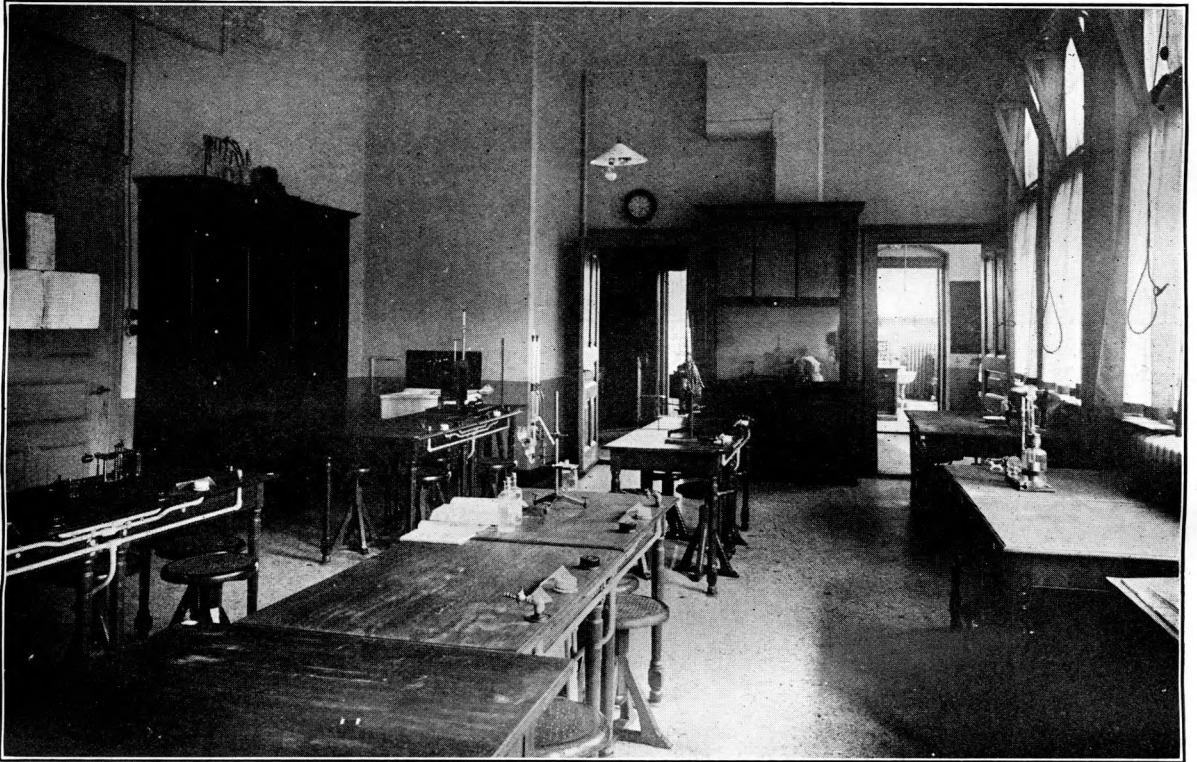


FIG. 10.—CLASS LABORATORY FOR PHYSIOLOGY

on the part of the late Director to promote order, cleanliness, and neatness, causes every one to feel a moral obligation to co-operate in the same spirit. Experience indicates that the system works well.

Another convenience is the telephone system. In a large building it is difficult to locate a person by telephone if he is moving about from one room to another. In the Institute the house telephones have been constructed so that every instrument produces two tones, one high and one low. If the Director wishes to speak to an assist-

the lecture rooms the telephone may be temporarily disconnected when desired.

HISTOLOGY

As stated above, both histology and microscopic anatomy are taught in the physiological laboratory. Formerly this was the case everywhere, but gradually a division has taken place at most universities. From a purely scientific point of view much may be said in favor of such a separation. More justice is done to histology, since it obtains workers who devote themselves exclu-

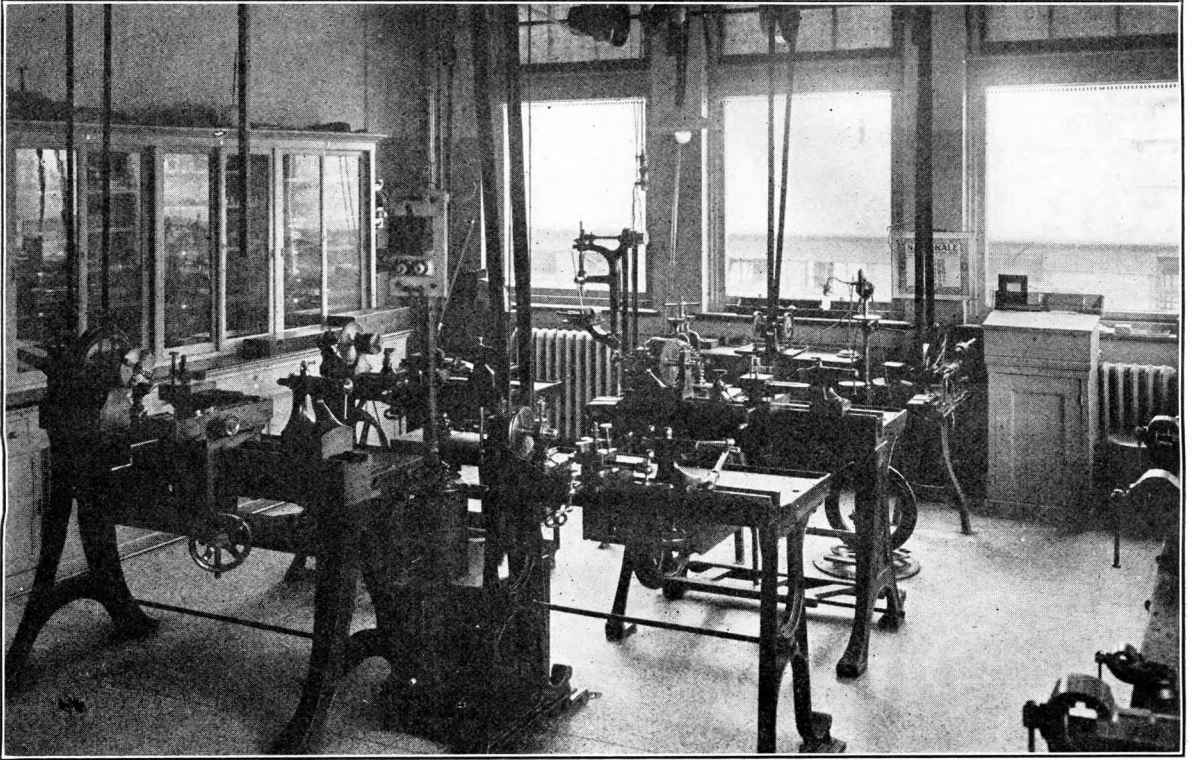


FIG. 11.—SHOP FOR MAKING APPARATUS

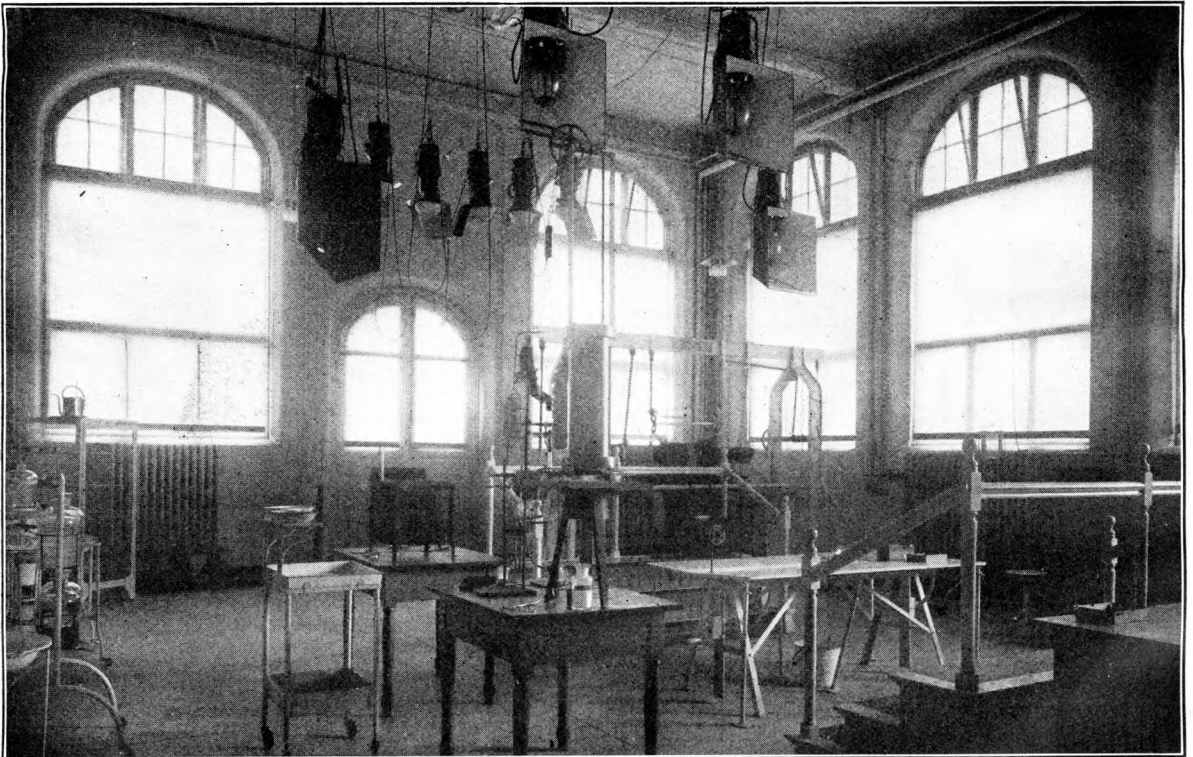


FIG. 12.—OPERATIONS AND PHYSIOLOGICAL EXPERIMENTS

sively to it. In the interest of teaching, however, such a division is less desirable because morphological facts are of interest to the medical student only when considered in connection with living processes. This consideration has prevented the transfer of elementary instruction in histology and microscopic anatomy to another institute.

BACTERIOLOGY

It is sometimes thought that bacteriology concerns only the hygienist and pathologist. Bacteria, however, are also of interest to the physiologist. In the first place, millions are found in the intestinal tract of a healthy man, and, secondly—and this is of even greater importance—the physiologist must frequently reckon with bacteria as unwished-for guests which often form a disturbing element in his investigations. The lower organisms, found everywhere in the air, infect the body-fluids with which he works, feed and multiply at the expense of these fluids, and even secrete various substances modifying their composition.

It is necessary, therefore, to keep these lower organisms away from the fluids, and to do this efficiently, the worker ought to have at his disposal a room especially adapted for this purpose and provided with the usual appliances required for the study of infectious diseases and their prevention.

Of the many investigations in physiology which have to be carried out by sterile methods, mention may be made of the study of enzymes which are found in great variety in the cells and fluids of the body, and are daily becoming of more importance to biology. Another example is the production of antibodies. The mechanism of these antibodies is extremely complicated, especially when they are formed by bacteria. The substances playing a part in this process are of many kinds and it is only with great difficulty that they can be obtained in a free and pure state. It is advisable to introduce the simpler substances into the body, and thus turn the problem into one of a chemico-physiological nature. The conclusion is that serum therapeutics and immunity, which are virtually based on physio-

logical reactions, certainly concern the physiologist as much as they do the pathologist and hygienist.

RESEARCH

As regards the principles that have guided research work in this institute for some ten years or more, it should be noted, as has already been pointed out, that physiology proper, physiological chemistry, and histology have all been brought together under a single professorship. Every physiological investigation must take these two allied sciences into account. In general it can be said that the aim has been to approach physiological problems from the chemical and physicochemical side, keeping in mind at the same time histological physiology, that is to say, whatever the histological picture as it varies during the course of the physiological experiment can teach the physiologist concerning the function of the organ studied. A number of publications that have appeared since the erection of the institute bear witness to this trend.

PERSONNEL

The scientific staff consists of the Director, a head of department (lecturer in general biology), a conservator, two assistants, and three voluntary assistants who help with the laboratory and classwork of the students, the rest of their time being devoted to research work of their own. All their time is given to teaching and research. There is also an assistant for research and administrative work only.

The technical staff consists of four well-trained men, two of whom are detailed for work in the instrument shop and are in charge of various apparatus, and two who do work of a clerical nature and give technical help in experiments. There are, besides, a farm-laborer, a charwoman, and two apprentices.

BUDGET

Professional staff	f22,500
Technical staff	12,510
General maintenance and research.	13,996
	<hr/>
Total	f49,006