society for the corresponding years, that the average time given to study is ten hours a week instead of eight, that there has been no difficulty in finding a large number of cultivated gentlemen who were willing to give their time and attention to the work, and that the wonderful success of the earlier society may be taken as an indication of what may be done for young men by the same means. The secretary says, "This year's work has convinced us that we have every promise of the society's becoming a successful and useful institution, and that it is meeting a great need in a practical way." A year later it is decided to give up the organization; and no more specific reason for this course is given than that the committee is satisfied, on the whole, that the good done is not enough to make worth while the labor required of officers and correspondents.

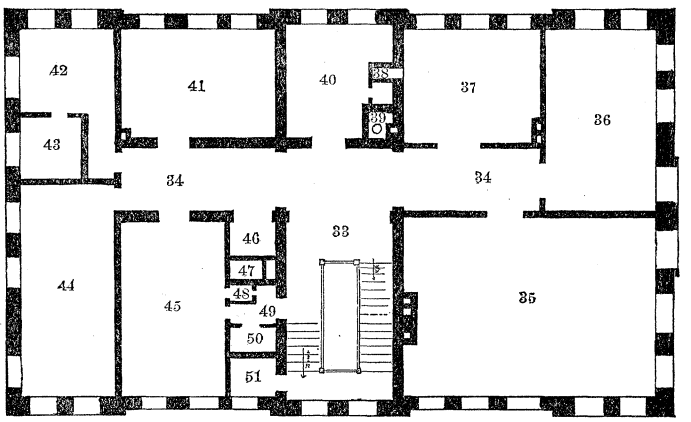

FIG. 2.—33, 34, hall and corridor; 35, museum; 36, advanced morphology; 37, preparation-room for museum: 40, assistant's room; 41, library; 42, 43, photography; 44, advanced botany; 45, lecture-room; 46, elevator; 47, 39, ventilating-shafts; 51, lavatory.

THE BIOLOGICAL LABORATORY OF THE JOHNS HOPKINS UNIVERSITY.

THE recently opened biological laboratory of the Johns Hopkins university is eighty-four by fifty-two feet in external measurement, and consists of three stories and a basement. It is built of Baltimore pressed brick; with steps, entry, window-sills, and band-courses of Cheat-river bluestone. While free from any attempt at mere architectural display, the building is handsome, as will be seen on examination of fig. 5, which represents its north and west elevations. A fact that at once attracts attention is the number and large size of the windows: as the laboratory is free on all sides, it is therefore very well lighted.

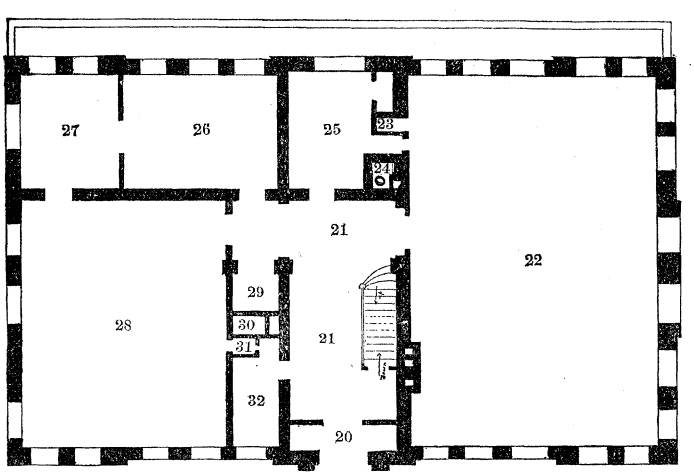

FIG. 1.—20, vestibule; 21, main hall; 22, work-room for practical instruction of less advanced students; 24, 30, ventilating-shafts; 25, storeroom of materials and reagents for general practical class-work; 26, chief assistant's room; 27, storeroom for diagrams and lecture-apparatus; 28, lecture-room; 29, elevator; 32, cloak-room.

On ascending the front steps, and passing through the door, the visitor enters the main hall, from which a wide staircase ascends to the third story, and on which most of the rooms of the first floor open. This floor is given up to the regular class-instruction of students not engaged in special work. It has on it (see plan, fig. 1) a lecture-room with seats for sixty; a storeroom connected with this, for the keeping of diagrams and lecture-apparatus; an administration-room, the headquarters of the chief assistant; a preparation-room containing a supply of the reagents, specimens for dissection, and histological material required for the daily practical class-work; and the large general laboratory, thirty-two by forty-eight feet.

The latter (fig. 6) has windows on three sides. Around these sides runs a work-table, supported, independently of the floor, on brackets attached to the walls, and affording ample space for thirty students. If necessary,

a second table can be set inside this, giving places for fifteen or twenty more. The centre of the room is in part occupied by a dissecting

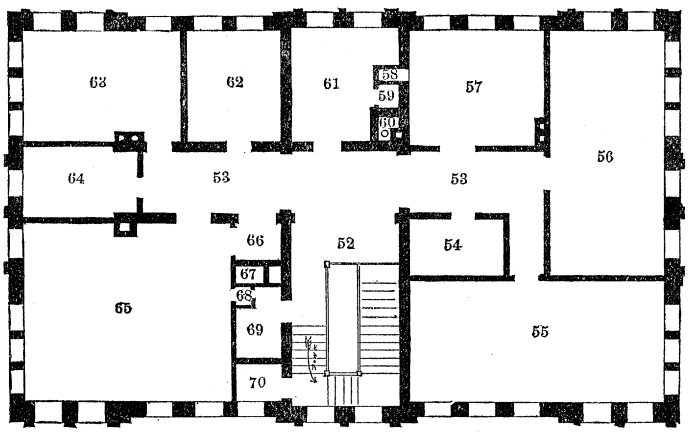

FIG. 3. — 52, 53, hall and corridor; 55, experimental physiology of lower animals; 56, advanced histology; 57, workshop; 54, balance-room; 61, assistant's room; 62, myograph-room; 63, director's private room; 64, dark chamber; 65, experimental physiology of mammals; 66, elevator; 60, 67, ventilating-shafts; 69, closet; 70, lavatory.

and a chemical table. The latter is supplied with the reagents and appliances for practical work in elementary chemical physiology. The dissecting-table is for the dissection of animals, such as cats and dogs, which are of a size not to be conveniently handled at the regular work-places on the wall-tables: it has a slate top, and is provided with a sink and water-tap between every two students. The inner side of the room has, against the wall, tables for scales and the warm-water oven; a large hood for the performance of chemical operations calculated to give rise to noxious vapors; and a dumb-waiter leading to the basement, on which articles can be sent up from the store-rooms there when called for. Near the centre of the room is a chute, lined with plate-glass (so as to be readily kept clean), and passing direct to the furnace-room below. Through this chute all refuse is at once got rid of. The floor of the room, and of all others in the building in which messy work has to be done, is of asphalt, and the walls of hard cement to a height of two and a half feet. Thus no spilled blood or other offensive matter is absorbed; and the floor can be flooded with water, and thoroughly cleansed, whenever desirable.

The work to be done in this room annually is as follows: by first-year students, a thorough macroscopic and microscopic examination of about twenty-five selected vegetable and animal organisms illustrative of the course of lectures on general biology, and a study of the embryology of the chick; by second-year students, a course in practical animal physiology and histology a little more extended than that given in Foster and Langley's 'Practical physiology,' but essentially similar to it, and the thorough dissection of a dog or cat.

The second floor (see plan, fig. 2) contains the following rooms: a laboratory for research and advanced study in animal morphology, and a corresponding room for botanical work; a photographing-chamber, with heliostat and other appliances for micro-photography; a library of biological text-books, monographs, and journals; a small lecture-room (to be used for the present as the laboratory of psycho-physiology) capable of seating about thirty; an assistant's private room; a museum containing such typical osteological and other specimens as are needed by students pursuing the regular courses of class-instruction, and the beginning of a collection of the local fauna

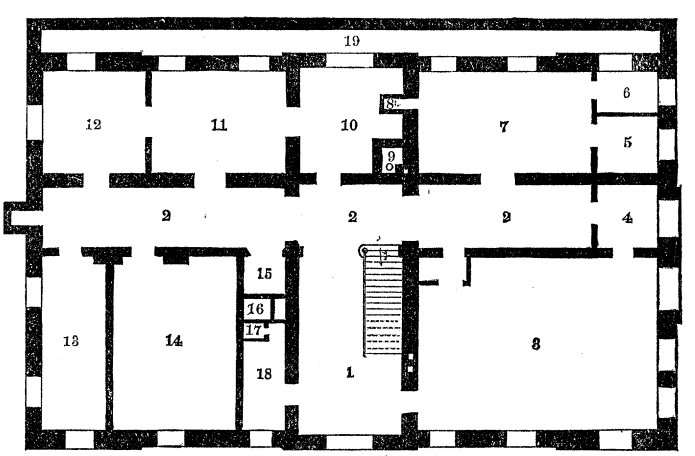

FIG. 4. — 1, 2, entrance and corridor; 3, chemical physiology; 4, balance-room; 7, furnace-room; 10, 11, 12, janitor's store and battery rooms; 13, animal-room; 14, electro-physiology; 15, elevator; 16, 9, ventilating-shafts; 18, lavatory.

and flora, made by the members of the field-club; and a store and preparation room for the curator of the museum.

The third floor (see plan, fig. 3) contains three main work-rooms for advanced students, — one for animal histology, one for physiological experiment on invertebrates and the lower vertebrates, and one for experiments on warm-blooded animals. The room for the latter purpose communicates directly with the hydraulic elevator, which has also doors opening directly on the corridor of each floor, and runs to the basement: there is consequently no carrying of animals or their remains up or down the stairways. The other rooms on the third floor are, a dark chamber for spectroscopic work, for experiments in physiological optics, etc.; the director's private room; a room for the myograph; an assistant's private room; the mechanics' shop, for the construction and repair of instruments; and a small balance-room, containing also a case with a supply of chloral, curare, morphia, and other drugs frequently employed in physiological experiments.

The building being heated by steam supplied from a boiler in the neighboring chemical laboratory, the basement (see plan, fig. 4), which is well lighted, is left free for use. The scientific work-rooms in it are, a large, well-equipped room for advanced study in chemical physiology, a balance-room, and a room for the study of animal electricity. The basement also contains a suite of three rooms, which form the janitor's headquarters, where he has charge of the necessary stock of chemicals and glassware, and has also a carpenter's bench, at which he does any simple bit of carpentering required. From one of these rooms a shaft two feet square runs to the top of the building, communicating with each floor. Through this shaft it is intended to run wires to various work-rooms, transmitting electrical currents for the running of chronographs, and for similar purposes. The shaft was also planned in the hope that ultimately the clock-work of kymographs and such instruments will be replaced by electrical energy generated by an engine and dynamo in the basement, and distributed thence over the building.

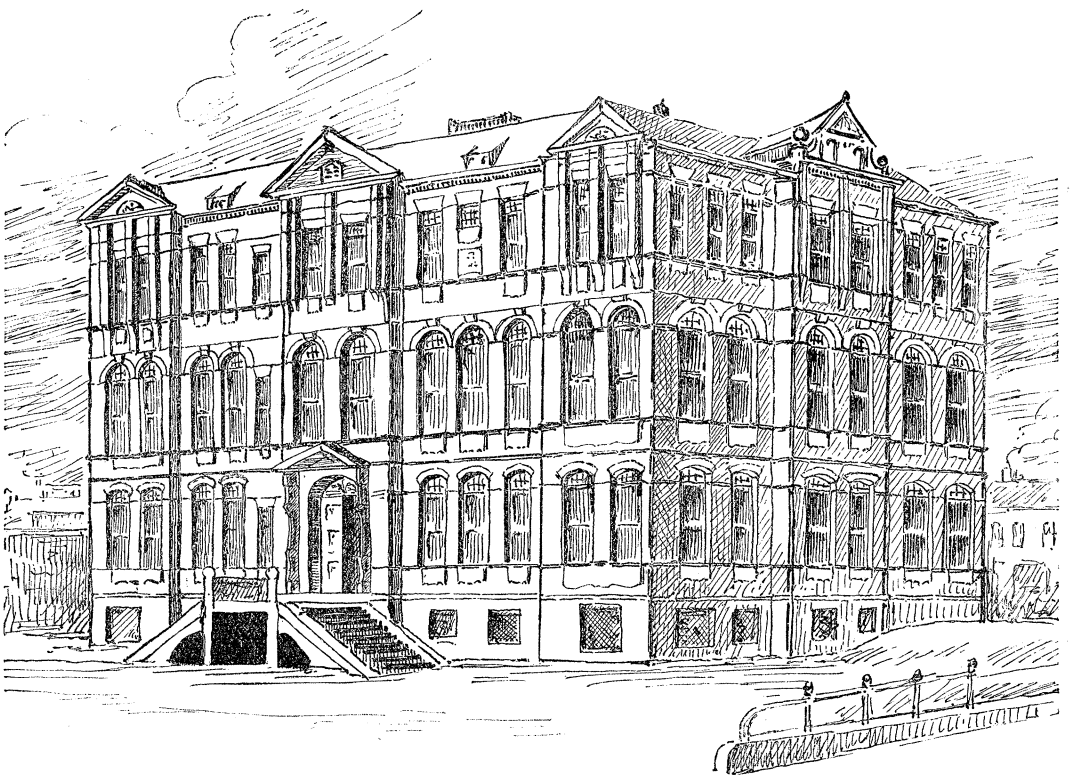

FIG. 5.

The remaining rooms in the basement are, the 'animal-room,' fitted up with tanks for the keeping of frogs, terrapins, and so forth; and the furnace-room. The latter contains a cremation-furnace, in which all the combustible *débris* of the laboratory is disposed of, and a boiler and condenser for the preparation of distilled water: it has also in it a small steam-engine, designed to be used for running a centrifugal apparatus.

In the general internal fitting-up of the laboratory, the trustees of the university have acted upon the belief that it is, in the long-run, more economical to provide students with furniture which is good and attractive, and trust them to take care of it, than to supply cheap tables and cases, which the average undergraduate, at least, is apt to feel no hesitation in mutilating. The halls and lobbies are comfortably covered with cocoa matting; the tables, instrument cupboards, and cases of drawers are of polished cherry. But there has been no attempt at ostentation: the furniture is all simple, though handsome, and finished in every essential in the best manner. Every drawer runs as smoothly as in the best cabinet work: and each has its own lock, to be opened only by its own key, or the master-key for each floor kept in the administration-room.

The library is a little more luxuriously furnished than the other rooms. It is carpeted, and supplied with armchairs. So many students can only afford to hire rather uncomfortable lodgings, that it was believed desirable to provide in the library a really pleasant study, in which they might find at hand, not only the books they wanted, but writing-tables and other conveniences. None of the books are locked up. The student, on entering, finds before him a list of books which are not to be taken from the room, including text-books, monographs on the plants or animals which are used as types in the regular class-instruction, and the last-received numbers of periodicals: all other books may be taken (subject to call for immediate return at any time) on the student writing his name, and the title of the book he desires to take away, on a card provided for the purpose, and then slipping this through a slit in a locked drawer. The fellows and scholars in the biological department act in turn as librarians for the day, and are present

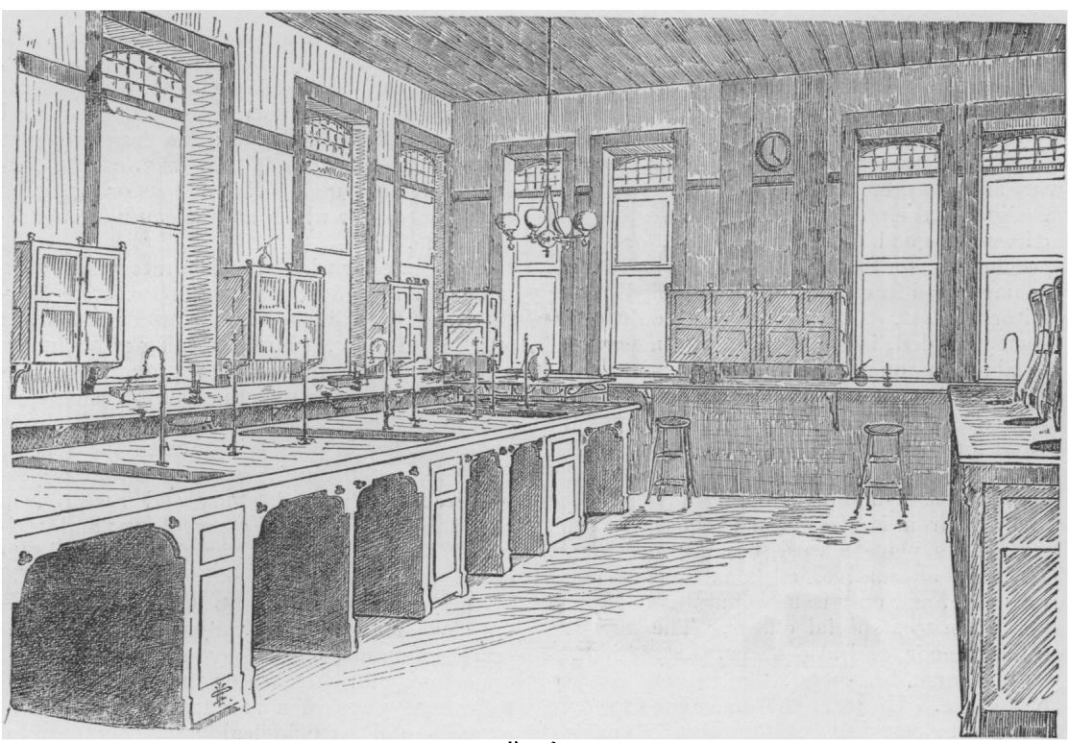

FIG. 6.

at a stated hour to receive books returned, and restore the receipts for them: until the card is returned to its signer, he is responsible for the book. This system of almost absolute freedom in taking books from the library is still on its trial: it has now been in practice for four months, and with the best results. Those who desire to take books home appreciate the trust reposed in them, and also the convenience to them of the present plan, and are anxious to secure its continuance.

The principle on which the library is managed, of inviting students to co-operate with the administrative officers in making it possible to allow the freest use of all books in it compatible with their safety, has been extended to the instruments in the various rooms for advanced work. On admission, each man has assigned to him a microscope, microtome, other histological appliances, and such chemical glassware as he is pretty certain to need. For these he signs a receipt, undertaking to restore the articles in good order on demand, or pay a specified sum for them. Glass slides and covers are purchased in quantity, and supplied by the janitor at cost. Other glassware, only occasionally needed, is supplied to any member of the laboratory on requisition, the recipient signing an agreement to return or pay for it. With these exceptions, free use of all instruments required for such work as he has been permitted to undertake is allowed to every student, on condition that upon removing any piece of apparatus from its drawer or cupboard he shall leave in its place a card bearing his name. The only alternative, of course, is to lock every case, and only issue apparatus on formal application to a special officer. The men are on their honor, and also know, that, if instruments cannot be traced, the present system must cease. Hitherto the endeavor to secure their aid in carrying out this plan of making all the apparatus accessible with the minimum of trouble or delay, has had most satisfactory results; largely, no doubt, owing to the fact that the majority of the students are graduates old enough to have a sense of responsibility, and to influence the younger men. Once a month one of the fellows, or graduate scholars, examines the instrument cupboards in each room, compares their contents with the inventory, notes what piece of apparatus has been taken and who has taken it. If any instrument is not accounted for, he posts a notice asking who has it. During the past four months the latter proceeding has been necessary only three or four times, when students had, in the hurry and excitement of an experiment, forgotten to write the required receipt: in every such case the delinquent has at once come to apologize and explain. What may be called the 'permanent' apparatus in the laboratory, as distinguished from glass tubing and other perishable 'current' apparatus renewed yearly, has cost more than ten thousand dollars: about fifteen hundred dollars are annually provided for repairing and adding to it. During the current year another five hundred dollars has been placed at the disposal of Dr. Stanley Hall for the purchase or construction of apparatus for psycho-physiological teaching and research. This stock of instruments is so valuable, and in many cases so easily injured, that a longer trial will, of course, be necessary, before it can be decided whether the present system of leaving every thing unlocked, and trusting students to leave an acknowledgment for such instruments as they take, can be continued without undue risk of loss or injury by carelessness for which no one can be found responsible.

The work for which the laboratory has been planned and built was stated in Professor Martin's lecture, published in our issues of Jan. 18 and 25. Briefly, it is the training of beginners in biology in the fundamental properties of living matter, and the structural and physiological characteristics of the chief groups of plants and animals; in co-operation with the seaside laboratory of the university, to afford opportunities for advanced study and research in animal morphology and embryology; and, ultimately, similar opportunities for advanced students of botany. In addition, very special attention has been given to providing facilities for class-instruction, advanced study and research in animal physiology and histology, and opportunity for such senior students as intend to become physicians to learn the methods of experimental pathological and therapeutical research, so far as they can be carried on in a laboratory. It is hoped that in this way the biological laboratory may prepare annually some students to enter special laboratories of pathological or pharmacological research more immediately connected with a medical school.

SOME PECULIARITIES OF PLANT-GROWTH.

THE following cases are here placed on record as affording interesting instances, not only of the ability of plant-tissues to repair injury, but of the enormous power exerted by vegetable structure during the process of development.