

INSTITUTE OF PATHOLOGY OF WESTERN RESERVE UNIVERSITY AND THE UNIVERSITY HOSPITALS OF CLEVELAND

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INTRODUCTION

The Medical Center in Cleveland represents the joint interest of Western Reserve University and the University Hospitals of Cleveland, Incorporated. A contractual relationship exists between these two bodies, and their boards of trustees, although entirely independent, show a considerable degree of interlocking. The University Hospitals of Cleveland, Incorporated,

is a corporation made up of representatives of the various constituent hospitals and the University, and acts as an operating and correlating body with certain holding functions. The hospitals comprising the group include the Babies' and Children's Hospital, Lakeside Hospital, Hanna House adjacent to Lakeside and for private patients, Maternity Hospital, Rainbow Hospital for Crippled and Convalescent Children, and the out-

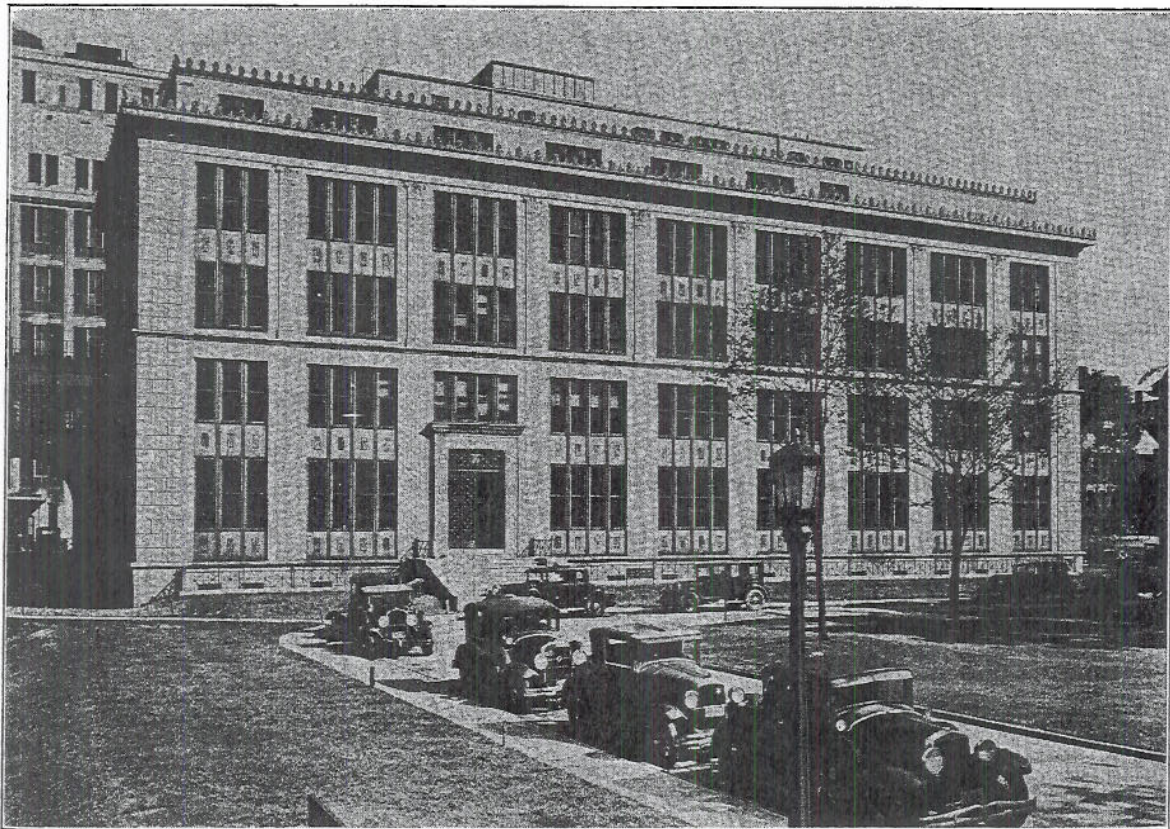


FIG. 1.—THE INSTITUTE OF PATHOLOGY VIEWED FROM THE LAKESIDE HOSPITAL

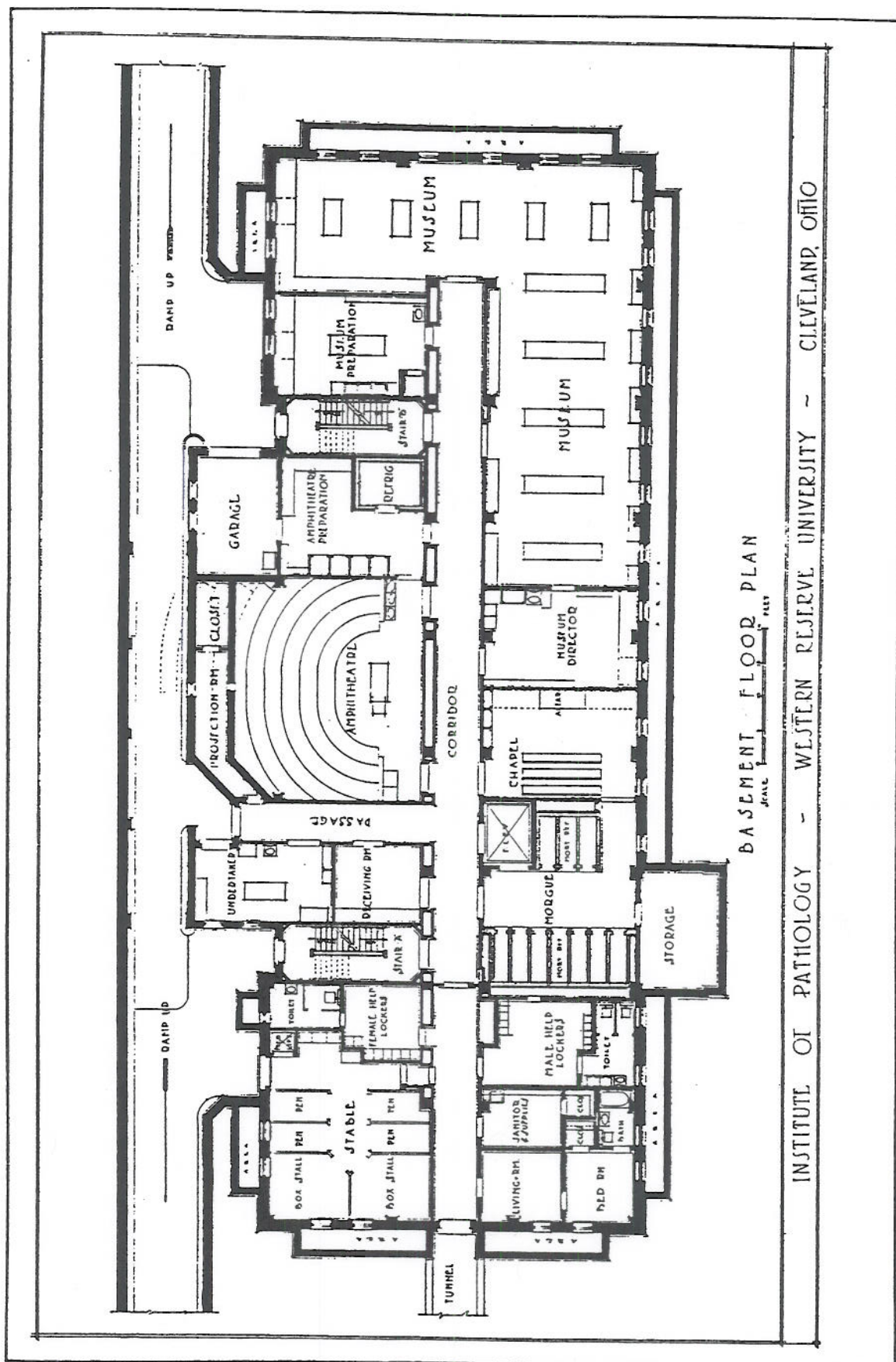
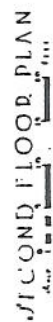
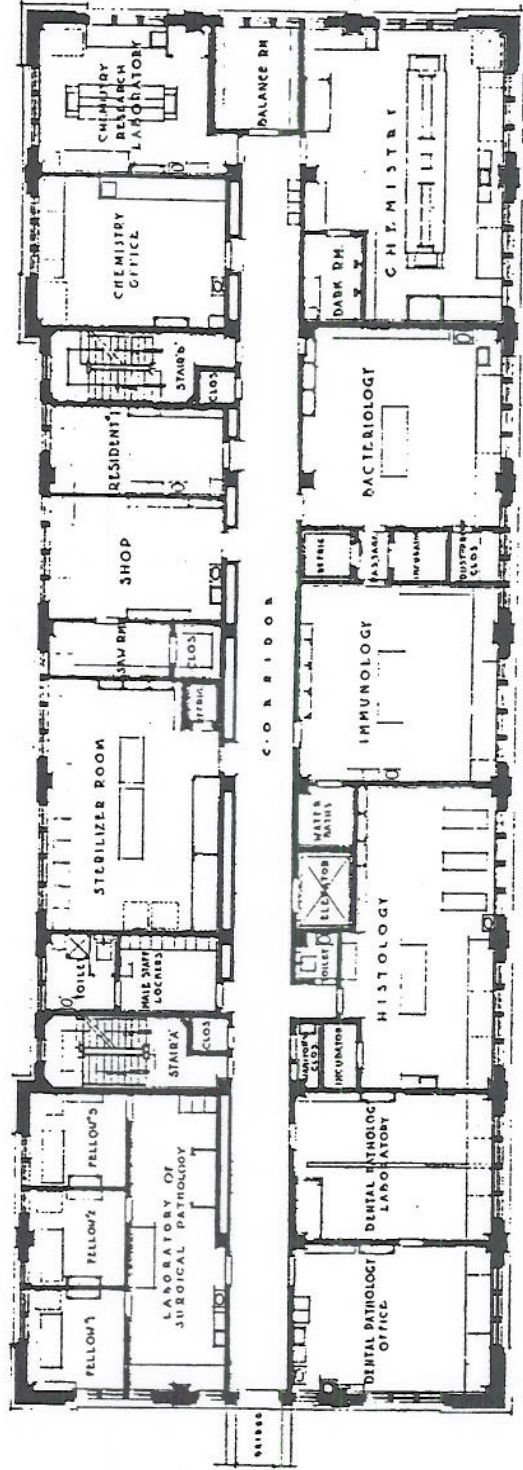


Fig. 2



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Fig. 1



THIRD FLOOR PLAN
SCALE 1" = 10' FEET

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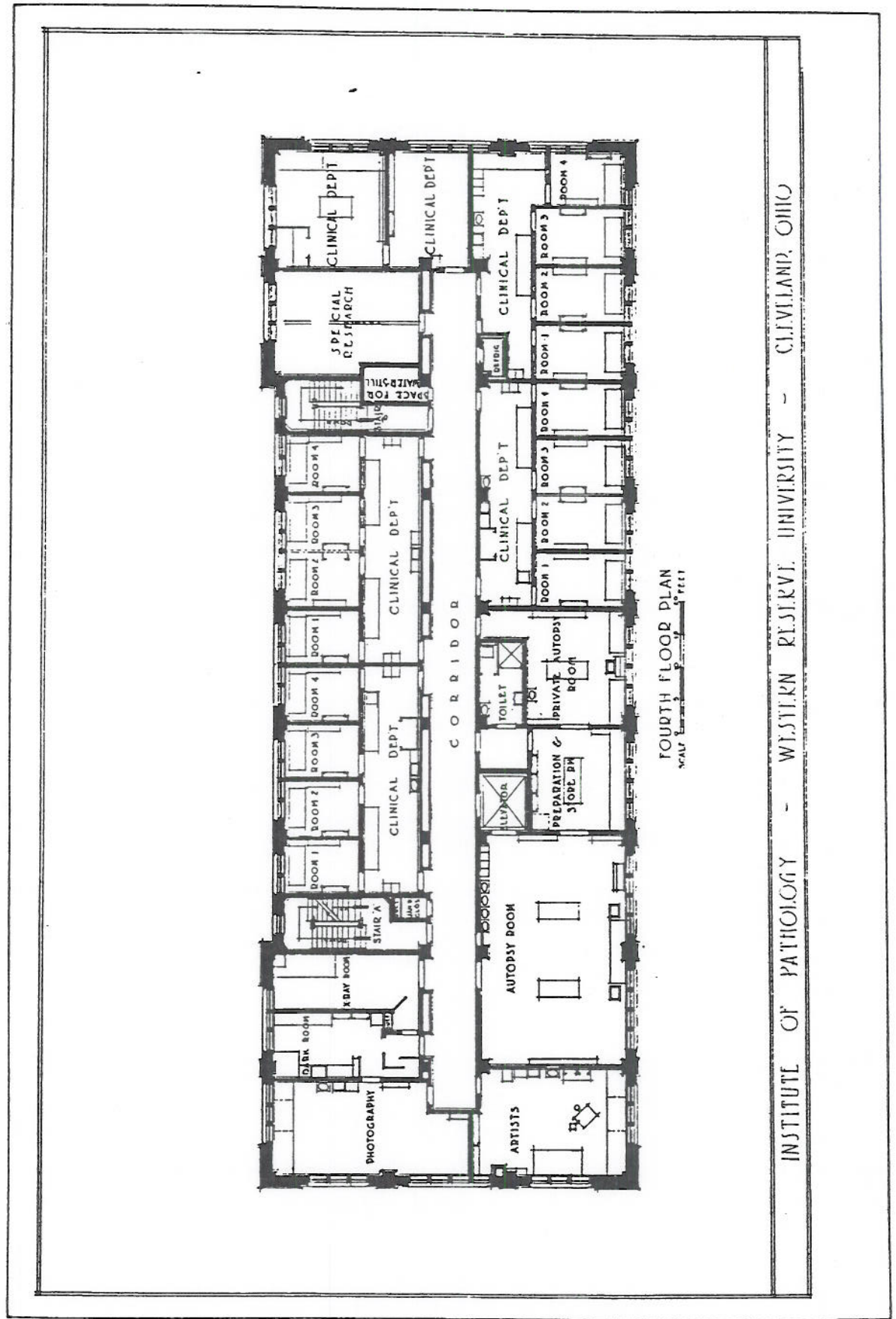
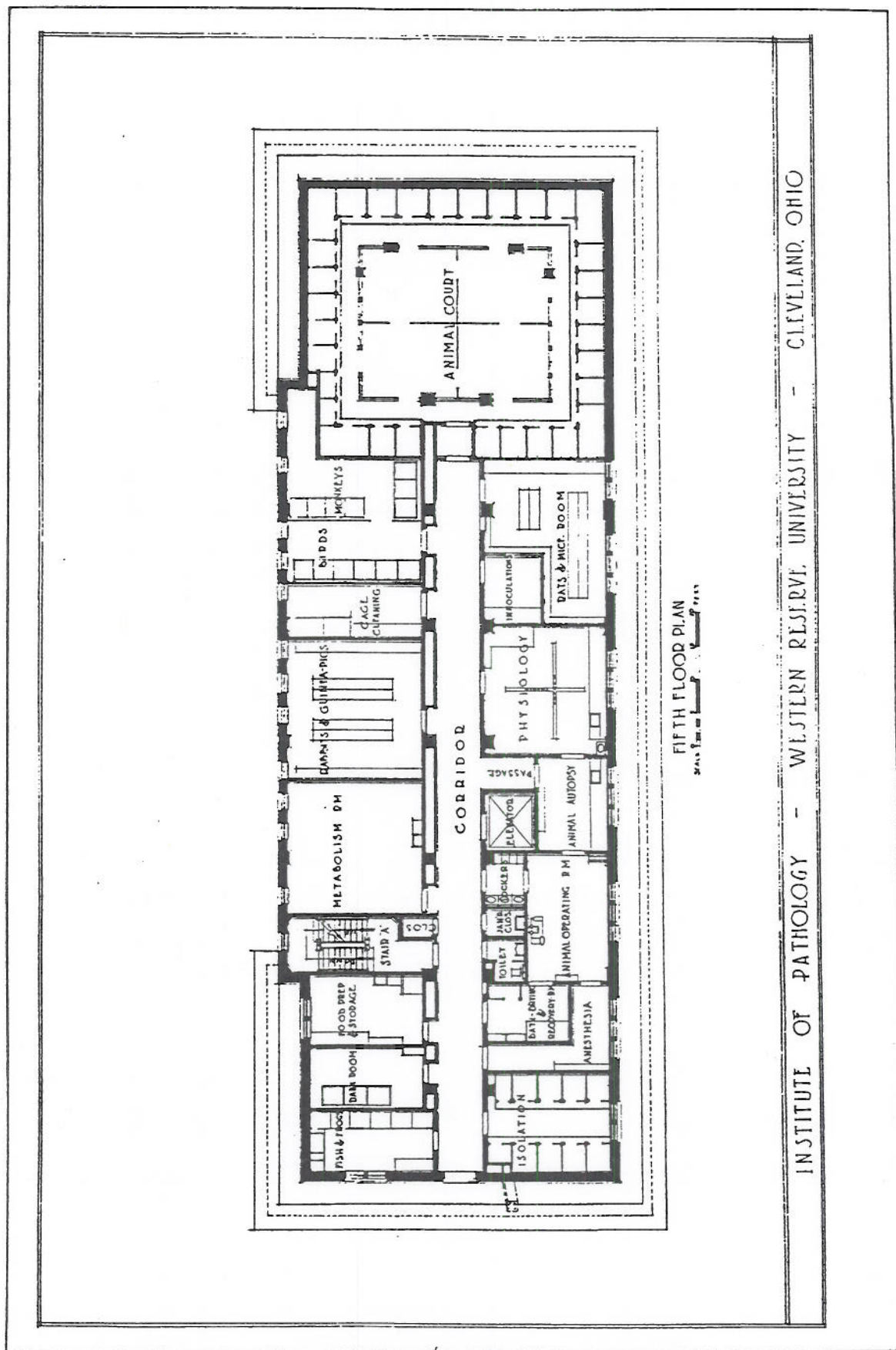


FIG. 6



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patient department. In the activities of the Medical Center are included those of the School of Medicine, the School of Dentistry, the School of Nursing, the School of Applied Social Science, and the School of Pharmacy. The public health agencies of the community and municipality are correlated with the University largely through its department of hygiene and public health and with the hospitals through outpatient departments and wards.

By contract the staffs of the various hospitals are nominated by the University and appointed by the hospital trustees. The heads of departments in the hospitals are heads of similar departments in the University and automatically are consultants in their special fields. Somewhat similar contracts associate the Cleveland City Hospital and St. Vincent's Charity Hospital with the University. The professor of pathology, as head of a department in the University, has a directing position in the laboratories of pathology of these various hospitals, nominates the laboratory staffs, and has control of the material provided by the hospitals.

In the original plans for the construction of the Medical Center, the department of pathology of the School of Medicine was to have had its teaching quarters in the school building and in the laboratory units of the various hospitals. The department was actually in operation in the school building and was described in the third series of this publication in 1925. However, before the program of the hospital buildings had become too far advanced to permit of alteration, it became apparent that the situation was ideal for the development of an institute of pathology. Although such institutes had been successful abroad only a few universities in the United States had adopted the plan. In the autumn of 1926 a gift to the University of the sum of \$750,000 provided for the construction and equipment of the Institute of Pathology.

This experiment appears to have fulfilled its promise of success. At present, seven months after the Institute has been in full operation, there can be no doubt but that the work in pathology of the University Hospitals and of the University has been correlated and centralized so that it is performed with increased effectiveness and that this has been accomplished at a distinct financial saving. On casual observation the cost of operation of the Institute may seem large but a consideration of the costs entailed in operating the various units as originally contemplated shows a genuine economy. The intangible benefits, from the scientific point of view and from that of prompt and effective hospital service, cannot be quantitatively estimated.

The planning committee of the University Hospitals and the officers of the University agreed that the most suitable site for the Institute would be one contiguous to the hospitals of the Medical Center and as near as

possible to the School of Medicine. It was decided to erect the building on the south flank of the plaza in front of the new Lakeside Hospital, as a companion architecturally to the Hanna House for private patients, situated on the north flank of the plaza. This brings the Institute into close proximity with the Babies' and Children's Hospital and the Maternity Hospital also. The building was so designed that an arcade from the third floor of the Institute directly communicates with the third floor of the Lakeside Hospital. A lateral tunnel from the basement level of the Institute enters the main axis tunnel of the Medical Center.

After careful deliberation it was decided that the Institute should serve, in addition to the purposes of pathology, as a central laboratory for the University Hospitals, in order that the common laboratory work of the several hospitals could be concentrated, correlated, and economically performed. It was thought also that the training of young men and women for careers in laboratory work, either in university or general hospital fields, would be greatly enhanced by the broad type of laboratory work thus established. The Institute, therefore, houses all work in pathology of the School of Medicine and the School of Dentistry, the teaching activities in pathology of these schools and of the School of Nursing, and the central laboratory activities of the University Hospitals.

Notes on the construction of such a building had been made by the director of the Institute over the course of several years, as the result of visits to numerous laboratories in this country and abroad, and from descriptions of other laboratories and institutes of pathology. Throughout the construction of the building the director was given great freedom of action by the officers of the University and the building committee of the Board of Trustees, and his numerous suggestions as to details and specifications were generously met by the architects, Abram Garfield and associates. Ground was broken in February, 1928, and the building was occupied in June, 1929. Full activities of all the divisions housed therein were commenced at the time of occupation of the new Lakeside Hospital early in February, 1931.

GENERAL DESCRIPTION OF BUILDING

The building is in the form of an oblong 160 feet 6 inches in length by 58 feet in depth (Fig. 1). Forty steel columns imbedded in concrete support the steel framework. The floors are made of heavily reinforced concrete of seven-inch thickness. This construction provides a building practically free from vibration and from noise transmitted from one floor to another.

The building consists of a sub-basement, a basement, five main floors, and a penthouse which contains the

elevator machinery, fans, and duct outlets. The exterior is of buff-colored brick and Indiana limestone. Grilled bronze doors and bas-reliefs make the entrance impressive. The bronze doors are decorated with the zodiacal signs of Libra and Cancer, the pine cone, the medieval urine glass, and medieval lancets. The central figure in the grille above the door is the American caduceus under which is an open book with the legend from Claude Bernard, "Observation shows and experiment teaches." The bas-reliefs around the door represent Morgagni, Virchow, Rokitsky, and Pasteur at the right, and John Hunter, Bichat, Cohnheim, and Welch at the left. Six are representative of their various countries; Cohnheim represents experimental pathology and Pasteur represents bacteriology and immunology.

The panels under the windows are decorated with motifs from the shields of medieval guilds; the radiant head of Apollo from the Physicians of London, the medieval lancets from the Barber Surgeons of London, the thistle from the Barber Surgeons of Edinburgh, the effigy of St. Comus from the Barber Surgeons of Brussels, and the various utensils from the Apothecaries of Nuremburg. Instead of any part of the Della Robbia escutcheon of the Painters and Physicians of Florence, the shield of the Medici of the corresponding period has been used also. These six designs are repeated under all the windows.

The entire floor space of the building is 61,815 square feet, and is distributed as follows:

Sub-basement	4,118 square feet
Basement	10,567 square feet
First floor	10,915 square feet
Second floor	9,139 square feet
Third floor	9,139 square feet
Fourth floor	9,139 square feet
Fifth floor	7,290 square feet
Penthouse	1,508 square feet

The volume of the building is 784,000 cubic feet. There are 369 windows, which in typical units extend from bench level to the ceiling. They are divided into two large panes of glass. The sashes are of wood and upon swivels so that they swing in and out for cleaning. Each window is provided with two shades hung at the middle of the window to roll upward and downward. Single, hand-operated, opaque shades are provided for the windows of the museum, amphitheater, small classroom, photographic room, and x-ray room. The windows in the photographic room have panes of galvanized sheet iron. The windows in the autopsy rooms, the animal rooms, and the museum preparation room have panes of semitransparent glass. All windows are equipped with copper screens hinged at the top to swing outward when the windows are cleaned.

There are 125 rooms in the building. The corridors are seven feet wide and are so situated that the rooms on the north side are 23 feet 6 inches deep and those on the south side 20 feet 4 inches deep. When the entire depth of the north units is not necessary for the purpose of the rooms, the rear space is used for closets or small rooms that do not need daylight. The height of the first floor is 13 feet 1 inch. The other floors are all 11 feet 10 inches high, except the sub-basement which is 9 feet 5 inches and the animal rooms on the fifth floor which are 9 feet 11 inches. Partitions are of hollow tile. All interiors are plastered and painted in a semiglossed finish, the walls in a pale buff color and the ceilings somewhat lighter in color.

The flooring of the corridors and of most of the units is simply a water-proof covering on the concrete. The library, record room, and adjacent offices have wood flooring. Most of the office-laboratories have heavy linoleum flooring. The lavatories, autopsy rooms, amphitheater, and the animal quarters on the fifth floor have terrazzo floors. The stables are paved with mastic brick.

Two stairways, as required by local building laws, are provided on the four main floors; one stairway leads to the sub-basement and one to the fifth floor. There is only one elevator, a supercollective drive elevator, 5 feet by 7 feet in area, which serves all purposes.

The construction cost of the building, exclusive of architects' fees, was \$0.76 per cubic foot. Movable equipment cost approximately \$78,000. The total cost of the building was \$733,000.

VENTILATION

In general, natural ventilation is employed throughout the building except for special rooms. The stables in the basement, the morgue, and the undertaker's room have their own fresh air supply and exhaust. In the amphitheater and adjacent preparation room, ventilation provides six and one-half changes of air per hour. From a beam part way back in the ceiling the fresh air is sent toward the back of the room (Fig. 8). It is drawn out both at ceiling and floor level behind the instructor's table. Complete circulation of air is thus secured. The classrooms are ventilated in similar fashion. Air is supplied to the autopsy rooms on the fourth floor and the animal autopsy room on the fifth floor directly from the outside through unit heaters and is exhausted through the regular ventilating system. Exhaust is provided for the dust-proof cubicles, the constant temperature unit, the projection booth behind the amphitheater, and all toilet rooms.

The ventilating system for the fifth floor, which is used exclusively for animals, is a separate system with an extra amount of air supplied and exhausted. The fresh air is driven into the corridor and is exhausted

from the several animal rooms. Louvers are provided in all the doors to these rooms. This method of circulation has been successful in preventing odors from permeating the corridor and thence the rest of the building. The windows in the animal rooms may also be opened without disturbing this ventilating system. In the animal court air is forced into the corridors and is exhausted behind the cages.

The chemical hoods throughout the building are of the open front type, such as those used at the Baker Chemical Laboratory of Cornell University. At the back is a baffle-plate of sheet asbestos with openings above and below. The exhaust is so adjusted that the ventilation is adequate without the creation of draft on open flames. The ducts are all lead lined. The hoods are paired; one fan is provided for each pair. These fans are controlled by switches at the hoods themselves. A signal light shows when one hood of a pair is in use. The vertical baffle-plate at the outlet

prevents heavy gases from entering the duct of one hood and passing down the duct of the companion hood and thus entering the room. In actual practise this arrangement has proved wholly satisfactory.

STANDARD EQUIPMENT

The stationary equipment, such as sinks, wash-basins, hoods, window benches, bookcases, shelves, etc., was standardized for the whole building.

The benches, which are built in permanently in the larger units, are usually situated under the windows. They are 30 inches high, are mounted on a sanitary concrete base 3 inches high, and project from the wall 30 inches, thus allowing 24 to 30 inches clear working space when allowance is made for radiator covers and fixed equipment. The tops of laminated wood covered with black acid-proof dye are $1\frac{1}{8}$ inches thick. Under the benches, drawers and cupboards are arranged to leave leg room in front of the windows for work at the

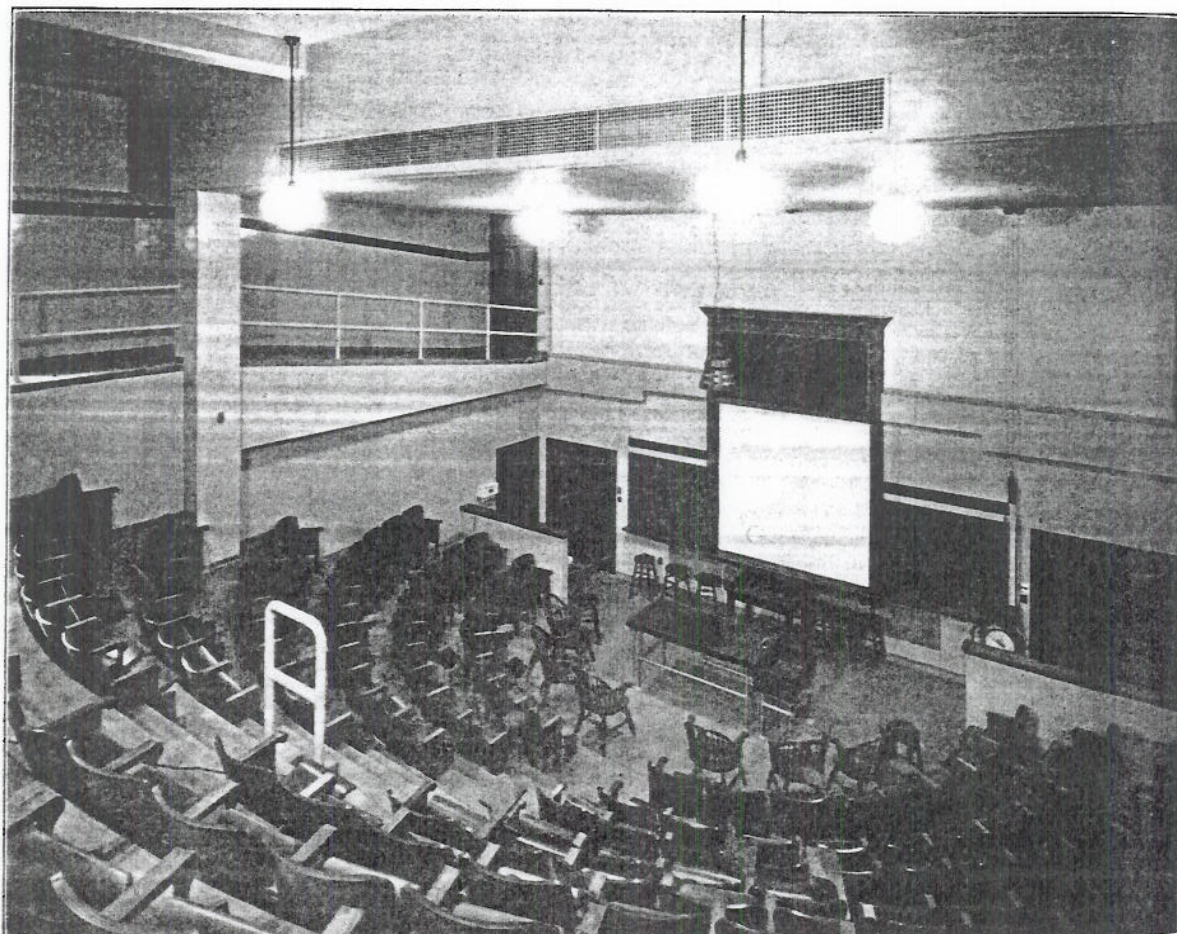


FIG. 8.—AMPHITHEATER. THE CENTER BLACKBOARD AND THE LAMP OVER THE DEMONSTRATION TABLE HAVE BEEN RAISED TO SHOW THE PROJECTION SCREEN

microscopes. The regular bench facilities include gas, compressed air, dry vacuum, electric light and power outlets (with battery outlets in certain units), and a goose-neck cold water outlet with a six-inch hemispherical drain. In the smaller units on the third and fourth floors, removable benches are provided, with tops similar to those described above, but mounted on pipe-iron legs. In these units the service outlets are mounted on the walls under the windows. No goose-neck cold water faucet is provided.

The sinks used throughout the building are of alberene stone, treated with linseed oil. The measurements vary somewhat in the different units but generally are 24 inches in length, 18 inches in the side, and 9 inches in depth. The drainboards, of the same material, are 24 inches by 18 inches in size, and have a protecting flange at the front of not less than $\frac{1}{2}$ inch in depth. The sinks are provided with hot and cold water faucets, and hot and cold water mixers with goose-neck faucets whose outlet is vertical and 24 inches above the bottom of the sink. Over the drainboards are six cold water faucets for prolonged washing of specimens. These have threaded adapters for the attachment of rubber tubing. The screw-cock operates a modified needle-valve with brass contacts but without washers of any kind.

The standard bookcases used in the offices and laboratories are of oak with sliding glass doors and with adjustable shelves, 4 feet long and 10 inches deep. The library bookcases will be described later. The larger rooms are provided with open shelving running from the floor to a height of 7 feet. These are as long as the space will permit and 11 inches deep. The shelves in the smaller units of the third and fourth floors are removable and adjustable.

The alberene demonstration tables in the amphitheater and in the large classroom are 7 feet 11 inches by 3 feet in size. They are supported on pipe-iron legs, 36 inches high, are pitched to a small center drain, and are equipped with the standard services and a small sink at one end.

SERVICES

The various services are supplied from a central power house. A lighting current of 115 volts D.C. supplies most of the lights except those in the amphitheater, which are on 115 volts A.C. to reduce the noise of operation of the several control switches. The separate power lines are 115 volts D.C. to provide smooth operation of centrifuges and quiet running of the elevator. Power can be stepped up to 220 volts in any unit by adjustments at the panels in the corridors. Battery lines, supplied also from the power house and adjustable from two to sixteen volts in steps of two volts each, are run into the class experiment room, the chemistry

rooms, the animal operating room, and the physiology room. High amperage is supplied for the x-ray room, the special research room on the fourth floor, and the amphitheater.

Compressed air at a pressure of twenty-five pounds at the outlets is supplied. One outlet in the photographic room provides a pressure of seventy-five pounds. The dry vacuum outlets provide a negative pressure in excess of 150 millimeters. In addition to the high pressure steam used for ventilation, a steam line at forty pounds pressure is supplied through outlets to all chemical benches, water-baths, autoclaves and sterilizers, and water-stills. The main water-still, which is a Stokes still with a capacity of five gallons per hour, is situated in a small cubicle on the fourth floor. A block tin pipe runs from a thirty-five-gallon block tin tank to the other floors and the basement. Chromium-plated cocks are provided on each corridor.

The refrigerators, the ice machine, and the morgue boxes are cooled by a brine system located in the central power house with an auxiliary pump in the Institute. Each large refrigerator is provided with a large and small coil, so that one may be kept in operation when the other is being freed of frost and thus reduce the lag in subsequent cooling. In each corridor a drinking fountain supplies water cooled by a special refrigerator coil in the sub-basement. Hot water is supplied by a high pressure steam tank located in the sub-basement. All plumbing is exposed.

Electrically operated Hearson incubators have been installed. The microscopes used by students are of Bausch and Lomb make. Binocular research microscopes are in some instances Bausch and Lomb and in others Zeiss.

LIGHTING

Each large unit has two lights operated by separate switches. The lights over the demonstration and autopsy tables are especially designed Daylike lamps, with deep-flanged hoods and equipped with 500-watt lamps. The Daylike feature has been built into portable microscope lamps for use with binocular microscopes. The microscope lamps used by the students and portable lamps for monocular microscopes have been described in an article on the department of pathology published in a previous volume of this series.

SUB-BASEMENT

The sub-basement occupies approximately half the building area. Two rooms are used for machinery, such as the auxiliary pump for brine, the refrigerator for drinking fountains, the heater for water, etc. One room is used for food storage, particularly food for large animals. Seven rooms are provided with adjustable metal shelving for the storage of tissue blocks of

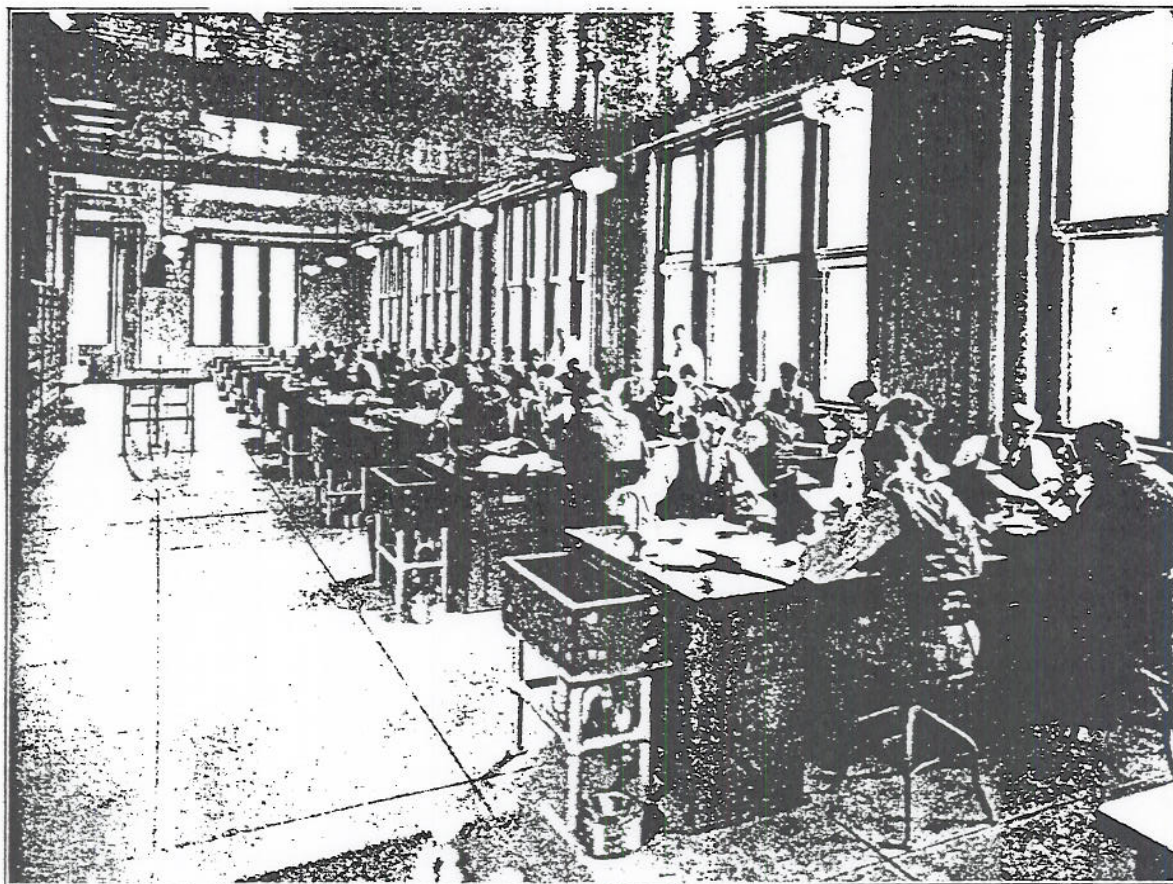


FIG. 9.—HISTOLOGY CLASSROOM

autopsies, surgical material, and experimental material. The amount of steel shelving approximates 5,300 linear feet and furnishes storage space for material accumulated over the course of about twenty-five years. Care has been taken to have no heating lines in these rooms.

BASEMENT

The basement (Fig. 2) houses the amphitheater, the pathology museum, the morgue, the undertaker's room, the receiving room, and their attendant preparation rooms. Living-quarters for a resident orderly and quarters for large animals are also provided in the basement. There are also rooms for janitor's supplies, and locker and toilet rooms for the unskilled male and female personnel.

The museum is equipped with steel dust-proof cases with adjustable shelves. Ten cases are arranged in the middle of the room and the rest along the walls. Sufficient wall space has been left free for the hanging of charts and other illustrations. The windows are provided with opaque shades. The museum preparation

room is equipped for the fixation and mounting of gross specimens. There are a large sink for washing specimens and a motor-driven saw and knife for sawing bones and cutting flat surfaces of brain, liver, and other organs. This room communicates with the museum exhibition room immediately above by a separate electrically operated dumb-waiter. An office-laboratory is provided for the curator.

The use of the museum by students is encouraged in every way possible, but has not yet become a traditional activity. This is due in part to the large amount of fresh material available for study at all times. The museum at the present time serves principally as a storage place for well-classified, illustrative specimens. These are cross-indexed and sent to the clinical departments for their use in connection with group conferences on patients. The clinical instructors may also use the exhibition room on the first floor. In addition to the cross index, a complete description of the specimen with full reference to its source is given. The index indicates the availability of microscopic preparations, photographs, drawings, and photomicrographs.

The morgue serves as the central morgue for the hospital group. The individual compartments are arranged in two refrigerating boxes which accommodate nine and twenty-one racks respectively. The trays are self-supporting when withdrawn from the compartment. The larger or smaller box, or both, may be used as the needs require; the total number of compartments seems to be adequate to meet a peak load. An elevator with a direct entrance into the morgue communicates with the autopsy room on the fourth floor. When bodies are being transported on the elevator the cart is surrounded by a high portable screen.

A chapel adjoins the morgue and is used for identifications, for the funeral services of victims of contagious disease and of others when the relatives so desire. No charge is made for the use of the room. A viewing cabinet, hung with purple velvet, and with special illumination serves for the identification of bodies and as a place for the casket during funeral services. The altar has no special equipment, but three cabinets are provided for the special appurtenances of Protestant, Catholic, and Hebrew faiths. There are three prayer benches with a total capacity of about thirty persons. The room is paneled in oak and has a parquet floor.

The undertaker's room is equipped for embalming and such other preparation of bodies as may be desirable. There is an autopsy table identical with those in the autopsy rooms, except that it is equipped with compressed air and dry vacuum outlets. Large shelves capable of supporting five- and ten-gallon bottles of embalming and other fluids are placed near the table. The rest of the equipment includes a standard workbench, a slop sink, and a wash-basin. A wide doorway leads directly out on the covered ramp for the undertaker's wagons.

All deliveries of goods are made at the same doorway and are transported directly to the delivery room. This is a vermin-proof room, which serves for the packing of outgoing shipments as well as for the receiving and unpacking of incoming shipments.

The amphitheater preparation room is provided with a large refrigerator for the storage of fresh material to be demonstrated in the amphitheater. There are large chart cabinets and ample space for storage of the opaque projector, microprojector, and the x-ray viewing cabinets.

The living-quarters for the resident orderly include a living-room, bedroom, and bath. This man is on duty at night to assist with autopsies, to deliver bodies to the undertakers, and to help with any special night work.

The stable consists of two box-stalls for large animals and four pens for sheep or goats. Food for these animals is transported from the sub-basement by a separate, electrically operated lift.

AMPHITHEATER

The amphitheater runs through from the basement to the first floor (Fig. 8). Its greatest depth is 44 feet 6 inches and its width is 41 feet. The upper portion covers the projection room and extends from the rear of the building to form a cover for the rear driveway. The seating capacity is 164; individual chairs with adjustable tablet arms are provided. The rows rise at an approximate angle of 40 degrees and are arranged in the form of an arc. The walls and ceiling are treated with acoustic felt, in accordance with specifications given by Professor Dayton C. Miller of the Case School of Applied Science.

Students enter the room by lateral ramps from the first floor. Entrance is afforded to the lower level from the preparation room and the corridor in the basement.

The demonstration table, which is a standard alberene table, is visible from all seats. Sinks and washbasins are also provided, and there are three chart racks and adequate blackboard space. Patients' beds can be accommodated between the wall and the demonstration table.

The lamp over the table is controlled from a switch at the table. It may be raised or lowered by wheel, pulley, and counterweight. The general lighting is controlled by switches on the basement level, the first floor level, and in the projection room. Dimmers are not used. On the large platform at the rear are five small tables equipped with light outlets in the wall. These tables serve for incidental microscopic demonstrations.

Opaque, hand-operated window shades which run in grooves render the room practically light-tight for projection of all kinds. The projection screen is an eight foot square of plate glass, ground on the outer surface and covered with a dull finish white paint mixed with a small amount of black. Lantern-slide and motion-picture projections are made from the fire-proof, separately ventilated projection room at the rear. The signal button is on a length of wire attached under the screen. There is ample space between the seats and the demonstration table for microprojectors and opaque projectors. This permits the demonstrator to be independent of a special operator.

The room serves for didactic teaching with medical, dental, and nursing students, and is used also for staff clinical pathological conferences, for special lectures, and for scientific meetings.

FIRST FLOOR

The first floor (Fig. 3) is devoted practically exclusively to students' purposes. Except for autopsies and for visits to the teaching staff and the library, students need go nowhere else in the building for their

routine work. There are two entrances to the floor, but the students usually come by way of the tunnel from the School of Medicine building.

All the classrooms, which include the amphitheater, a large classroom, a small classroom, an exhibition room, and a class experimental room, are on this floor.

The large classroom (Fig. 9) is 89 feet 5 inches long and 23 feet 6 inches wide. There are eleven tables, 3 feet 5 inches wide and 10 feet 11 inches long, which accommodate six students, three on each side. This allows about 3 feet 8 inches of space per student. Each student has a drawer and shares a cupboard with students in her classes, and in addition to has an individual wall locker. On each table are three microscope lamps with daylight screens and openings facing each one of a pair of students. Four-way gas-cocks are provided, two to a table, and at the end of each table is a small alberene sink with hot and cold water mixer and a goose-neck faucet. The capacity of this room could be expanded by building a table for ten students at the west end of the room. A small lecture-table, in back of which is a blackboard, provides facilities for occasional talks to the entire group. There is also an alberene demonstration table, over which is a Daylike lighting unit. This is used for the demonstration of experimental and fresh anatomical material. A centrifuge is also provided for clinical pathology.

The smaller classroom has thirty tablet-arm portable chairs, blackboards, a projection screen similar to that in the amphitheater but only six feet square, wall-benches, and large microscope lamps (Spencer Lens Co., No. 372) adequate for demonstrations with twenty-four microscopes. Opaque window shades in grooves provide for the darkening of this room. The room is used for conferences with small groups of students, for staff conferences where gross or microscopic material is used, and for the monthly conferences of the pathologists of Cleveland.

The exhibition room communicates with the museum preparation room immediately below. It has a refrigerated exhibition tank for fresh material designed after that used by Professor Horst Oertel in Montreal. There are ten alberene tanks for preserved specimens, copied after those in the museum of the Harvard Medical School. They have monel metal tops mounted on hinges, and are used for the "hand" specimens which the students employ in the detailed study of gross morbid anatomy. A large movable table, over which is a Daylike lighting unit, is used for the exhibition of mounted museum material. A wall-bench and shelves provide additional space for exhibition. A sink and wash-basin are provided for students.

The experimental room at the east end of this floor is used only for student work. Here are performed the experiments in immunology which are too delicate for

work in the large classroom, and also the physiological experiments in connection with the course in systemic pathology. The equipment includes a long paper kymograph, water-baths, a refrigerator, an incubator, instruments for physiological work, and glassware.

Across the corridor from the experimental room is the men students' locker room. A smaller locker room for female students is also provided. The number of lockers is adequate for second- and third-year medical students and second-year dental students. The lockers are of steel with two coat closets and two hat compartments for each locker.

Other rooms on the first floor include: a small information office and a telephone booth off the lobby; a store-room for microscopes and other optical equipment used by the students, who are not required to possess their own; and an office and stock-room for clinical pathology. Teaching in clinical pathology is a joint activity of the departments of medicine and of pathology.

SECOND FLOOR

The second floor (Fig. 4) is designed to accommodate most of the office-laboratories of the professional staff, the departmental library, and the record, secretarial, and stock-rooms. The stock-rooms were placed on this floor so that a secretary might act as stock-room clerk and thus obviate the employment of a special clerk.

The entire east end of this floor is occupied by the library. This is divided into two stack-rooms and a central reading-room. The stacks are of steel, open, and with adjustable shelves 8¾ inches deep. The open type was selected because hinged doors occupy considerable space, sliding doors are often difficult to operate, and the expensive dust-proof type is rendered ineffective in a busy library by failure to close the doors. Tables and chairs are provided in the stack-rooms so that work can be done with journals close at hand. The central reading-room (Fig. 10) is partly paneled in oak and has oak bookcases in harmony with the general interior of the room and provided with hinged doors and shelves 11 and 15 inches deep. Magazine racks on each side of the entrance are large enough to accommodate more than 100 current journals, and have shelved cupboards underneath for the current volumes. The room is furnished with two leather upholstered small sofas and several Windsor chairs. The lamp-shades are decorated with the trademarks of eight of the great medieval publishers. At this writing the library possesses about 3,000 volumes, in addition to a large collection of reprints. The stack space provides for about 12,000 volumes.

Adjacent to the library is the secretaries' room (Fig. 11), which accommodates a secretary, a stenographer, and a typist. In this room are kept the Kardex file of current records and steel files for the completed records

still active and for the microscopic slides of hospital cases for ten years back. The bound records are kept in the library stacks near the record room. A large movable table holds machines for stamping and sealing, addressing, adding and calculating, mimeographing, etc. A steel fire-proof vault is used for valuables such as platinum, special optical items, alcohol, petty cash, certain records not yet in duplicate, etc. A closet is provided for secretarial supplies. An adjoining room is used by the executive secretary of the Institute, who is also private secretary to the director.

The director's office is paneled in oak and equipped with sufficient bookcase space for a small working library. It is furnished with a desk, a library table, leather upholstered chairs, and a couch. The adjacent private laboratory has a standard bench, bookcase, and shelving. A private coat closet and toilet are also included in the director's suite.

Three office-laboratories are provided for associates and three for fellows. Except for slight variation in size these rooms are essentially the same. They are equipped with desks, library tables, bookcases, and extensive open shelving. Each has a standard bench, sink, and wash-basin. Where coat closets are not built in, large steel lockers are provided. The third associate's

room is used by the associate professor of immunology, and because of the extent and character of his work an adjacent laboratory is provided. This could be altered to an office-laboratory simply by a change of the furniture. The special equipment of this room includes two large incubators and a centrifuge. A small constant temperature room is built in near the associates' rooms.

In order that workers on this floor need not go to another floor to use apparatus heavier than can be housed in their own rooms, a unit has been set aside for heavy apparatus. This is equipped with a chemical hood, built-in steam water-baths, chemical bench, centrifuge, shaker, large incubator, muffle oven, and glass-blowing devices. Adjacent, but for convenience opening into the hallway, is a large refrigerator.

A conference room is equipped with a large library table and a dozen Windsor chairs. Because the space happened to be available, it also contains a cabinet for the permanent lantern-slide collection, with a capacity of 4,000 slides. Tea is served in this room each afternoon and this gives an opportunity for daily staff conferences. Additional staff conferences for special purposes are called as necessary. The room is also used for occasional school and hospital committee meetings.

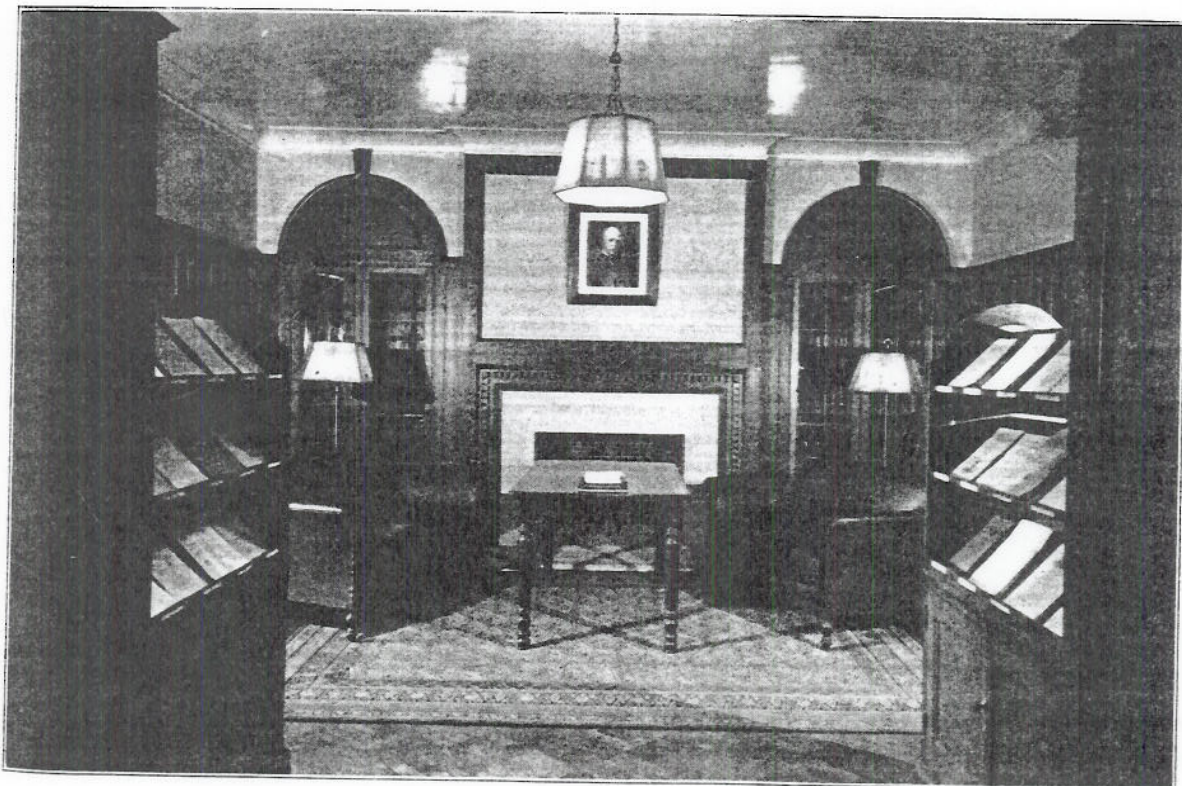


FIG. 10.—READING-ROOM OF THE LIBRARY SUITE



FIG. 11.—RECORD ROOM, SHOWING KARDEN FILE, PNEUMATIC TUBES, AND PART OF FILING-CASE SYSTEM

An adjacent kitchenette is equipped with an electric stove, refrigerator, and German-silver sink, and is used to prepare the teas and by those of the staff who wish to prepare lunches.

The stock-rooms are located in the west end of the floor. The glass and chemical stock-rooms are equipped with the usual shelves, racks, boxes, and drawers. A closet for volatile chemicals is attached to the chemical stock-room. An apparatus stock-room houses such apparatus as is not in constant use. Pieces are withdrawn from this room on requisition and returned when they are no longer needed by the individual worker.

Locker and toilet rooms are provided on this floor for secretaries, technicians, and other women members of the staff. A toilet room for the male professional staff is also provided.

THIRD FLOOR

The third floor (Fig. 5) is designed principally for the routine work of the hospitals. The large units are used also for technical procedures of a routine nature which are necessitated by research. Dental pathology is housed on this floor because its technical requirements are such that a certain amount of correlation is

possible with the technical units, especially in the preparation of microscopic material. This floor communicates directly with the third floor of Lakeside Hospital by an overhead passageway.

The suite for surgical pathology is located next to this passage and uses operative material from all divisions of the hospitals, but principally from general surgery and gynecology. It has a central laboratory and three small offices occupied by the resident pathologist, the intern in pathology, and an assistant resident surgeon assigned from the surgical department for a period of from three to six months' duty in pathology. The laboratory is equipped with a standard sink, wash-basin, two standard benches, a hood, and a special table for cutting blocks from specimens. Each of the offices is provided with a small desk, a portable bench, a bookcase, and portable shelves.

The dental pathology suite consists of an office-laboratory and a laboratory. The former has the usual equipment for a room of this type. It contains, however, office furniture for two persons. The laboratory has a standard bench, bookcase, shelves, sink, wash-basin, chemical hood, and a table with a machine for cutting and grinding teeth and bones. A service

trench from the front to the rear provides for setting up special equipment in any part of the room.

Next to the dental pathology laboratory is a histology room for the preparation of microscopic materials (Fig. 12). Work of this nature for the entire Institute is done in this room, except the grinding of teeth and bones. A standard bench occupies the space in front of one set of windows. In front of the other windows are three tables, 2 feet by 6 feet 6 inches in size and 32 inches high, of laminated wood and surmounted on pipe-iron legs. These are provided with gas and electric outlets. They are set at right angles to the windows so that the daylight comes over the left shoulder of the operator at the microtome. Standard sink and wash-basin, bookcase, and shelves are along the walls. An ice-making machine is at the rear of the room and adjoining it is a refrigerator. In the center is a large movable table for general work and at its end a filing cabinet for recent slides. A twelve-changer Autotechnicon mounted on the bench provides for the general routine work of surgical, autopsy, and experimental material. By the use of this machine reports on surgical material in excellently prepared paraffin sections are made the afternoon of the day after they are received at the laboratory. A small incubator room opening off this

room has two incubators, a vacuum embedding oven, an electrically heated funnel for filtration of paraffin, and a six-changer Autotechnicon for rapid embedding of rush specimens. Each technician has his or her own Bausch and Lomb rotary microtome, designed according to the type of the International Equipment Company. There are also a large Spencer sliding microtome of new type and a Bausch and Lomb precision microtome. A Sartorius microtome is used for frozen section work. The carbon dioxide cylinder is mounted on the wall at an angle of 45 degrees, to give the advantage of vertical mounting combined with the added advantage that the sediment does not collect at the outlet valve.

A suite of communicating units, with common refrigerator and incubator rooms, has been provided for immunology and bacteriology. The immunology room has a small adjacent room for water-baths. These are large monel metal tanks mounted on a gas-heated base of the Kolmer type. In addition to the standard bench, bookcase, shelves, and large cupboard space along the wall, the room is equipped with three centrifuges of the International Equipment Company, sizes 1, 2, and 3. It is possible by using one or the other to care for varying amounts of material with an economy of power. It

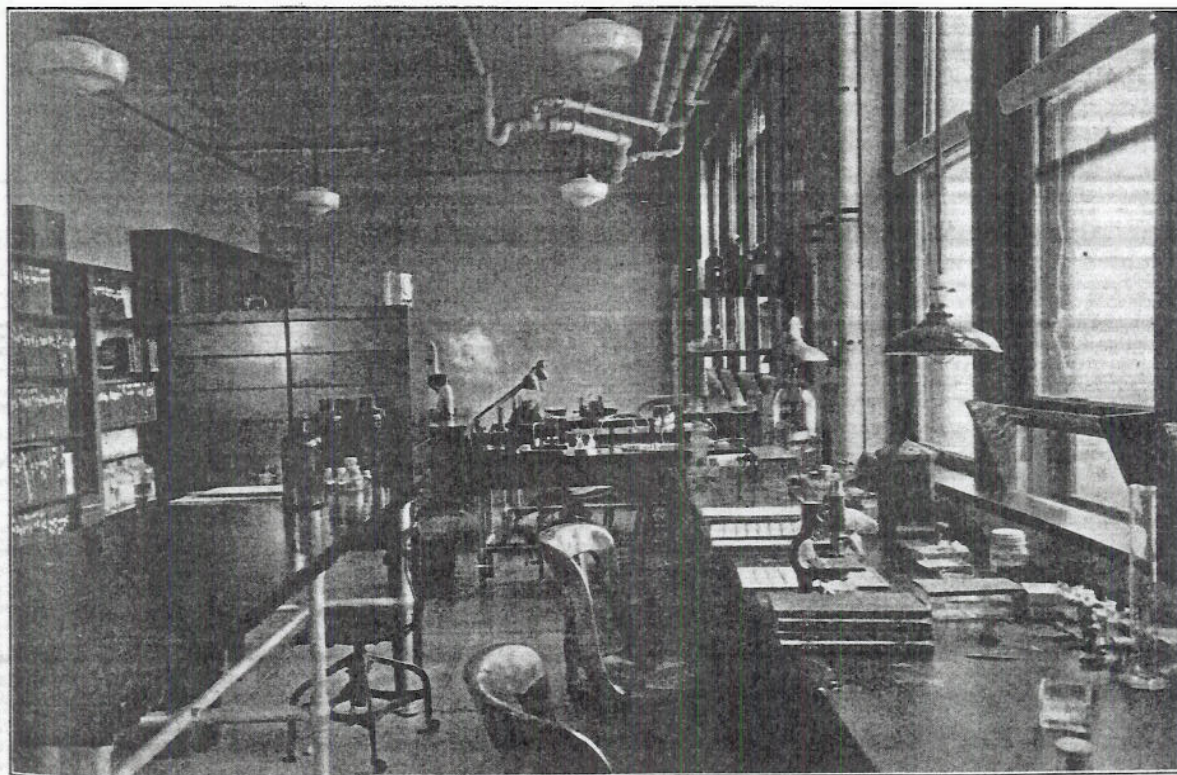


FIG. 12.—ROOM FOR MICROSCOPIC TECHNIC

is also possible to centrifuge a peak load of more than 250 Wassermann tubes at the same time. A shaker of the same make is also provided. The bacteriology room is equipped the same as the immunology room and it also has large wall cupboards. A size 2 centrifuge is provided. Off this room is a dust-proof closet, cleared by a spray of water under the force of compressed air.

The chemical suite comprises an office-laboratory with the usual equipment, a private research laboratory, a routine laboratory, a dark room, and a balance room. The routine laboratory has a bench with an alberene top under the front windows. In the middle of the room is a large chemical bench with alberene top and with sinks in the middle and at each end. On the rear wall are a hood with built-in water-bath, and a large refrigerator. On the east wall are a hood equipped for macro-Kjeldahl determinations and a bench for the Kjeldahl still. There is also a portable size 2 International centrifuge. The dark room has table, sink, and cupboards. The private research room is equipped much the same as the routine laboratory. The balance room houses all the delicate balances of the Institute. Along each wall is a laminated wood bench, $1\frac{3}{4}$ inches thick, 18 inches wide, and 40 inches high, supported on heavy pipe-iron legs. Under the top is a series of drawers for the weights. There is a wall light for each balance.

An office-laboratory, with the usual equipment, is provided on this floor so that one member of the staff may be quartered there and be able to give general supervision to the technical staff.

A workshop, equipped with large lathe, drill-press, planer, and saw, all electrically operated, as well as numerous hand tools for wood and metal work, is also located on this floor. An adjoining saw room, originally designed so that sawdust would not enter the main shop, has been found impracticable and is now used as an office for the mechanic.

A sterilizer room is used for the preparation of media and the cleaning of glassware. This was arranged so that the glass-cleaning personnel would be under the immediate supervision of the media-preparing personnel. A large chemical hood is equipped with stove, drying oven, and a five-gallon steam kettle. The center table supports two large hot air sterilizers, gas heated and with automatic temperature control (designed by the Arthur H. Thomas Co.). A stovepipe carries the exhaust gases to the vent above the chemical hood. Three medium-sized horizontal autoclaves of sliding-door type (Bramhall Dean) are at the east end of the room. Multiple units for the sterilizers are used for the economy of operation in meeting variable demands.

Under one set of windows is a large alberene sink with four separate compartments and ample drainboard space. Under the other set of windows is a bench, beneath which is a steam coil-heated drying compartment

for glassware. There are also a large refrigerator for storage of materials and media and a large wall cupboard.

Since most of the male technical staff is employed on this floor or the floor above, a locker room for these persons is provided on this floor.

FOURTH FLOOR

The fourth floor (Fig. 6) houses principally the autopsy suite, an illustration suite, and a series of rooms for clinical staff members.

The autopsy suite consists of a main autopsy room and a private autopsy room connected by a preparation room. The main autopsy room (Fig. 13) is 35 feet 6 inches by 23 feet 6 inches in size. Semiopaque window-glass has been used in order that the work will not be visible from the nearby hospital. There are two autopsy tables, 6 feet long and 30 inches wide. This width table was selected so that the body will be within easy reach of the operator from both sides, and the length was determined in order that the body will not have to be dragged along the table when work is done on the head. The top is a 4-inch slab of alberene with a marginal flange 2 inches wide, $1\frac{1}{2}$ inches high, and fully rounded on the top so that fluids will not accumulate on it. The table is well pitched to a central drain, 17 inches in diameter, over a hemispherical basin with continuous circular water flush. The table is immovably mounted on heavy pipe-iron legs and is $33\frac{1}{2}$ inches high. At the head are two electric outlets for lamp and saw. Mounted across the entire width of the foot end is a monel metal tank, with a water entrance in the bottom and four pipe outlets so situated near the top in each corner that if organs are placed in the tank there will be no overflow. The lower ends of the pipe outlets are directed inward so that the water does not run over the table flange. A light wooden bench with a removable ribbed rubber cover may be mounted over the lower extremities for the examination and sectioning of organs. In addition to the regular illumination of the room, each autopsy table is lighted by a Daylike unit. A lamp is also provided for work on the head. This is a simple hemispherical shade mounted on a flexible tubing and without the daylight feature. For each autopsy table there is an instrument table with monel metal top and mounted on large casters, and a similar table for other incidental purposes. Opposite the head end of each table is a slop sink elevated on a concrete base so that the margin is 33 inches high, thus rendering much bending over unnecessary. Spectators are accommodated on two large stands mounted on heavy pipe-iron with large, rubber-tired, ball-bearing casters and movable with comparative ease. Each stand accommodates twelve persons. A larger capacity is not necessary because the number of autopsies and the small size of the

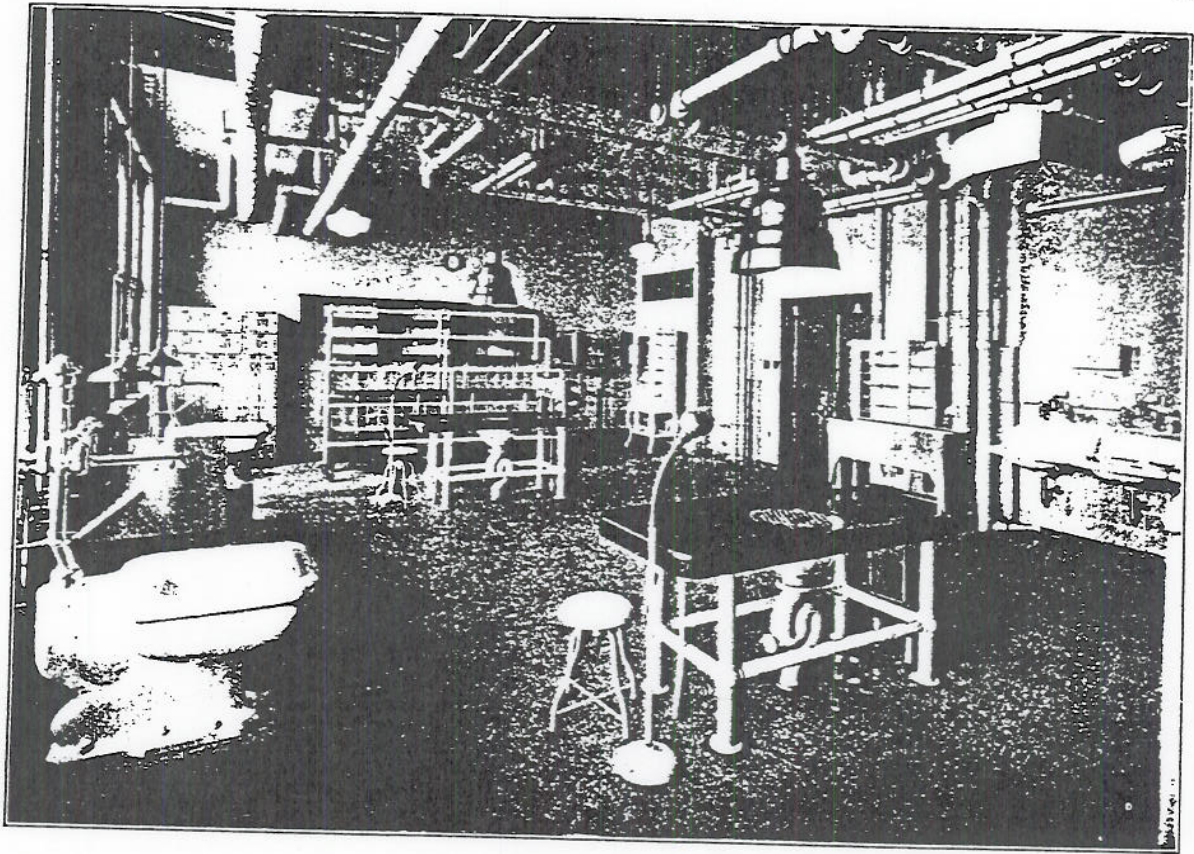


FIG. 13.—MAIN AUTOPSY ROOM

classes permit student attendance in groups of four. The additional presence of staff members does not exceed the capacity of the benches. The remaining equipment of the room includes a stereoscopic x-ray viewing stand mounted in a movable cradle so that it can be taken to the amphitheater if occasion requires; six lockers for the property of the professional staff; four washbasins, equipped with elbow-control of the hot and cold water mixer; and steel instrument cabinets for each table.

The private autopsy room is equipped with one table and accessories identical to those in the larger room. This room is used for autopsies which are required by the relatives to be private, for autopsies on infectious cases, and for expansion when the main room tables are occupied.

The preparation room has a standard bench, sink, a large central movable table, wall cupboards, and in the adjacent passageway six refrigerator compartments for temporary storage of fresh material, pending its destruction or removal to the refrigerator in the amphitheater preparation room for clinical pathological conferences.

Immediately opposite the main autopsy room is the x-ray room. This is equipped with a heavy Victor ma-

chine with an oil-immersed unit and a table carrying a Bucky diaphragm. On a balcony is a vertically mounted camera. If it is necessary to make x-ray views of bodies or photographs of the entire body or a large part of it, the body is wheeled across from the autopsy room. The raying room is also used for x-ray work on experimental animals and other experimental procedures.

A dark room is shared by the x-ray room and the photographic room. This dark room, in addition to the usual features, has an enlarging machine and a special camera for making lantern slides. The walls are painted a cream color, but the maze is painted black. The room may be entered directly from the photographic and x-ray rooms, but if darkened, both these doors are closed and entry must be made through the maze. Steel shelving is used for the storage of photographic negatives.

The photographic room is equipped with a wide variety of cameras and lenses. All the photographic work of the Medical Center and also some work for the University departments is done here. There is a vertically mounted camera on slides for the photography of gross specimens and for copying. Most of the specimens are photographed under water, but this is not in-

variable. The photomicrographic apparatus is a large completely equipped Zeiss outfit.

The artist's room has northern and eastern exposures. It is equipped with a large cutting table, a cabinet for large-sized sheets of paper and board, a standard bookcase, a standard sink, a wash-basin, shelving, an articulated skeleton, a disarticulated skeleton, and a small special collection of books. Although at this time there is only one artist, tables and chairs have been provided for three persons.

The rest of the floor is given over to suites for the clinical departments. Four of these suites consist of a laboratory and four small rooms. These are provided to accommodate members of the clinical departments who are conducting studies related to pathology or allied fields. Each laboratory is equipped with standard benches, standard sink and wash-basin, clothes lockers, and incubators. In two of the laboratories

there is a chemical hood and in the other two a size 2 self-balancing centrifuge. The suites are adapted to the needs of special divisions of pathology, such as neuropathology, gynecological pathology, etc., if future development of the work should require the space. At the west end of the floor is a suite of two rooms. These are especially equipped for dermatological pathology. The department of dermatology has for a long time been active in a pathological study of its material and gives every promise of continuing in this work. One of the rooms is an office with the usual furniture and the other is a laboratory with the usual equipment and in addition a dust-proof closet.

Another room for special research is provided with all services common to other laboratories and with, in addition, an alternating current line and a direct current line, each with high amperage. A trench in the floor provides for carrying the services to any part of the

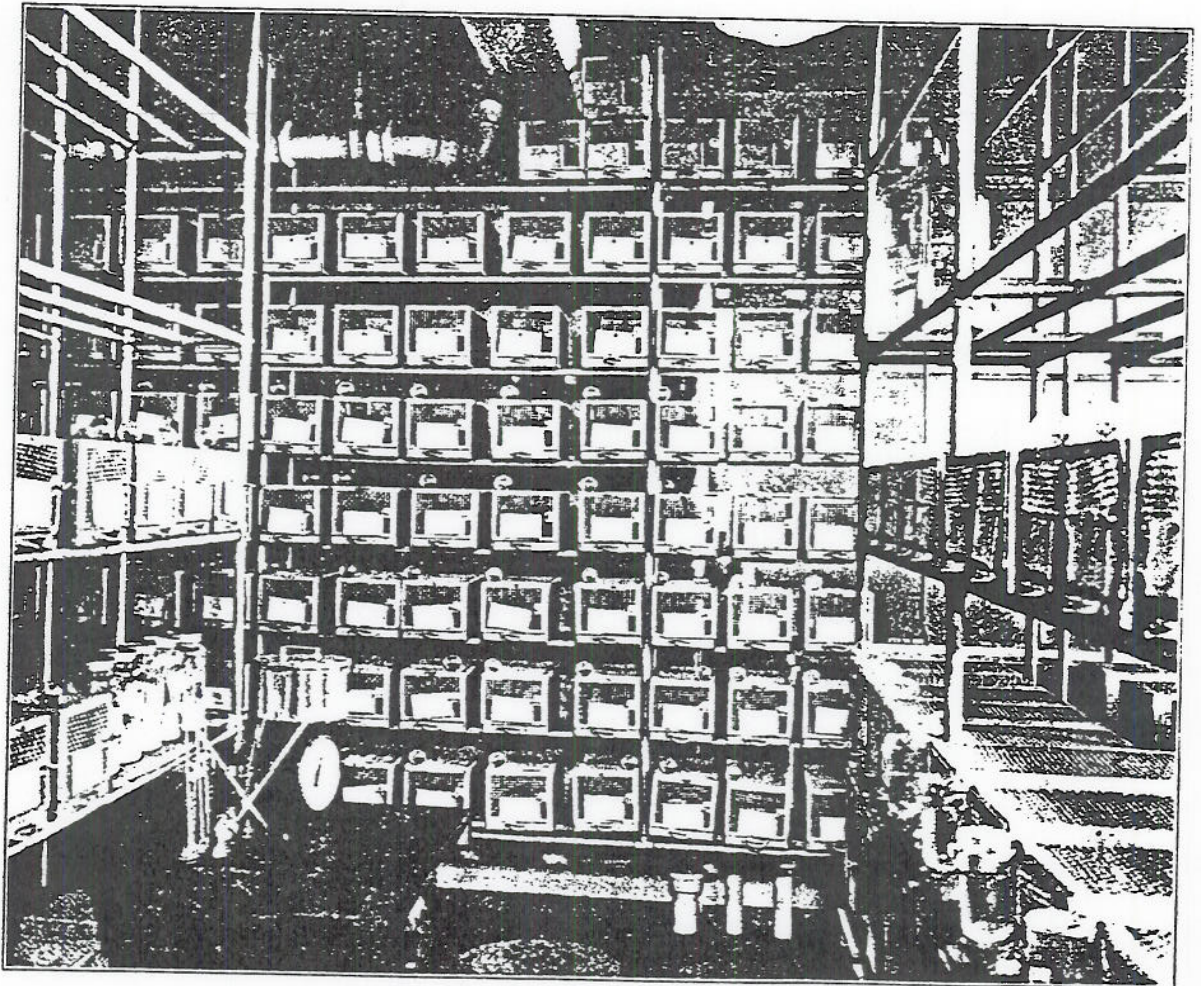


FIG. 14.—ROOM FOR RATS AND MICE. ALONG THE WALL ARE SINGLE TYPE CAGES; LOWER RIGHT, FAMILY CAGES; LOWERMOST RIGHT, BREEDING-CAGES

room. This room was designed to provide for any special type of work that might be desired. At the present time the room is assigned to work in tissue-culture.

A small refrigerator near the west end of the floor cares for the needs of the clinical workers. Opposite is a central water-still room.

FIFTH FLOOR

The fifth floor (Fig. 7) provides quarters for the animals used in experimental and hospital work and facilities for work in animal surgery and pathological physiology. It is unnecessary to remove the animals from this floor except for x-rays and for certain work requiring continuous observation over a period of several hours. The ventilation already described is so satisfactory in practise, that even in humid summer weather no odor of animals is noticeable either in the fifth floor corridor or in other parts of the building. Occasionally noise may be heard in the elevator shaft, but not elsewhere in the building. Except when otherwise described, the cages are placed on pipe-iron racks suspended from the ceiling, according to the design made by the George H. Wahmann Company of Baltimore. The floors are of terrazzo throughout and there are numerous sill cocks with hot and cold water mixers.

The fish and frog room has the usual type of frog tank and a large fish tank that can be divided into four compartments.

The room for rats and mice is equipped for large colonies of stock and experimental animals housed in cages on suspended racks (Fig. 14). On the west wall the racks are built in shelf form for nutrition experiments; the solid shelf prevents the dropping of food from one tier to the next below. The room contains 132 individual cages, each 8 inches wide, 7½ inches high, and 14 inches deep. Under the removable mesh floor of each cage is a removable pan 1 inch deep. The front, top, and back of the cages are of mesh, but the sides are solid to prevent cage to cage contamination. The material is galvanized iron covered with aluminum paint. Breeding-cages, of which there are twenty-four, are 14 inches wide, 19 inches high, and 20 inches deep. These have mesh sides as well as fronts, tops, and backs. On one side the mesh is continuous with that of the top, and has no angle iron support. This arrangement, together with a lateral mesh shelf, provides for the exercise of the animals. The pans to these cages are 2 inches deep. Door hinges are simple galvanized sheet straps. The hinge rods, however, are of brass, because experience has shown that iron rods even though galvanized will rust under steam sterilization. There are also ninety-five guinea-pig type cages for rat families and individuals. A table and a balance are provided for weighing food in this room.

The animal court (Fig. 15) was designed principally for dogs, although the cages around it are used also for stock rabbits and guinea-pigs. They are 4 feet square and 3 feet 6 inches high, except in the corner cages which are 4 feet by 8 feet. They are built in two tiers of thirty-one cages each. The sides are of slate and the fronts of heavy mesh. The tops of the upper tier are also of mesh. The doors occupy half of the front of the cage and have locks which the animals cannot open, designed by the Wahmann Company. They may be padlocked if necessary. The cages are flushed into a gutter immediately in front of the lower tier. Between the two tiers is a heavy angle iron projection to prevent flushing from the upper tier running into the lower cages. The corridor pitches to the marginal gutter. The wall between the corridor and the court is almost entirely of heavy glass, protected when opened by copper screens. The animal court, 26 feet 6 inches by 20 feet 6 inches, is divided into four portions, which can be combined as desired by opening the doors. There is no roof, but the top is covered with heavy mesh so that cats, monkeys, and birds may be exercised. The floor drains to the four corners. Although the ventilating system used in the animal quarters is quite adequate, double doors between this unit and the main corridor are an added precaution and also aid in keeping noise from the main part of the building.

Birds and monkeys are housed in one room, divided by a heavy mesh partition. The space for monkeys allows for a small runway, but both birds and monkeys are taken into the animal court for airing. The room has a special heating coil in order to maintain a temperature of 80 degrees F. The bird cages are 23 inches wide, 21 inches high, and 2 feet deep, and have a roost bar. The pan is 1½ inches deep. The monkey cages are 2 feet wide, 2 feet 6 inches high, and 3 feet deep, and have a cross bar and swing. Their pans are 3½ inches deep.

The room for rabbits and guinea-pigs will accommodate about 240 rabbits and about 200 guinea-pigs. Rabbit cages are of two sizes to accommodate one or two animals. The larger cage is 20 inches wide, 15 inches high, and 20 inches deep. A hay-rack on hinges is mounted on the side and a water-cup is hung on the door. The smaller cage has the same dimensions except that it is only 13 inches wide and has no hay-rack. The guinea-pig cages are 9 inches wide, 8 inches high, and 20 inches deep. The pans of all these cages are 1 inch deep.

The metabolism room for animals has eight cages for dogs, 27 inches wide, 24 inches high, and 36 inches deep. Along each of the side walls of the room are racks designed especially to hold metabolism cages for rabbits. Slides hold the cage and pan, and a shelf holds the urine bottles. The pan is pitched to the center and has small

flat margins so that no urine can escape even though discharged against the side of the cage. The cages are the same size as the large rabbit cages, and are thus large enough for cats.

A cage cleaning room is provided with a large alberene tank sufficient in size to hold the largest metabolism cage. The top of the tank is of monel metal. A small pipe leads out of the window for the exhaust of steam. Sterilization may be effected by either the live-steam or hot-water and heating-coil method. A small crane lifts, moves, and deposits the larger cages.

Also on the floor is a food preparation room equipped with bench, steam-kettle, refrigerator, scales, grinding mill, electric mixer, and gas-stove. A vent pipe from the steam-kettle goes out through the window. Otherwise the usual exhaust type of ventilation is provided. An isolation room for incoming animals is equipped with large cages like those off the animal court.

The facilities for animal surgery include an operating suite, which consists of an anesthesia room, an operating room, and a recovery room. The recovery room has a steam-heated cage which serves also as a drying cage. Animals are bathed in the special bathing tank in this room. The operating room is large enough for two tables, but so far only one has been required. The operating table is of the simple Kny-Scheerer type except that it has monel metal top panels, monel drain groove, and light pipe-iron legs. Special boards for each kind of animal are made to rest on the table. All services are available from wall outlets. The overhead illumination is effected by six direct-indirect lamps and is almost shadow proof. There are also small portable lamps. An autoclave, utensil steam sterilizer, instrument sterilizer, and water sterilizers with provision for hot and cold water are mounted together by the American Sterilizer Company. They are operated by live steam. A steel instrument cabinet, shelves, a wall cabinet, and instrument and utensil tables are provided. In the adjacent passageway there are lockers and three wash-basins with elbow-control water mixers.

The animal autopsy room is used for all animal autopsies. It has a standard bench, standard sink, shelving, instrument cabinet, and a table like that in the operating room.

A room for pathological physiology is provided with two standard benches, a standard sink, and a wash-basin. On the west wall a heavy board is bolted through the partition for the suspension of heavy apparatus. A trench system in the floor provides for the extension of services to various parts of the room. A complete Becker kymograph, an air-pressure operated artificial respiration device (designed by the departments of pharmacology and anatomy), small kymographs,

and the usual pieces of equipment for physiological work are provided. This room is also used for ultraviolet exposures.

A small inoculation room is equipped with a small standard bench, an instrument sterilizer, and boxes and boards for small animals.

A dark room is provided for work requiring darkness or special kinds of light. Its ventilation appears to be adequate to prevent undue increase in temperature.

ADMINISTRATION

The administration of the building is recognized as the joint responsibility of the University and hospitals; the director and associate director act as the agents for both bodies. An executive secretary supervises the submission of requisitions, keeps accounts, and checks expenditures against budget. She is in constant touch with the purchasing and accounting departments of both University and hospitals and is responsible for cross-billing between the two institutions. She acts as private secretary to the director and as supervisor of the secretarial staff.

The relations of the Institute with other departments of the University are built upon a mutual desire to cooperate, but with a recognition that the director of the Institute must be in direct control of all personnel of the Institute. The professor of biochemistry is the adviser in biochemistry to the Institute. He nominates the instructor in pathological chemistry to the director, who is then responsible for the appointment. When a department of bacteriology and immunology is established in the School of Medicine, it is expected that the same plan of organization will be followed. At the present time, immunology is a division of the school department of pathology. It is thus administered directly by the professor of pathology, and complication is avoided by having hospital bacteriology combined under this division. The teaching of clinical pathology is carried on in the Institute and the professor of medicine and the director of the Institute agree that the persons assigned to this work, although nominated by and from the department of medicine, are in reality appointees of the department of pathology. This cooperation has been highly successful.

A monthly report of all the hospital activities of the Institute is sent to the director of administration of the University Hospitals, indicating in a chart the details of the number of autopsies and examinations of various specimens for each of the hospitals in the group. From this report the director of administration assesses the laboratory costs against the separate budgets of the hospitals.

Specimens for biochemical, bacteriological, and immunological examination are collected twice daily by an orderly from the pharmacy. Reports on specimens

are sent twice daily, through the hospital messenger service, directly to each hospital record room, whence they are distributed to wards or physicians. Emergency specimens are deposited in a special place in the basement, always accessible, either on open shelf, in incubator, or in refrigerator according to the specimen. A notice directs orderlies as to the deposit of each type of specimen. A switch is thrown for each of the three places of deposit. This turns on a light of special color in the technical rooms and in the executive secretary's room. The lights can only be switched off at the point of origin. If the executive secretary sees that immediate attention is not given by an orderly or technician she sends an orderly. On Sundays, the orderly deposits the emergency specimen and telephones the resident pathologist or the intern in pathology. When reports are desired before the regular messenger delivery, the person requesting the report telephones the record room. The secretary, using a house telephone, calls the particular technical room and the report is sent in writing through a pneumatic tube system to the record room. It is then telephoned to the originator of the request. This system reduces the factor of error in telephoned reports. The pneumatic tube system is used

also for the delivery of the regular reports from the technical staff.

Surgical pathology is carried on entirely in the Institute by its personnel. A small laboratory near the surgical operating room is supervised and operated by the Institute. Periodically the professor of surgery nominates one of his assistant residents for duty in the Institute. The duration of his service is determined by the surgeon. This assistant resident surgeon helps with the general work of the Institute, taking his turn in the autopsies. His special function, however, is, with his possession of information about specimens sent from surgery, to orient the pathologist properly in cutting blocks. This necessitates his attendance at operations, so that about half his assigned time is spent in work in pathology. This arrangement furnishes an admirable liaison between the two departments and gives the surgeon an introduction to the methods and limitations of pathology. When frozen sections are required they are made by the assistant resident surgeon and are examined by a senior member of the Institute staff who goes to the hospital for the purpose. When requested, a senior member of the Institute staff will attend surgical operations and make such immediate

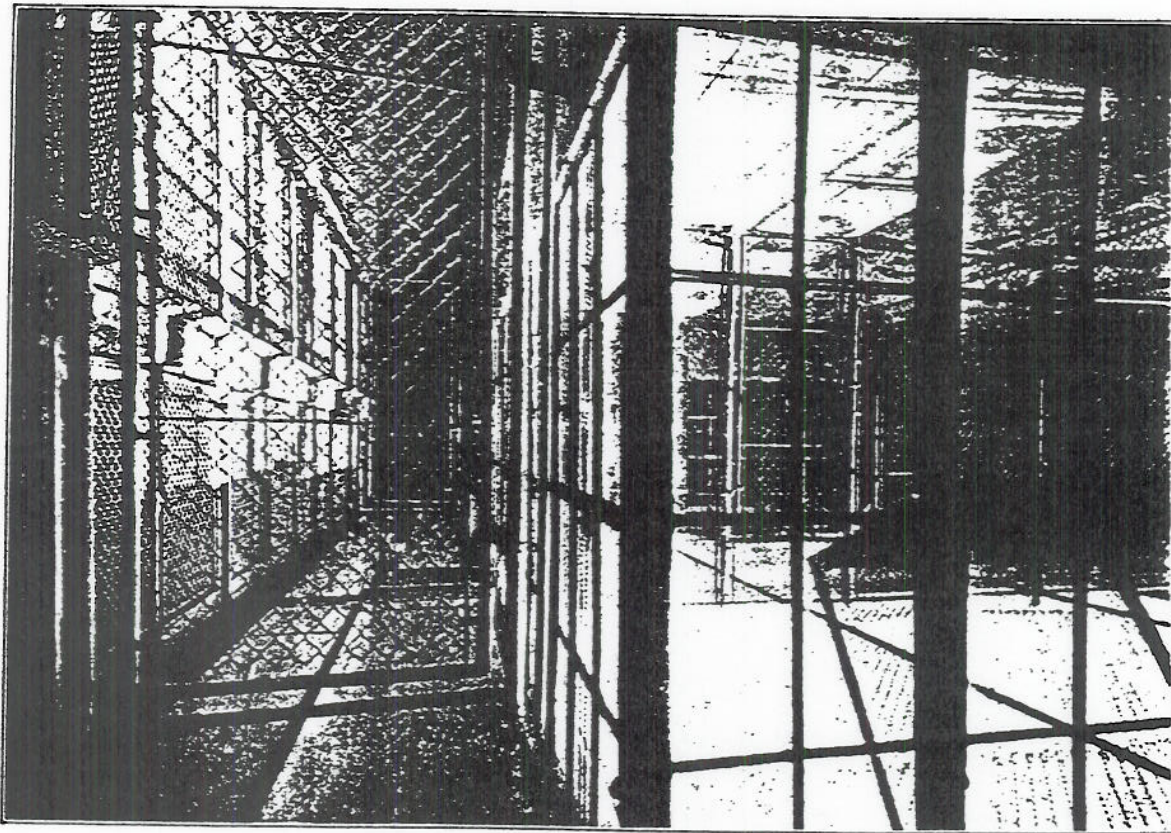


FIG. 15.—ANIMAL COURT, CORRIDOR, AND BUILT-IN CAGES

examinations as are necessary. This same arrangement applies to the work in gynecology, orthopedic surgery, urology, and to occasional operations in other departments. The correlation, however, is by senior members of both departments, rather than through a regularly appointed person. Most of the specimens from operations are received in the special unit on the third floor in the early afternoon. The fellow in pathology, the resident and the intern in pathology, and the assistant resident surgeon, study the material under the supervision of the assistant professor of pathology, or in his absence under the associate professor of pathology. Gross descriptions are delegated to various men in this group and the blocks are cut. They are run through the Autotechnicon and are ready for microscopic examination at noon the next day. The same method of study and description is followed and the reports are ready for distribution in the middle of the afternoon, just before the work on that day's gross material starts. If further study of, or consultation upon, a specimen is necessary, the surgeon is notified that the report will be delayed and if possible a tentative diagnosis is given him.

Except when especially requested, autopsies are performed in rotation by junior members of the staff, invariably under the close supervision of the professor, the associate professor, the assistant professor, or an instructor. The rotation of junior members includes the fellow, the assistant resident, the intern, the assistant resident from surgery, special fellows from foundations, and when his time permits, the Hanna fellow. The clinical staff members immediately concerned and the student group assigned from the third-year class are notified by telephone about thirty minutes before the autopsy. About ten minutes before, general signals are given in the Institute and the various hospitals.

Clinical-pathological conferences are held each week. In so far as possible adult cases are emphasized one week and children's cases emphasized the alternate week, but neither to the exclusion of the other. These conferences are separate and distinct from those held for students. The staffs of the hospitals, the fourth-year clinical clerks on duty at the time, certain members of the preclinical staffs, physicians from the neighborhood, and the staff of the Institute attend these conferences. The hospital roentgenologist is present to demonstrate with the four viewing-boxes any x-ray photographs of the patient and to enter the discussions of diagnosis.

Although the x-ray machine is usually operated by the curator of the museum and may be used by trained members of the staff, it is a part of the general x-ray equipment of the Medical Center and is under the supervision and advice of the assistant professor of roentgenology, the roentgenologist to the University hospitals.

Drawings or photographs of specimens may be re-

quested by either clinicians or pathologists. If made for hospital records, they are charged against the hospitals. If for research, they are charged against the University department concerned. Personal requests may be made and are charged accordingly. The charges for this type of work are far below commercial costs and represent a University and hospital service. The income barely exceeds the cost of materials. This principle of operation meets the approval of both institutions.

The decisions as to what specimens go to the museum are made principally by the pathologists, but the clinicians have and also exercise this privilege. When a specimen is turned over to the curator of the museum, a note on its origin, nature, diagnosis, availability of photographs and drawings, and a complete description are furnished. These constitute the basis for a cross index of lesion and organ. The type of mounting is a matter of consultation between curator and physician. If a clinician desires any museum material for demonstration, he sees or telephones the curator, who sends it to him on a special truck and sees to its return.

The library is open at all times for the use of the departmental, University, and hospital staffs and for students. Any books, and any journals not more than ten years old, may be withdrawn by signing in a record book. Current journals may not be withdrawn from the reading-room, except by special permission of the director. Books and journals may be kept out for a period of one month. A fine of twenty-five cents per week or any fraction thereof is charged thereafter. Notification of expiration of time is given by one of the secretaries. The loss from this simple but liberal method of administration has not exceeded thirty-five dollars in any one year. When a new issue of a journal is received, it is stamped and a slip is attached bearing the names of all professional members of the staff. It is then circulated from one to the other; each indicates the dates of receipt and of forwarding. No one may keep it for more than three days but may indicate that he wishes it returned to him for more careful reading after the circulation is complete. When all staff members have finished with it, a printed notice to the effect that it may not be withdrawn from the library is attached and it is filed on the journal racks.

The stock-rooms were filled when the building was opened; supplies are replenished principally from the University stores but to a small extent from the hospital stores also. The senior members of the staff have keys to the stock-rooms and a key is kept in the records room for the juniors. Any member of the staff may draw supplies at any time. Withdrawal blanks are kept in each stock-room. When material is withdrawn a slip showing the material, the quantity, the manufacturer, the stock number, and whether for hospital purposes, is

filled out and filed on a spindle. At intervals of two or three days the slips are taken by one of the secretaries, whose duty it is to keep stock-records, and the withdrawals are entered on the stock-cards. When the amount of any item is reduced to 25 per cent of the original amount, the stock is replenished. This method saves the employment of a stock-clerk and permits personnel to withdraw stock at their convenience. The errors caused by occasional failure to fill out withdrawal slips are small in number and are controlled by checking at the 25 per cent figure without real danger of exhaustion of supplies. Such errors are fully compensated by the simplicity and convenience of operation of the system. In the chemical stock-room a typed list of synonyms of chemicals and dyes is kept to avoid difficulty in finding the materials on the shelves where they are filed alphabetically and to avoid confusing the secretary by the use of different names for the same substance. At the end of each month a record of withdrawals for work of the hospitals is sent to the University purchasing department, where the costs are figured and billed against the hospitals. If any stocks have been replenished from the stores of the hospitals a countercharge is made and the balance paid.

Except for the most junior members of the staff, who must write their records in longhand, the staff members dictate records either to the dictaphone, the stenographers, or the typist. Most of the autopsy records and some of the surgical records are given to the dictaphone. All records are written in duplicate; one copy is retained for the Institute files and one is sent to the hospitals. No attempt is made to provide records for individual members of the staff. Each report is entered in brief in the Kardex file. Current surgical reports are kept in a loose-leaf book in serial numbers and are ultimately bound. Autopsy reports are kept in envelopes in a filing cabinet and are ultimately bound. The cross index of names is found in the Kardex file. There is also a cross card index of lesions, filed according to organ and to type of disease. The autopsy protocols are written on the kind of paper required for the record systems of the individual hospitals. In order that the senior members of the staff may have secretarial service, each member of the secretarial staff is permanently assigned to two staff members.

METHOD OF TEACHING

The intimate relationship of the University Hospitals, the close affiliation of the University with the Cleveland City Hospital and Saint Vincent's Charity Hospital, and an informal but close association between the Institute of Pathology and the Laboratory of Pathology and Research of the Mount Sinai Hospital of Cleveland, all contribute to the teaching program in pathology. The material available for this purpose is derived from a

total of over 2,900 beds. The total number of autopsies now performed each year under the supervision of the professor of pathology is well in excess of 1,000. About 400 of these are performed in the Institute. Surgical specimens to the extent of about 7,000, and other laboratory materials in proportion, are available. The teaching of gross morbid anatomy is therefore conducted almost entirely with fresh specimens. Those selected from hospitals other than those in the University group are brought to the Institute and kept in the refrigerator in the amphitheater preparation room for examination either in the amphitheater or in the classroom. Exceptionally good material is exhibited in the refrigerator case in the museum exhibition room. This wealth of material has proved useful in building up the museum collection.

The students' work in pathology comes in their second, third, and fourth years. The second year covers the regular courses in pathological histology, gross morbid anatomy, together with the course in immunology and certain exercises in pathological physiology. In the third year the students in groups of four attend autopsies at the various hospitals. Student clinical pathological conferences are held in the final semesters of the second and third years, and in the fourth year the students as clinical clerks attend the staff clinical pathological conferences at the Institute, the City Hospital, and the Charity Hospital.

The clinical phases of pathology are emphasized rather than the purely scientific side. The subject of pathology constitutes the application of what the student has already learned in anatomy, physiology, biochemistry, and bacteriology to the study of disease. In all stages of the work constant reference is made to normal form and function. Although the basis of pathology must be morphological, every effort is made, by experiment and by reference to clinical subjects, to correlate abnormal form with abnormal function.

In recognition of the fact that interest is developed by the clinical application of pathology and the demonstration of its importance in the clinics, the second-year class is divided into six sections for special work on one morning each week. Each of these sections rotates through assignments to the hospital routine of the Institute and to the laboratories of the City, Charity, and Mount Sinai Hospitals, and receives exercise in the method of opening the heart by the use of calves' hearts and the method of opening and studying the brain by the use of human brains. Each student must demonstrate proficiency in opening a heart and is thus able to orient himself in the study of hearts already opened. In the hospital laboratory the instructor in charge is free to conduct the work of the students as he sees fit, whether with autopsy material, preserved autopsy or surgical specimens, or fresh surgical material. His ob-

jective is to make the students familiar with the character of hospital laboratory activities and the relation of pathology to the living patient. After the two-hour period in the hospital laboratory of the Institute, the class assembles for a one-hour period in the amphitheater. Two illustrative fresh specimens are assigned to two students, who have an hour for study of the material. They describe and diagnose the specimen before the entire class under the supervision of the professor. The method of description and the rationale of diagnosis are the subject of free discussion. The material is finally correlated by a brief outline of the clinical aspects of the particular case, given by the professor.

The teaching schedule is so arranged that each instructor in the Institute is assigned to the three-hour periods for demonstration work in pathological histology. No instructor is in attendance for more than two hours at a time and two men are present at all times. Each of the pathologists from the associated hospitals takes at least one of these periods each week and is thus familiar with what is going on in the University courses. Each instructor has a definite responsibility to a group of six students but does not confine his attention to this group. He may take the group to his own room or to the small classroom for conferences but is not obligated to do so unless he desires. His group changes each week and his responsibility is chiefly instructional. Formerly the group remained the same throughout the teaching year and the instructor occupied a truly tutorial position, but this plan was abandoned because differences in training, experience, and personality, differences in availability of intramural and extramural instructors and the fact that when in personal difficulties the students almost invariably consulted the senior instructors rather than their own tutors, made the plan unsatisfactory.

The regular teaching of second-year pathology is concentrated into four months and occupies 332 hours. Of the time allotted, about two fifths are devoted to general pathology and about three fifths to systemic pathology. This proportion is determined with the idea that systemic pathology will better train the student for his later clinical work and permit a more detailed correlation of morphological lesions and functional alterations. The didactic work is almost entirely in the form of conferences between the professor and the entire class, a feature made possible by the acoustic properties of the amphitheater. The conferences occupy about forty-five minutes of the period and the remaining ten or fifteen minutes are devoted to a brief introduction to the next assignment. Assignments are made by topic rather than by pages in a book. The principles underlying this teaching method are: that since a student in his postgraduate years must advance his knowledge by reading, the sooner he starts this method the better able

he is to become independent; and that learning is more valuable than teaching. The conferences are closely correlated with the laboratory work in gross morbid anatomy, pathological histology, and experimental pathology. A few formal and well prepared lectures are given during the course by members of the staff who have made a special study of a particular topic. These are illustrated by lantern slides and other forms of projection. Quiz conferences are held once a week. In the large laboratory each student is provided with a permanent collection of microscopic preparations and a set of mimeographed descriptive notes. The microscopic preparations are assigned not by days but by periods of a week or ten days so that the students may have freedom in apportioning their time and be available for experimental work.

During the study of general pathology the experimental work is devoted entirely to immunology. Certain fundamental experiments in immunology are conducted by the entire class and for this purpose the centrifuge and water-bath are available in the experiment room. Mimeographed notes of the experiments in immunology are provided for each member of the class.

The teaching method used in experimental work is illustrated by the following example. The entire class performs an experiment in toxin-antitoxin union with tetanolyisin and tetanus antitoxin. A small section composed of from four to six students then works out, in the special room provided for experiments, further details of toxin-antitoxin union not only in reference to tetanus toxin and antitoxin but also diphtheria toxin and antitoxin. The results of these experiments are demonstrated to the entire class and entered in a note-book with the mimeographed notes. The same program is applied, after the performance by the entire class, to agglutination, precipitation, cytolysis, and complement fixation. Anaphylactic shock and inhibition of shock are demonstrated in the amphitheater. The students are required to hand in note-books of the results of the experiments built upon the basis of their mimeographed notes. The associate professor of immunology gives lectures and conducts quiz conferences at suitable periods which do not conflict with the didactic work in pathology.

During the course in systemic pathology, pathological histology is closely correlated with gross morbid anatomy. In addition, experiments are performed annually in connection with the study of the circulatory system, respiratory system, and kidney. If time permits, experiments dealing with diseases of the lungs, liver, pancreas, and alimentary canal are also made.

During the periods when circulation is being studied groups of five students work in the experiment room under the direction of the professor or associate professor. Each group studies with the kymograph the

effects of such conditions as hydropericardium, aortic stenosis, aortic insufficiency, and experimental myocardial degeneration, infarction, and air embolism. With the multiple stethoscope, all students hear the murmur of aortic stenosis. Previously they have learned the method of opening the heart by practise on calves' hearts and during the period of study of circulation they are constantly engaged with morbid anatomical preparations. At the end of the period assigned to circulatory diseases the students assemble at one of the hospital amphitheaters where one hour is given to a quiz conference on gross morbid anatomy of heart disease, one to the demonstration of the physiological results obtained by the small groups, and one to the presentation and examination of living patients with heart disease.

The experiments in the respiratory tract deal with the effects of hydrothorax, acute asthma of anaphylactic shock, acute bronchitis from irritant gases with auscultatory demonstration of râles, and experimental pneumonia.

The physiological work in renal disease is concerned principally with the production of experimental nephrosis, the study of accumulation of nitrogenous products, and the excretion of phenolsulphonephthalein. A correlation period such as that which follows work in connection with heart disease follows the work on kidney disease.

In the fourth semisemester of the second year eight periods are given by the associate or assistant professor for training the students in the methods of the clinical pathological conference. Two cases are usually covered in each period. Two students present an abstract of the clinical history and differential diagnosis and two other students present the organs from the autopsy. The students then discuss the features disclosed.

In the third year the work in pathology comprises attendance upon autopsies at the associated hospitals, and during the fourth semisemester, eight clinical pathological conferences under the direction of the professor similar to, but more advanced than, those of the second year. The students are assigned to autopsies in groups of not more than four and are subject to call at any time. This assures close observation of the autopsy method and findings as well as an opportunity to assist in the work. Cards, indicating the place of autopsy, the name of the patient, the clinical conditions, and a review of the pathological findings, are furnished and must be filled out and returned to the department office. No student is accepted for graduation with a credit of less than six autopsies, many students observe ten or more and occasionally a student has credit for twenty or more.

Fourth-year students are admitted to clerkships in pathology in the hospitals and, if properly qualified,

may conduct research in pathology and immunology. During this year the clinical clerks at City Hospital and the University Hospitals attend the weekly staff clinical pathological conferences. Each student attends approximately sixteen such conferences throughout the year. Elective courses offered in general pathology are conducted in the hospital laboratories, immunology courses are conducted at the Institute, and gynecological pathology courses are conducted in cooperation with the division of gynecology.

In this school, work in pathology and bacteriology is under separate departments. Bacteriology is taught in the latter part of the first year and is a prerequisite for admission to the course in pathology. In the study of the pathology of infectious diseases constant reference is made to the preceding work in bacteriology, and the experimental and didactic work in immunology naturally requires constant reference to bacteriology. The most cordial relations exist between the two departments and every attempt is made to correlate the two in so far as their place in the school schedule will permit.

Teaching in dental pathology is under the general supervision of the professor of pathology and is carried on by the professor of oral pathology in the dental school, who also holds the rank of senior instructor in pathology in the medical school. His office and laboratory are in the Institute. The course in general pathology for dental students is somewhat briefer than that given to medical students but covers the same general topics. Members of the Institute staff aid in the classroom work and the senior members give lectures on topics in which they have a particular interest. They also aid in demonstrating gross morbid material. No experimental work or instruction in immunology is given to dental students in this department. It has been found desirable to use the conference method and didactic instruction to a lesser degree in dental pathology than in pathology for medical students. The course in special oral pathology is given entirely by dental staff members and has available for study an unusual permanent collection of mouth tumors, tooth and jaw sections, and ground sections of teeth. Both courses are given in the second year of the dental school program.

Teaching in clinical pathology, formerly included in the department of pathology, is now a joint activity of the departments of pathology and medicine, with the latter playing the major part. The instructors are members of the department of medicine. The course is concentrated into 104 hours in the last semisemester of the second year. All the facilities of the Institute are at the disposal of the teaching staff and an office and stockroom are provided adjacent to the main classroom. The work is largely practical, supplemented by lectures and conferences. Morphological, clinical, and chemical studies of blood, urine, and various other body secre-

tions and excretions, applied immunological and bacteriological examinations, and parasitology with special reference to feces and blood constitute the basis of the course. Permanent preparations are available for the routine work in the course and in addition numerous specimens of blood, stomach contents, urine, feces, etc., are brought from the associated hospitals and presented to the student for examination, with a clinical history of the particular patients concerned. The students themselves serve as subjects for experiments by their colleagues, dealing particularly with the blood, concentration of urine, output of phenolsulphonephthalein, and other similar procedures. Throughout the entire work the attempt is made to correlate this subject with all that has gone before in the student's medical career and to prepare him for the clinical clerkships upon which he will enter during his fourth year.

RESEARCH

Original investigation has always been a feature of the work of this department, as well as teaching and hospital duties. The research problems are usually designated by senior members of the department, who encourage the junior members to act as collaborators in order to obtain first hand experience with experimental, observational, statistical, mathematical, and library methods. If junior members originate problems they are aided by the seniors in their work. Intensive supervision is exercised over all studies by the juniors. The writing of case reports for publication is looked upon as an introduction to research methods, when the material justifies the time spent and is believed of value to the literature. Cooperation with other laboratory and clinical departments is active. Senior authorship of a problem is based on the principle that the origination of the problem is usually the most important feature, unless in the course of the research another contributor has had an inordinately large share of the work or devised methods of significance in its prosecution. The resident pathologist and the intern in pathology are encouraged but not urged to take up special studies until they have become well orientated in the routine. The assistant resident surgeon assigned to the Institute almost invariably works on a problem originating either in surgery or in pathology. The present assistant resident surgeon is collaborating with the director in a study of carcinomas of the colon.

At the present time nearly all the funds for research are provided by the University department budgets. Research is carried on by students in the summer period under the support of Crile Fellowships and often continues into the following winter if the study has not been completed. These studies are always contributory to some major problem of a senior and under his immediate direction.

A major research activity is the study of kidneys. There have been several publications concerning the number of glomeruli in man and animals at different age periods, as well as studies of patency of glomeruli in experimental and human lesions. There is an extensive study in progress dealing with the effects of ischemia upon renal function. Chemical, anatomical, and nutritional studies of experimental nephrosis have been conducted in collaboration with the department of medicine.

Another major activity deals with the effects of repeated alterations of pressure of various gases upon the cultivation of tissues. The subdivision of immunology has conducted studies of the toxic substances of bacteria and a study of the Schwartzman phenomenon. Furthermore several studies deal with the microscopic anatomy of the Schwartzman phenomenon in relation to lesions of stomach, kidneys, and joints. In addition this subdivision has carried on intensive studies of the cultivation of virulent *Treponema pallidum* as part of the program of the Committee on Research in Syphilis. Anatomical studies of the effects of syphilis upon aorta, aortic orifice, and coronary arteries have recently been published and further studies are in progress. A new description of the coronaries of the dog has resulted from cooperative studies of the departments of physiology and medicine upon experimental occlusion of these vessels. The rat colony is being used for studies of the pathological effects of various nutritional factors.

The subdivision of dental pathology, somewhat limited as to staff, is working on syphilis as it affects the teeth, on experimental and human granulomas, and on the effects in animals and man of root resection.

All projected studies must be submitted for approval to the director before they are undertaken and all manuscripts are subject to his visé before they are published. The progress of the various groups of research problems is frequently reported and the collaborators are often called together for suggestions and advice. Through discussions around the tea-table each member of the Institute knows what work is being carried on by the others and ideas are freely and sympathetically exchanged. The fitness of an individual to enter into the harmonious spirit of the Institute is one of the prerequisites in his selection for membership. Research is also conducted by the staff in pathology of the Cleveland City Hospital, Saint Vincent's Charity Hospital, and Mount Sinai Hospital.

STAFF

The staff of the Institute combines two groups, one whose primary duties are concerned with the University and one whose primary duties are concerned with the hospitals. However, every effort is made to have all staff members regard the Institute as a unit and so direct

their activities as to contribute to the common good. Thus, the functions of each group overlap and take in both University and hospital work.

The professor and associate professor of pathology in the University are respectively the director and associate director of the Institute. The remainder of the professional staff includes an associate professor of immunology, an assistant professor and an instructor in pathology, an instructor in pathological chemistry, a Hanna research fellow in pathology, a resident fellow in pathology, an assistant resident pathologist, an intern in pathology, and the assistant resident surgeon assigned to pathology. The non-medical staff includes the curator of the museum; an artist; a photographer and his assistant; nine trained technicians, augmented by a variable number in training; four secretarial workers; one mechanic, who is the supervisor of equipment; three orderlies; one resident orderly; and three janitors. Repairs and upkeep are cared for by members of the University carpentry, electrical, and engineering shops.

Appointments to the professional staff of the Institute, except for junior positions, are made by the University trustees upon recommendation of the School of Medicine. Certain junior posts are filled by election by the faculty of medicine either directly or upon nomination by the Medical Council. The selection of the technical personnel and orderlies is made by members of the Institute staff delegated by the director to the divisions concerned, but their appointments are made by the director. The executive secretary selects the personnel of the secretarial staff and they are appointed by the director. The janitors are assigned by the University janitorial service, upon approval by the director. The supervision of the various services is in the hands of designated members of the professional staff. The associate director has charge of the instruction of volunteers in training as technicians. These are admitted only upon proper recommendation; they must have an adequate preliminary education, preference being given to college graduates; they must agree to stay for a year; and they are rotated in the technical departments. Nothing more than an informal note of character of training and proficiency are given at the end of the course.

Most of the professional staff hold titles in both the University and the hospitals, but the Hanna research fellow is appointed only in the University and the resident staff is appointed only in the hospitals. The director and associate director of the Institute are appointed by the University. The following table shows the correlated ranks in both institutions:

<i>University</i>	<i>Hospitals</i>
Professor of pathology	Director of pathology
Associate professor of pathology	Associate director of pathology

Associate professor of immunology	Associate director of immunology
Assistant professor of pathology	Pathologist-in-charge
Instructor in pathology	Assistant pathologist
Instructor in pathological chemistry	Biochemist
Hanna research fellow
Fellow in pathology	Fellow in pathology
.....	Assistant resident pathologist
.....	Intern in pathology
.....	Assistant resident surgeon

In addition to the list of staff members given, the pathologists-in-charge at the affiliated hospitals, namely, the City Hospital and the Saint Vincent's Charity Hospital, are members of the University staff. No formal relation exists between the University and the Mount Sinai Hospital, but the pathologist of this hospital is a member of the University staff and contributes largely to the work of the department.

With the number of positions to be filled it is possible to provide appointments for students who anticipate a career in pathology and for those who occupy a year or more in preparation for the clinical subjects. Appointments which carry any form of financial compensation are made for not less than a year. Volunteers are occasionally given appointments for shorter terms. The appointments are entirely devoid of local prejudice and include at the present time graduates of the following universities and colleges: Pennsylvania, McGill, Chicago, Wageningen, Nebraska, Ohio, Iowa, Indiana, City of New York, Harvard, Johns Hopkins, Kansas, and Western Reserve.

BUDGET

The budget is drawn up annually and represents contributions by both the University and the hospitals. The fiscal year of the University begins July 1 and that of the hospitals begins August 1. As part of the attempt to secure unity of spirit in the Institute the disbursement of salaries and wages is made from the office of the treasurer of the University. The University then bills the hospitals for those which are provided for by the hospitals' budgets. In general the payments for each individual are made from one institution or the other, but in a few instances the salary is made up of a contribution from both divided upon the basis of services to each.

It is impossible to estimate the proportion of the expense which goes to research, teaching, or hospital routine. It is probable that from one third to one half of the salary expense and about one quarter of the

appropriations for supplies could be charged to research. The number of teaching hours allotted in the school schedule is not a fair basis for estimating the teaching activities of the staff, since all members are not engaged in the classrooms throughout these periods. Those who have heavy hospital responsibilities are given lighter teaching duties and vice versa. Even in the performance of hospital routine a certain amount of instruction is given to students and house officers. Fur-

thermore, much of the routine material is utilized for classroom purposes. The difficulty of allocating funds according to function is further accentuated by the principle of unification of the work.

The gross total expenses from all sources is about \$100,000 per year, of which about one third is for professional salaries, one third for wages, and one third for supplies, equipment, and maintenance of the building including repairs, heat, light, and power.

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