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·DISCE·QUASI·SEMPER·VICTURUS· ·VIVE·QUASI·CRAS·MORITURUS·

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A Cipher and its Key.

WILLIAM A. FAGAN, '97.

THE H_2 O lapped softly
The banks of Si O_2;
In an Al_2 O_3 like glow
Afar in the west the sun sank low.
Si O_2 tinted clouds all arow
Bade the gentle day adieu.

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The listless *waves* lapped softly
The shores of the yellow *sand;*
Blazing aloft in a *ruby* glow
Afar in the west the sun sank low.
Amethyst cloudlets all arow
Said adieu to the sorrowing land.

A Study of the Mosses.

JACOB ROSENTHAL, '97.

THE study of this great group of plants is both interesting and instructive. They bear an honorable part in the economy of nature. For instance, the *Sphagnum*, or common bogmosses, play an important part in the formation of peat; the mosses which cover the ground in the forests act as sponges in absorbing the water and keeping the earth continually moist. Again the beds of moss which cover rocky ledges protect them from the action of the weather. So I might cite many more instances in which the mosses hold an important office in the perfect symmetry of nature's work.

The *Bryophyta* (mosses) immediately follow the first division of the vegetable kingdom, the *Thallophyta*, and are similar in many of their characteristics. Some have a plant body consisting only of a thallus. They are not divided into stem and leaves, neither have they true roots. They are also similar, in some degree, to the next division, the *Pteridophyta* or ferns,

As to their structure, they are rather simple, usually one layer or more of cells around the outside, of uniform shape. Inside of this there are elongated cells, very like the fibrous tissue of the higher plants. These cells, for example, make up the midrib of the leaves. There is no real vascular tissue, no woody fibres as in higher plants, but there is cellular tissue pure and simple (Fig. 2, B–C).

As to their reproduction, they furnish us the key to the vegetable world in this regard; for it is in this division of plants that we find that peculiar alternation of generation which is now traced to be observed in every form of plant. Reproduction is brought about by means of antheridia and archegonia. The antheridia (Fig. 3, C) are club-shaped, oval or globular bodies, having a single layer of cells on the outside and a tissue inside formed of numerous small cells, in each of which one sperm cell takes its origin. These sperm cells are spirally coiled filaments, thickened at the posterior end, and tapering to a fine point at the anterior end which bears two fine, hair-like cilia by which they are enabled to move about in water (Fig. 3, D).

The archegonia are flask-shaped bodies, swollen at the base, which contains the oosphere, and being somewhat elongated and smaller at the top, forming what is called the neck (Fig. 1, A–B–C). The neck is a sort of tube having its lumen filled with a row of cells, called the canal-cells, and these, when the archegonium is ripe, become a jelly-mass which, when moist, swells and oozes out of the mouth of the neck. This is very important in the subsequent fertilization, as it is by means of this jelly canal that free access is obtained to the oosphere.

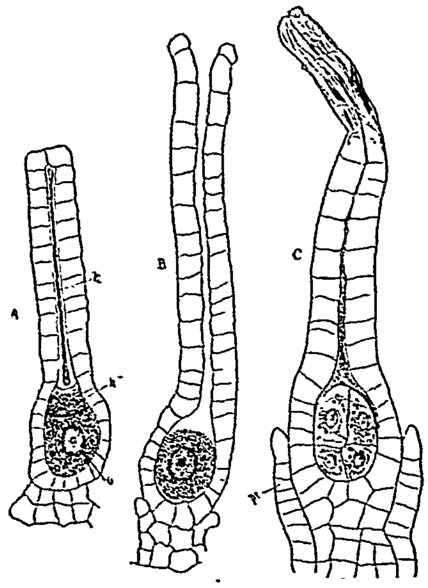


Fig. 1.

A, young; B, mature, but unfertilized, archegonium. C, fertilized archegonium with dividing oospore. K,' neck-canal-cells; K," ventral-canal-cells; o, oosphere; pr, perigynium (After Strasburger).

It has also been shown that by means of a peculiar substance or substances, of which this jelly is composed, the sperm cells are attracted to the mouth of the archegonium.

We will now trace the life of a moss beginning with the asexual spore. A spore falls on the ground and germinates, *i. e.*, it begins to grow. The cell wall breaks, and the protosplasmic contents elongates and divides, producing a long branched filament consisting of cells. This growth is called the protonema (Fig. 4). Some of the branches are formed into buds which grow into the leafy part of the plant above ground, and form what is commonly called moss, but which the botanist calls gametophyte or gamete plant.

This leafy part of a moss plant grows to a certain height—usually from one to three inches—or, as in the *Hepaticæ* it is a simple thallus. In either case the growth is terminated by the reproductive organs, which we may call the flower. It is here the antheridia and archegonia develop, and produce the first cell of the sporophyte, the oospore.

The oospore does not, as in the lower plants, drop off and germinate, but begins to grow in the venter of the archegonium. It divides first into two cells by a transverse wall—the basal wall—at right angles or obliquely to the long axis of the archegonium; the upper cell, or the one next to the neck, is called the epibasal, the other, the hypobasal cell. In some *Hepaticæ* this is followed by the formation of two walls which are at right angles to the basal wall and to themselves. These cells are called the quadrant and octant; while in other *Hepaticæ* and in the mosses, the division into octants is confined to the epibasal cell. The epibasal cell gives rise to the sporogonium, and the hypobasal gives rise to the foot, or that part of the bristle-like stem which penetrates into the tissue of the gametophyte and derives nourishment from it. (Fig. 2, A).

The cells continue to grow and divide, pushing their way upward and downward until they entirely fill the old archegonium (Fig. 2, B–C). This finally ruptures, either at the top, as in most *Hepaticæ* and some mosses, where the whole calyptra—the old archegonium—remains as a sheath (the vaginula), or it ruptures transversely into an upper and lower half; the latter remains as the vaginula, whereas the former is carried up as a cap on the capsule, the so-called calyptra (Fig. 3, A–a).

As I said before, the capsule originates from the epibasal cell, and as it progresses in growth, the tissue becomes differentiated into an external layer, or layers, of cells, called the amphithecium, which, in nearly all cases, becomes the wall of the capsule; and an internal mass of cells, called the endothecium. The spores are developed from a layer or mass of cells called the archesporium. In almost all *Hepaticæ* this includes the whole of the endothecium, while in some *Hepaticæ* and the mosses it is a layer of cells, either the outer layer of the endothecium, or the innermost layer of the amphithecium. All of these cells do not necessarily become spores. They may be either sporogenous or sterile; in the latter case they become spirally thickened and elongated into elaters. In those forms where the archesporium is a layer of cells, the internal mass of sterile tissue becomes the columella on which the spores are arranged.

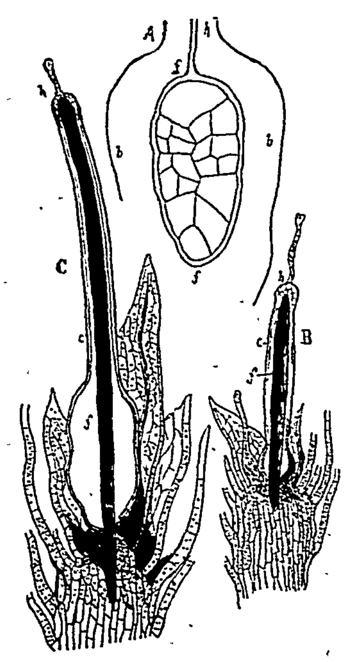
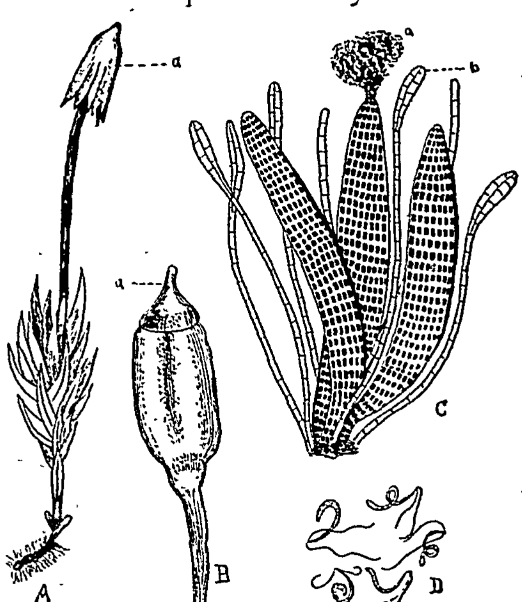


Fig. 2.

A, Development of the sporogonium (ff) in the ventral portion (b b) of the archegonium. B–C, different further stages of the development of the sporogonium (f) and of the calyptra (c); h, neck of the archegonia. This also shows cellular structure. (After Vines.)

Thus we find there are three kinds of reproduction in the mosses. The first, vegetative by budding; the second, sexual by antherozoids and oospheres; and the third by cells breaking up and forming a sexual spores. And it is in this group that we find the alternation of generation equally balanced: that is, the gametophyte is as much a part of the visible plant as the sporophyte. While in the *Pteridophyta* the gametophyte becomes small and in the *Phanerogamia* it becomes even microscopic—in these the sporophyte being the visible plant—in the *Bryophyta* they are equally developed, and can easily be distinguished: the gametophyte as a leafy growth, and the sporophyte as a bristle growing on the latter and terminating by a capsule enclosing the spores.

The group *Bryophyta* is divided into two classes—the *Hepaticæ* (Liverworts) and the *Musci* (mosses proper), which are closely related, but in external characters are separated by rather sharp boundary lines.



A, *Polytrichium formosum* in fruit covered with a calyptra. B, capsule somewhat magnified and with calyptra removed, showing operculm (a). C, paraphyses (b) and antheridia, one of which is emitting antherozoids (a). D, antherozoids highly magnified. (After Bastin.)

FIG. 3.

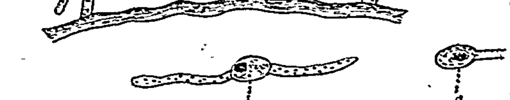
The *Hepaticæ* are lower in the classification of plants than the *Musci*, both in regard to number of species and individuals. They are found, as a rule, closely adhering to rocks and damp soil, being fastened by clasping roots called rhizoids. Their structure is very simple and also their growth. A spore germinates into a protonema, either filamentous, like the *Musci*, or, as is usually the case, a flat growth of cells. The adult shoot springs from the protonema, and is either dorsiventral or erect and leafy, when its symmetry is radial. It is usually a flat expansion with an upper (dorsal) surface, on which are found the reproductive organs, and a lower (ventral) surface on which are the rhizoids. But when it has leaves they are generally borne in two lateral rows on each side of the stem, with a row of rudimentary leaves on the ventral surface.

The organs of reproduction are borne on the dorsal side, and may be either scattered or in groups, or on a special modified branch called the receptacle. The fertilization goes on here; the oospore germinates, and the asexual spores are formed in a sporangium.

The sporangium remains enclosed in the calyptra until the spores are ripe. If a bristle be present it suddenly elongates, and ruptures the calyptra, which remains below as a vaginula. The capsule opens either by the decay of its walls, or, as is more often the case, by the splitting of the walls, from the apex downward, into valves; in some the capsule opens by a lid which falls off from the top.

As a type of the *Hepaticæ* I will take *Marchantia polymorpha* (Fig. 5, A–B), the most common, and also very characteristic of the entire class. It may be found almost anywhere, lying flat on stones, moist ground, and decaying logs. It is a very small plant, scarcely more than two or three inches long, or more than one-half inch wide, while the sporophyte never rises higher than one inch, and more often less. The spore, on germination, gives rise to a short, unbranched filament which develops at its apex a flattened cellular expansion, from the margin of which springs the adult shoot as a lateral branch.

The adult shoot is undifferentiated into stem and leaves, and is dorsiventral in symmetry: that is, it has an upper and lower side. On the lower side are found numerous small root-hairs, and also scales which are arranged in two rows. The upper surface bears the reproductive organs which are on short stalked receptacles. This plant is always diœcious: that is, the antheridia and archegonia are found on different plants. The involucres are alternate with the rays of the archegoniophores, are membranous, and irregularly cleft, as if torn, enclosing from three to six, one fruited, cleft, sac-like involucres of the archegonia. After the oosphere has been fertilized the sporophyte develops. The calyptra does not rupture, and contains a globose capsule which opens by several segments rolling back from the apex. The elaters are long and the spores smooth.



Germinating spores and protonema of mosses. a a, spores in different stages of development; b, filaments of the protonema; c, bud on protonema destined to develop into leafy plant. (After Bastin.)

FIG. 4.

In the *Musci*, the protonema is more conspicuous; it sometimes persists until the sporangium is ripe, and in some cases it remains from year to year. It is usually filamentous, but sometimes it is a flat growth. The adult shoot arises from a lateral bud of the protonema, and is always differentiated into the stem and leaves. In most cases the adult shoot presents no differentiation into the vegetative and reproductive portions, but in some genera this is to be found. In all cases the reproductive organs terminate the growth, and are usually found in a cluster of leaves like a flower, technically called perithætium.

The antheridia and archegonia are usually on different shoots, and sometimes grow on plants far removed from each other. Intermingled among the reproductive organs may be found numerous hairs, called paraphyses (Fig. 3, C b). The function of these appears to be that of secreting water in order to assist the process of fertilization.

The sporangium usually has a central axis, called the columella, and the spores are therefore developed from the external portion of the endothecium, or the inner portion of the amphithecium. They open by forcing off the lid at the top or by splitting, and even by decay of the walls. A very remarkable characteristic of this group, is its capacity of vegetative propagation, both as to the gametophyte

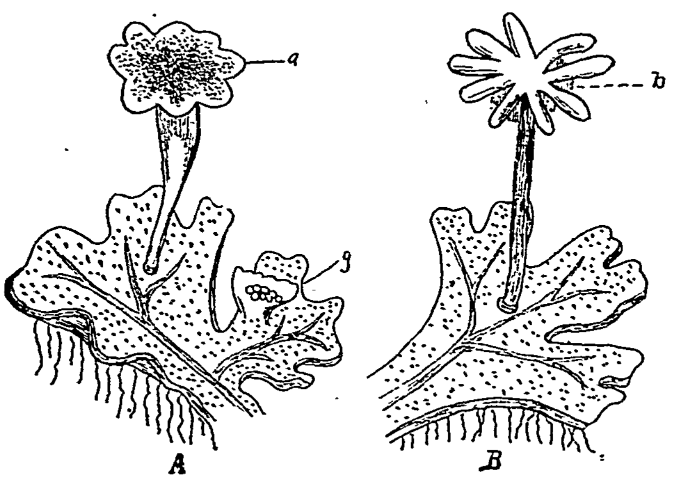


FIG. 5.

Marchantia Polymorpha. A, portion of the thallus bearing stalked receptacle (a) producing antheridia. B, portion of the thallus bearing stalked receptacle (b) with sporangia on under surface of rays; g, one of the receptacles with gemmæ. (After Bastin.)

and the sporophyte. It has been ascertained by experiments that if a portion of the capsule, or of the bristle—while the cells are still living—be kept under favorable conditions, the superficial cells will grow out into protonemal filaments; and thus we may obtain a gametophyte from a sporophyte without spores. When this occurs it is a case of Apospory.

For an example of the *Musci* I will take the *Polytrichium formosum* (Fig. 3, A), a very common plant which may be found almost anywhere in a comparatively moist soil. It grows from two to four inches high, its lower half being the gametophyte, and the upper bristle-like stem, with the capsule at the top, is the sporophyte. Much of the growth of this plant has already been described, as it is very characteristic of the class. The spore germinates into a branched filament, the protonema, and buds develop, from which the leafy gametophyte grows. At the apex of this, and terminating its growth, are found the antheridia and archegonia, but on different shoots: that is, the plant is diæcious. The antheridia are club-shaped, intermingled with hair (paraphyses). The archegonia are flask-shaped, and are also intermingled with paraphyses. After fertilization, the oospore germinates and grows into the bristle-like stem with the capsule. The calyptra ruptures transversely, part remaining below as the vaginula. In the capsule, the tissues are differentiated into the outer coat, the spores and elaters, and the columella. It is covered by a lid, the operculum, and when this is taken off numerous cilia-like bodies of a red color project outward and form the mouth of the theca; these are in two rows, the outer and inner peristome (Fig. 6).

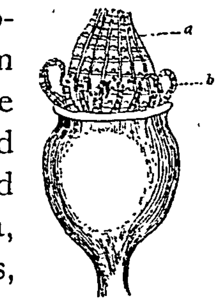


FIG. 6.

Capsule of one of the *Bryophyta*, with calyptra and operculum removed, showing the double peristome; a, inner, b, outer, peristome (After Bastin).

Comparing generally the *Musci* with the *Hepaticæ*, we see that, however great the variety of the forms are, they still form two connected series. In several of the subdivisions of the leaf-bearing mosses, conditions occur which remind us of the *Hepaticæ*. The simplest *Hepaticæ* make a near approach to the *Algæ;* the different classes, genera, and species bear a close relationship to each other; and while there is quite a chasm separating the mosses from the ferns, yet there is some resemblance which can be traced through their peculiar life history.

MELANCHOLY PLEASURES.

LET others sing, 'tis mine to weep.
I do not envy them their joy;
I will not sicken at their joy;—
Be't theirs to live in pleasures deep.

Let others thrive with blood and nerve.
I do not covet place or power,
I will not rail against their power:—
Be 't theirs to rule, 'tis mine to serve.

G. W. E.

Our Bacteriological Laboratory.

W. BURNETT WEAVER, '97.

Only a few years ago the study of bacteriology was unknown even in the best of educational institutions, for that science is of very recent origin; however, no school of science, worthy of the name, can be today without a well-equipped laboratory of bacteriology.

The bacteriological laboratory at Notre Dame is ample, and contains all the necessary apparatus for an extended course in this study. The space allotted to the study of this science is a room about sixteen feet by thirty, and is on the ground floor on the south side of Science Hall. The apparatus used is of the best and latest design and has been furnished by the Bausch & Lomb Optical Company of Rochester, New York.

For the benefit of the readers of the SCHOLASTIC, who are not initiated in the secrets of bacteriology, it may be of interest to learn something of the apparatus used and the methods employed in acquiring a thorough and practical knowledge of those minute forms of life that play such an important part in modern medicine.

In the laboratory it is essential that all culture media and glassware should be sterilized: that is, free from all living bacteria. To do this, two methods are employed—sterilization by dry heat and sterilization by moist heat, that is, by steam. The former is effected in an oven where the temperature can be raised to a high degree, and the latter is carried on in a steam sterilizer of peculiar construction, and the temperature is only 100° C. or a little above. The application of the dry heat is limited to glassware which is exposed to the temperature of 160°–180° C. for one hour. This destroys all living organisms which may adhere to it. With the use of steam the case is different, for the objects to be sterilized are usually of an organic origin, and by an excessive application of heat, such as 160° C., they would be materially damaged.

The method of sterilization depends upon the differences of resistance towards heat which the organisms that are to be destroyed possess. There is a time in the life of many bacteria in which the organisms resist the action of both chemical and thermal agents. This is during the spore or resting stage, but in the growing or vegetative stage they are easily killed. These conditions are taken advantage of in steam sterilization by the intermittent method: that is, they are subjected to the temperature of 100° C. for one hour a day for three or four successive days. To do this it is necessary that the conditions of temperature, nutrition and moisture, which favor the bacteria while in the vegetative form, and also favor the germination of the spores that are present, should exist. By the first application of steam the mature vegetative forms are destroyed. Those which resisted the heat by possessing spores by discontinued heating and under proper conditions will favor the germination of the spores in about twenty-four hours, to the less resistant vegetative cells. A second exposure will kill those in turn, and by so repeating the operation all will have been killed. In substances where the conditions for the growth are not favorable the intermittent method is used, but at a lower temperature and more exposure. Chemical sterilization is used only in rendering infected waste materials free from causing further infections. After the cleaning and sterilization of all the glassware, etc., the student prepares the culture media, of which the essential part is beef-tea or bouillon.

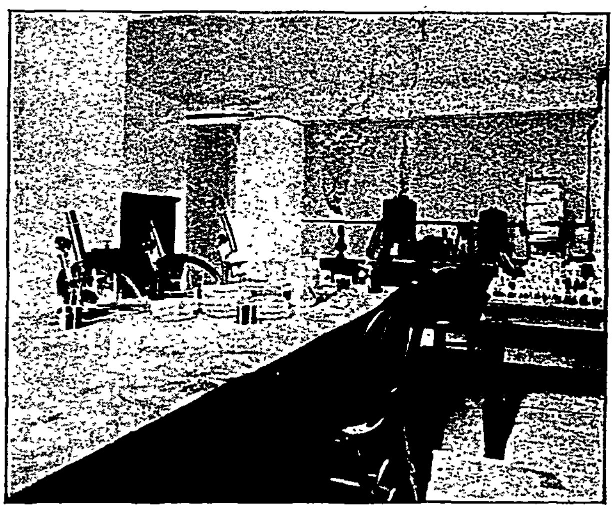
Agar-agar and gelatine are two forms of gelatine used as media. The former is of a vegetable origin, the latter of an animal. The greatest difference as to their application consists in their behavior towards heat. The agar-agar is used where the temperature must be raised above that at which gelatine remains solid; another difference lies in the relation the two gelatines bear to bacteria. Many forms liquify the gelatine; but no known bacteria effect such a change in agar-agar. Gelatine shows, also, more characterized colony formation.

Potato, milk and blood serum are other forms of media, of which blood serum is the most useful; for it is indispensable to the growth of some forms. All these media are used to recognize the different species from the characteristic growth produced.

After the media have been prepared they are placed in test-tubes and plugged with cotton. The amount of fluid media used must not exceed 10 c. c. Potatoes are cut in cylinders, and, the cylinders are cut to afford them a slanting surface. While still liquid they are left to harden. This is for the so-called slant culture.

The plate method may be called the foundation for all others. Both agar-agar and gelatine are used. The plates which are known as Petri dishes are flat, double dishes of glass, measuring 8 cm. in diameter and about 1.5 to 2 cm. in height. They consist of a flat dish with a cover. We first take "a set," which consists of three dishes, each being known as plate 1, 2 and 3. Three tubes of agar-agar or gelatine are placed in warm water to liquify. If a gelatine tube be used the water must not exceed the temperature of 35°–40° C. For agar-agar 41°–42° C., otherwise when bacteria are subsequently inoculated they would be killed by the heat.

We now leave the medium liquified. A very small portion of the organism to be examined is taken up with a sterilized, looped platinum wire, which consists of a piece of platinum wire fused into a glass rod. The organism which we have on the platinum loop is transferred into tube No. 1, where it is carefully mixed so as to diffuse through the whole of the medium. The loop is then sterilized and three loopfuls of No. 1 are passed into tube No. 2, where they are again mixed. Again the loop is sterilized and again the three dips are made into No. 2, and then transferred to No. 3. It must never be forgotten that the loop should be sterilized once more before laying it aside. If agar-agar is used the work must be done quickly.


LABORATORY OF BACTERIOLOGY.

The medium from tube 1 is poured into dish 1, tube 2 into dish 2, and so on, care being taken that the fluid is spread evenly. These are allowed to stand in a temperature between 18° C. to 37.5° C., if saprophytic; but in the case of the pathogenic, or disease-producing organism, there must be a place provided for them so as to develop their growth more readily. This can be done only by a constant temperature. This temperature, which is that of the body (37.5° C.), is arrived at by means of the incubator. This brooding oven consists of a copper chamber with double walls. Between the walls the space is filled with water which keeps all the parts of the apparatus at an equable temperature. The outside wall is covered usually with asbestos so as to retain the heat. In the top is an opening through which a thermometer is projected into the large chamber in the interior. There are other openings for the reception of another thermometer and a thermo-regulator which lead into the water chamber, and a water-gauge at the side to show the amount of water between the walls. A small gas flame burner is used with the thermo-regulator. This consists of a glass cylinder with a communicating tube running from the side just below the top opening. The gas is supplied through this tube at the top. This the tube projects nearly to the mercury at the bottom of the cylinder, and is ground to a slanting point at the extremity. At a little distance above this slanting opening is a small hole or capillary opening. The gas passing through the tube at the top streams into the cylinder and out the side tube to the burner. As the temperature rises the expansion of the mercury at the bottom of the cylinder gradually closes the slanting opening; the gas supply becomes diminished, and the temperature again is lowered. The supply of gas will now pass through the capillary opening, so as not to shut off the gas entirely. At the side of the cylinder there may be a screw to regulate the mercury. Considerable care is necessary in order to have all this adjusted so as to maintain a constant temperature in the incubator, which must not vary one degree of heat.

The agar-agar plates which have been prepared are placed in the incubator, and those which are left to grow at the temperature of the room are ready for examination in from twenty-four to forty-eight hours. Taking up the plate to be examined we find it to be dotted here and there with small points. Roughly examining them with the naked eye, we find some to be dense or opaque, while others will be so transparent that the naked eye can see them only with difficulty. Some are irregular in outline and some are sharply circumscribed. Some will be of one color and some again of another. In gelatine some will form deep pits and contain fluid; others will be seen to lie on the surface. But to examine these colonies, as they are called, under a low power of the microscope they seem quite different. Some appear finely granular, others coarse. Here we may find one having a concentrated margin or centre. Some of the margin will become dentated, another is homogeneous throughout. All these differences must be remembered when we take up a certain colony to be examined.

With the pointed platinum needle sterilized, a bit of the colony is taken up and introduced into a sterilized agar-agar or gelatine tube. Care should be taken that the platinum needle and handle be properly sterilized, and we should guard against touching the sides of the test-tube in passing it into the tube and out again. Such an inoculation results finally in a "pure culture."

In the stab or smear culture a tube with a sterile medium of gelatine, agar or potato is taken up, and held in the palm of the hand horizontally with the mouth pointed towards the worker and between the thumb and index finger; with the other hand holding the needle, the cotton plug is removed by a twisting motion with usually the index and second finger in such a way that the part of the plug which fits the mouth is pointed away from the worker when the palm of the hand is towards him. The needle containing the bit of colony is now introduced into the tube without touching the sides. If a smear culture is to be made the needle must be gently drawn over the surface of the media; if a stab, thrust the needle into the media. The tube is labelled and set aside for examination. In this form they can be kept for a long time. By their characteristic growth many bacteria are recognized. If gelatine is used, liquefaction occurs in all the upper surface and sometimes continues gradually downward to form in a funnel shape. In agar the case is different. Liquefaction does not take place. The growth is all along the needle track or at the beginning. The growth along the needle track presents variations, such as gas bubbles, which also mark the character of the bacteria.

In making a qualitative test of water many precautions are to be observed. The sample, when taken, should be collected so as to exclude all organisms from any other source. The water from a spring should not be taken from the surface but at a certain depth below. If taken from a hydrant, the water should be collected after it is let run for a half hour or so. The vessels in which it is collected should be thoroughly cleansed and sterilized, and the plates made as soon as possible after the collection. From one to five drops are sufficient for the qualitative analysis, but in quantitative a definite volume must be employed so as to know the number in a specified amount of water. After they are developed the plates are examined and compared. Those kept at a higher temperature are compared with those at a lower temperature so as to determine which have the greater number of colonies. We find, as a rule, that the greater number appear on the plates kept at 18° to 20° C. The pathogenic forms grow better in a higher temperature.

To distinguish these forms, each colony should be isolated. This process is very much the same as a quantitative analysis excepting that a definite amount of water is taken so as to ascertain the number in the volume of water used. We should have a fixed volume of water so as not to have the colonies too numerous to be accurately counted. This is usually done by making a preliminary plate with one drop, two drops, 1 c.c., 5 c.c., 25 c.c., of water. These are left to develop and are then examined the one containing from 200 to 300; the same amount of water that was used in making the plate is used. If the original water contained too many, as in the case of one drop, this is diluted with sterilized distilled water. This dilution must be reckoned, and therefore should be accurate. After the colonies have grown they are counted by means of a Wolfhügel's counting apparatus. This apparatus consists of a flat board in which is placed a white or black plate so as to form a background for the plate placed on it. The gelatine plate is now in position; a glass plate, consisting of ruled square centimetres and subdivisions, is held in position by blocks. This is brought over the gelatine plate, which is now moved to the centre. The number of colonies in each square are then counted and the sum total in the areas gives the numbers of colonies on the plate. If the colonies are too small a small hand lens may be used.

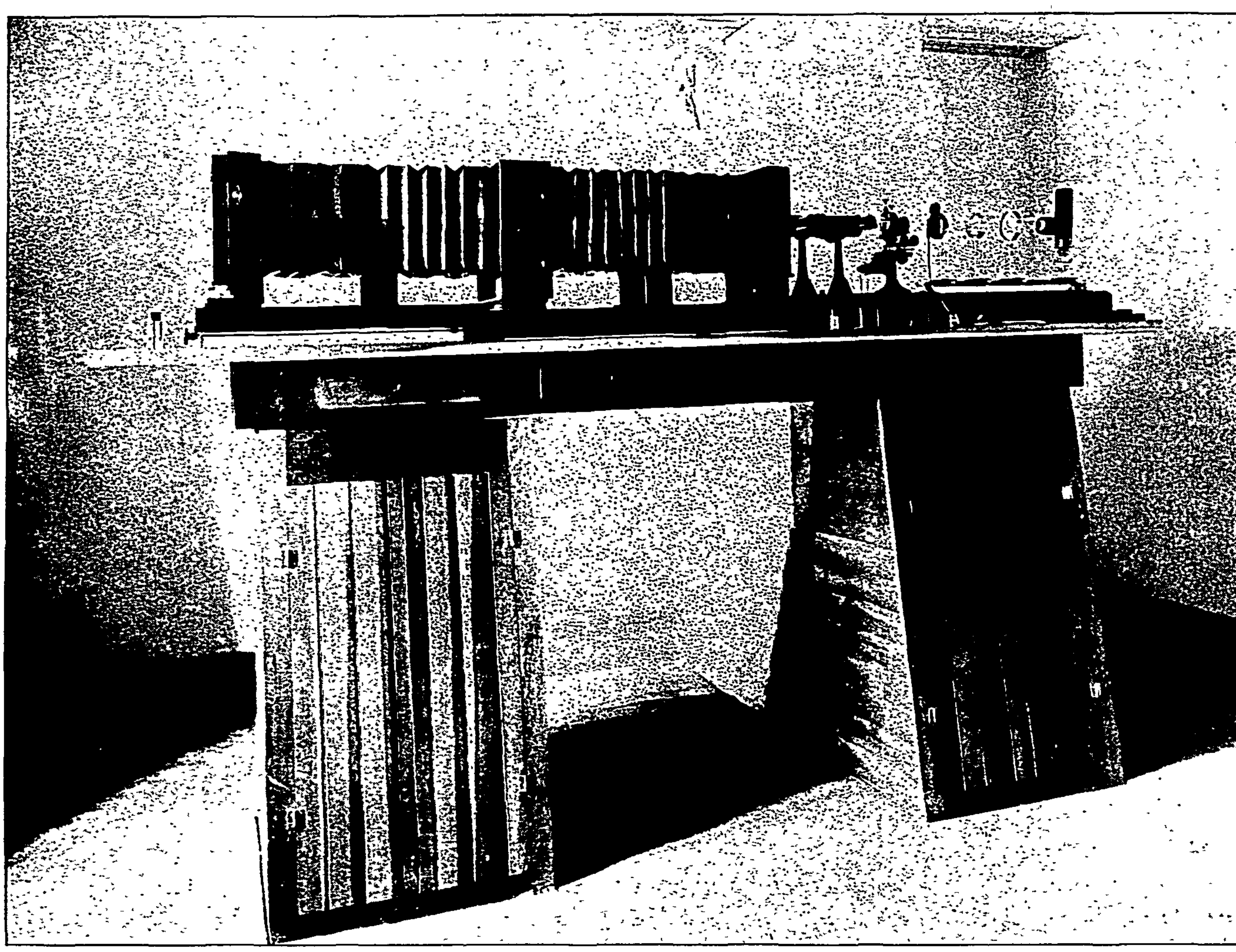
In preparing bacteria for microscopical observation the first thing to do is to properly stain them. The list of stains used are too many and can only be known by referring to a text-book. Watery solution of basic aniline dyes, fuchsine, gentian violet and methylene blue are commonly employed. Not all bacteria stain alike, nor do all bacteria retain the color the same. In a few words it may be summed up: to atain the bacteria which you have in question, and to decolorize those which you do not wish to stain

Photo-Micrography.

WILLIAM A. FAGAN, '97.

One of the greatest achievements in modern photography was accomplished when the first highly sensitive dry plate was sent out on its mission. Its use enables us to obtain an exact image of the lightning flash, the swiftly trotting horse, the surging waves, and numerous other swiftly moving objects. In fact, there is no phenomenon in nature that may not be reproduced in a photographic image, and we cannot foresee what manifold applications this new method of photography will find in the future. No wonder, therefore, that all branches of education press this art into their service. Chemistry and Physics use it mainly in connection with the spectroscope and polariscope.

The anthropologist finds it a most valuable aid in reproducing and retaining the types and peculiarities of different races and individuals. The ornithologist recognizes it as an advantageous method of studying birds, reproducing them as to form, habit, manner and mode of living. The astronomer attaches the photographic camera to this telescope, and from the images thus secured most of the maps and charts of the heavens are made. At the same time he obtains views of the stars and planets in their various positions during the different seasons of the year. Finally, the biologist finds it, in all its applications, one of the most powerful auxiliaries in making his observations not only permanent, but more especially accurate. Of late years one of its applications—the reproduction of the minute structure of nature by a photographic image,—has received marked attention.



The necessary apparatus for such work consists essentially of a miscroscope, a camera and a suitable source of light. By the proper combination of these three elements any one may produce an image of the most minute structure of both plant and animal. It is true that good work has been done by using an ordinary miscroscope, capable of being inclined to a horizontal position, and connecting with it a camera with suitable light; but to secure the best results, and especially with critical objects an apparatus constructed solely for this purpose must be procured.

The Biological Department has gone through all the stages of development in this line. The first apparatus was the simplest one possible.

PHOTOGRAPHIC LABORATORY.
(*Dark Room*).

The second stage was reached when the Walmsley Photo-Micrographing camera was devised. But in these two instruments the mechanical arrangements were at fault, and the Walmsley also proved unsatisfactory. German cameras were studied; but they, too, were not constructed properly in regard to the mechanism. The Bausch and Lomb Company, of Rochester, introduced an apparatus which was constructed solely for the purpose of Photo-Micrography. It was set up in the Laboratory of Photography, and was used for four years; but after trying all manner of appliances it was found to be lacking in its mechanical appointments. The principle was the correct one, and an entirely new apparatus was designed which should be perfect in every detail. This is the one now in use in the laboratory. It has been in use during the past two months, and perfectly satisfactory results have been obtained from every exposure. This instrument is called the "Complete Photo-Micrographing camera with Rafter Attachment."

The space set aside in Science Hall for work in photo-micrography includes three rooms.

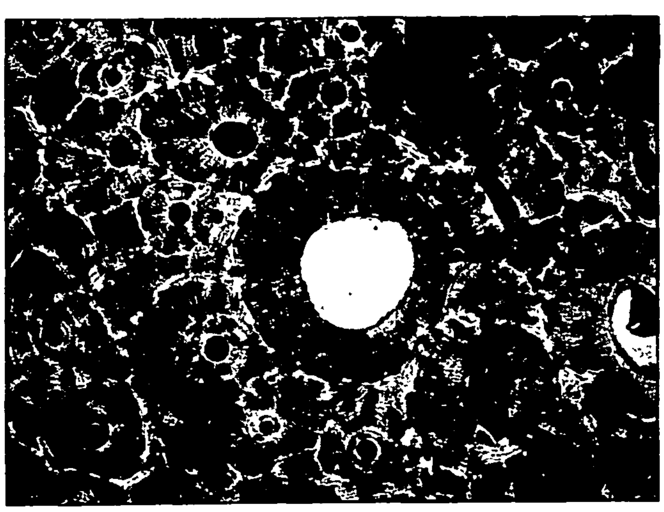


PHOTO-MICROGRAPHY-CROSS SECTION OF HUMAN BONE.

Illustrations are given of the operating and dark rooms. The operating room is arranged, as shown by the cut, to contain only the apparatus. It will be noticed that it is mounted on a specially constructed stand; the room being in the basement, the apparatus is entirely isolated. The floor has been cut out, and piers have been constructed for the two pyramidal bases to rest on. This secures the apparatus from any tremor caused by movements in the Hall or even in the room. Extending from one pyramid to the other is a box about ten feet long into which slide the drawers containing the accessory apparatus.

Looking at the illustration the reader may see arranged from left to right the following parts of the apparatus: First, the illuminant—a Wellsbach gas-burner with dark chimney and bulls-eye condenser. Next in order is the bi-convex condensing lens, then the light filters and iris diaphragm shutter; this con-

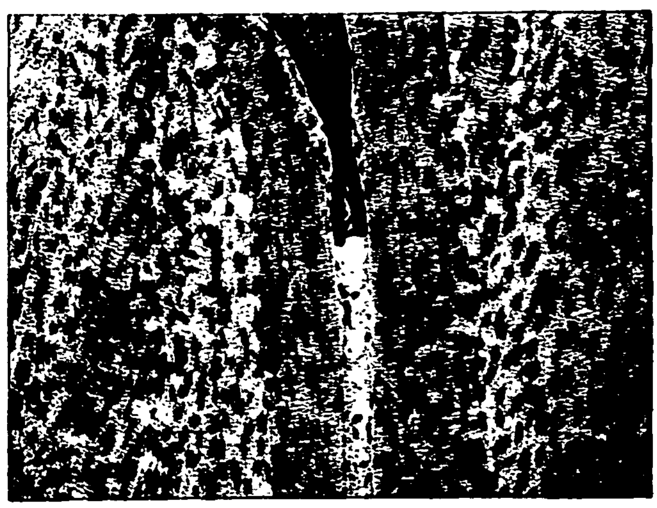
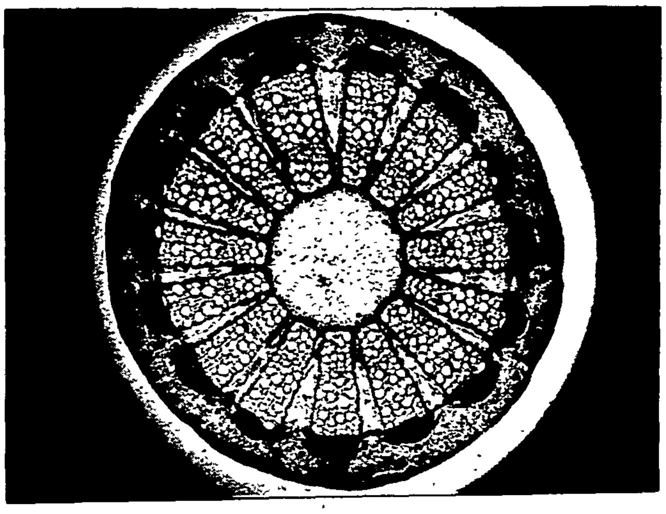


PHOTO-MICROGRAPHY LONGITUDINAL SECTION OF HUMAN BONE.

stitutes what is known as the optical bench. Next comes the microscope stage with sub-stage attachment. They are mounted separately, both work by rack and pinion, and have centring arrangements, and are of the most useful and absolutely necessary mechanical devices.

The "Rafter Attachment," immediately after the microscope stage, is the most convenient apparatus for doing work with both high and low objectives. A detailed description would take up too much space; suffice it to say that nothing can take its place for convenience and satisfaction in the most difficult problem of Photo-Micrography. The "Rafter Attachment" enables the operator to use at will either an ordinary eye-piece or a specially constructed projective eye-piece, or the objective alone, or, what is possibly the best arrangement—an amplifier. Finally comes the Complete Photo-

Micrographic camera. This camera is complete, for it is so constructed that it may be used also for copying, enlarging, reducing and lantern-slide work. Moreover, the mechanism of the whole apparatus is so complete that



everything can be kept under perfect control with very little difficulty. In a practical demonstration this is shown to great advantage.

To render the apparatus useful in other lines there are various accessories, that may be used to produce different effects, such as the polariscope, colored glass slips and neutral tinted discs to be inserted into the Abbe condenser. With the polariscope there were made, only a few days ago, a series of negatives of crystals of chlorate of potash, using in their production various selenites and different positions of the polarizer. As a bit of color-study there are few negatives of this kind that can excel them.

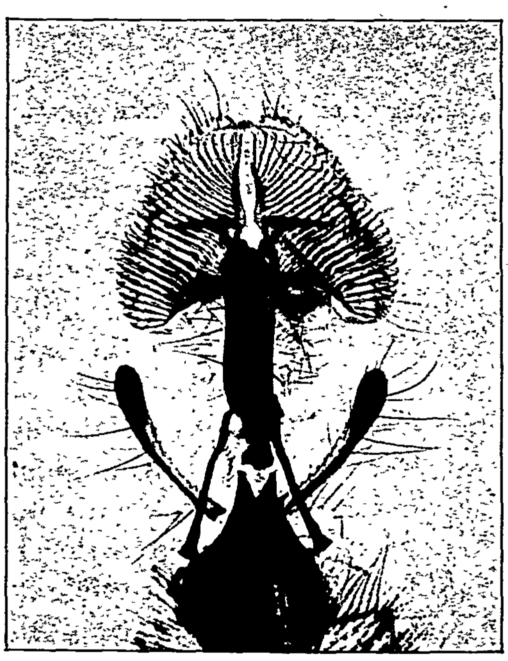


PHOTO-MICROGRAPHY. TIP OF THE TONGUE OF HOUSE FLY.

It is intended to have a spectroscope manufactured which may be inserted into the substage, thus enabling the operator to use any of the seven colors of the spectrum for projecting the image of the object on the ground glass. From all this it may be seen to what a multiplicity of uses the apparatus may be adapted.

The dark room, about the same size as the operating room, is admirably well arranged. One half of it is shown in the illustration, and it may be noticed that there is a complete outfit for developing, washing and drying the negatives. The different chemicals used are within easy reach, and, since most of the work is performed in almost total darkness, their positions must necessarily be in systematic order. A third room is used for lantern-slide making and the arrangements are rather unique. There is, for example, a stand by which the camera may be placed vertically, thus enabling one to copy drawings or illustrations from books and dissections from life.

In conclusion, we may say that photography in all its branches and applications forms a part of the biological course. The student learns practically all that is required from the first lesson in putting up a camera in position to making skiographs by means of X-rays.

Botany.

Few studies are of greater value in a system of education than botany, and more so in a course which has for its end the training of those powers of observation and experiment that are, so to speak, the foundation of science. No wonder, therefore, that a great portion of time in a course of biology is devoted to the acquisition of a thorough and practical knowledge of botany.

The course occupies two years; and consists, first, of a thorough study of elementary botany. This is divided into four branches, comprising the morphology of plants, the minute anatomy of histology, plant life or physiology, and the general classification.

The morphology of plants, as the word implies, gives us the form of the different organs which go to make up the plant. It begins with the root, and, after teaching us their uses, modifications and classifications, it passes on and does likewise with the stem and leaves. Since the flowers are the most important in the classification of higher plants, it dwells upon this subject more extensively, and takes up the different parts of which it is composed. After this it passes on and defines and explains polinization and fertilization, giving the various kinds in different plants. Finally, it gives us a knowledge of the fruits and seeds, and shows us the peculiar ways nature has provided for their dispersion.

The minute anatomy, or histology, begins with the simplest form in which life occurs—the cell—since, in order to understand the various complex structures of the tissues, we must have a complete knowledge of what they are composed. It treats of the cell-wall, protoplasm, nucleus, nucleoplasm, chlorophyl bodies, and the various other constituents of a cell. After obtaining a sound foundation, we gradually work onward, taking next the combination of cells, so as to form tissues, and the various series of tissues, named according to their structure and function. By this time we have a practical knowledge—for most of this work is done in the laboratory—of the different tissues found in a plant; and we then study the tissues according to the organs in which they are found, beginning, as in morphology, with the root, and studying successively the stem, leaves and flowers. But in order to study histology we must have a microscope and know how to use it. Therefore we also learn here the parts of a microscope, their use and the accessory agents used in a microscopical analysis of plants.

Whereas morphology and histology treat of the gross and microscopical forms of the organs of plants, vegetable physiology treats of these organs with regard to their function. As in histology, the cell is the foundation upon which all future study is based, so in physiology it is the starting-point, since it is the simplest form in which life is found; therefore, the study of vegetable physiology naturally begins with the study of the properties and attributes of protoplasm. After this we learn the functions of the various organs, and finally of the plant itself, as a whole, in regard to its constituents, food and how it assimilates it, the influence of temperature and light on its life, its movements and its reproduction.

The fourth and last subject which we consider is the classification of plants. There are two modes of classifying plants as well as animals: according to some characteristics which they possess, either in their structure, form, or number of parts, which is called artificial, or according to their genetic relation. The latter is very difficult, since the species, and even the genera, vary so much and appear so widely separated. It is endeavored in this part of elementary botany to give the student, as far as possible, a practical knowledge of the classification, partly natural and partly artificial, now used by the best authors.

In the second year is taken up a course of advanced botany. This goes more into detail of structure and dwells more on the principles which govern plant life. There are many experiments performed in the laboratory illustrating the evaporation of water from plants, effect of light and heat, various food of plants and their effects, irritability, structure, tissues, and so forth. The classification is also more thorough, and dwells principally on the flowerless plants. It is here that a complete study is made of the extensive herbarium in our museum, which includes almost every species of plant found in the United States, and some from foreign countries.

Such is a brief outline of the science which treats of what is most beautiful in nature. The starry lights set in the heavens, the feathered songsters of the air, all have their place in nature; but none are so sublime as the sombre forests, the groves which were "God's first temples," and the flowers which perfume the breezes of spring. And thus, while the botanist is a utilitarian, he is also an artist, and realizes to the full the words of the poet,

STUDENTS AT WORK IN THE BACTERIOLOGICAL LABORATORY.

> "To him who in the love of nature holds
> Communion with her visible forms, she speaks
> A various language."

He learns to study and love nature, and obtain from her the secrets of the past when the now stunted fern was the queen of the forest; and we learn to appreciate the vari-colored flowers and the beautiful grasses, not only because they constitute the glory of the summer landscape, but because of their indispensable utility to animals and man.

J. R.

Comparative Anatomy.

WILLIAM W. FITZPATRICK, '98.

Before attempting to master the mysterious and more complex form of the human body, the student of medicine should endeavor to acquaint himself with the structure and morphology of the various animals found in nature. Perhaps, by one not specially acquainted with this subject, it would readily be imagined that every species of animal now in existence has a special structure to itself and not shared by any other. This, however, is far from being true, no matter how great the apparent amount of diversity among animals may be. All animals may be arranged under no more than six primary morphological plans of structure; differing, it is true, some one from another in their scale of organization, yet all agreeing in being formed upon one and the same definite plan.

To compare the structure of one animal with that of another, noting the modifications of the various organs, explaining and confirming some of the theories of evolution, is none other than the study of comparative anatomy—the foundation of human anatomy, which is the corner-stone of medicine.


CLASS OF COMPARATIVE ANATOMY DISSECTING A HORSE.

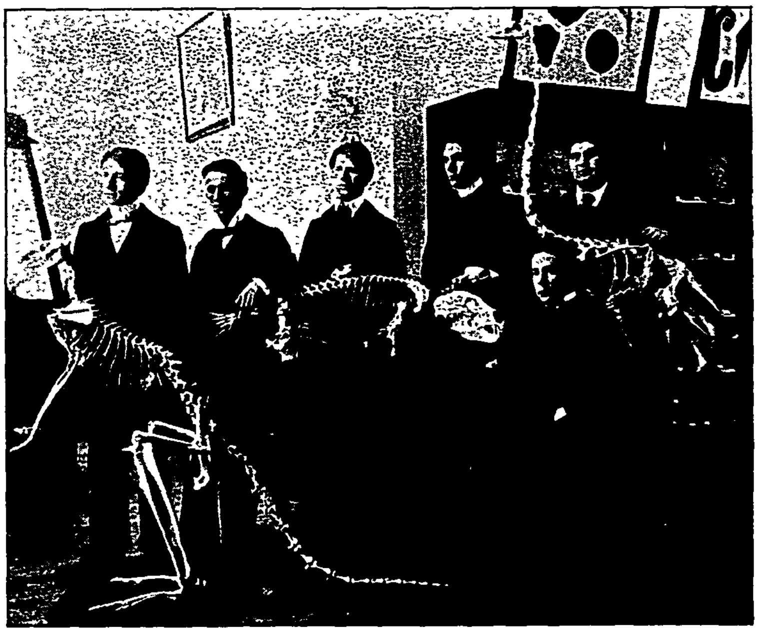
By such knowledge the student's idea of life is broadened, his conception of the once unexplainable forms that inhabit the earth is widened as, by degrees, he sees the change in all animals, from the perfect to the more perfect, each striving to attain that degree of perfection which will enable it to compete more successfully with its fellow companion in the great race of life.

The first step as a preparation for this great study is a course in Elementary Zoölogy. Here the beginner gets a faint glimpse of animal life; and, like a ray of sunshine first penetrating the dense foliage of a Southern forest, sees for the first time the beauties of nature hidden therein. Here he gets a general survey of the animal kingdom, from the lowest form of life—the simple mass of protoplasm—to the higher and more complex vertebrate. But a step farther, and he arrives at the threshold of Advanced Zoölogy. This study leads deeper and more extensively into animal nature, the children of the forest and the deep; it treats of their habits, structure, name and classification. It is here that one begins to realize the necessity of a natural classification, and that the task of arranging a proper one, extremely easy as it was at first supposed to be, is in reality one of the most difficult problems yet encountered by the scientist.

Zoölogy, then, is, indeed, to a student of medicine a science of the highest importance. Not only does it assist him in his material welfare, but it also secures for its faithful followers a spirit of earnest research and inquiry; trains the mind to vigorous and logical thoughts, and, dealing, as it does, with the highest expressions of matter, gives us an insight to the thoughts of the Creator through His creatures.

Comparative Anatomy and Zoölogy are so interwoven that the mere mention of one necessarily implies the other. But to know and pursue the study of Comparative Anatomy properly, the knowledge of zoölogy is indispensable. The latter deals with the habits, structure, external form, and the value or injurious effects of animals to man. The former, taking these structures, compares that of one animal with that of another, explaining the analogies and homologies existing between the various organs, and the cause of the modification as best suited to their possessor.

In the space of time, animals, being possessed of an internal tendency to vary, and influenced by external circumstances, in their structure and organs have undergone and are still undergoing great variations. On comparing the feet of the prehistoric horse with those of our present horse, a decided change may be noticed. The horse of the geological period possessed five toes instead of one; but, through the long ages of time one of these toes being used more than the others, it naturally obtained by constant use an abnormal size, while at the same time the other toes, being less frequently used, began to diminish, and so nearly have they become obliterated, that all that remains on the foot of the present horse are the two small splint bones of the remaining toe on which it now walks. But perhaps a more striking comparison, and one better suited, is that of the relation existing between the Ornithorhynchus of Australia, and the birds of the present. This extraordinary animal has the appearance of a small otter; its body is covered with hair, unlike a bird in this respect, yet it has a bill, rears its young from eggs, and is at the same time a mammal.



THE CLASS OF COMPARATIVE OSTEOLOGY.

How are these things to be explained? It evidently shows that there must be some relation existing between birds and mammals, and that this one single species is the only living demonstration that such relation does exist.

These problems are exceedingly difficult to explain, even with the help of Comparative Anatomy; yet they clearly show that in all animals there is a tendency to vary, either to a more perfect state, as in the feet of the horse, or, like the Rhizocephala, become so degenerated as to lose all animal characteristics whatever.

Since the time of Richard Owen, Comparative Anatomy has been given a high place in the natural sciences. It is this study that has forever made him famous in the scientific world. So thoroughly was he versed in this subject, it is said of him, that by simply taking the tooth of some animal he could readily describe its owner.

In Comparative Anatomy, evolution finds its greatest friend, for it was these two combined that have offered the only reasonable explanation concerning the derivation of the various species of animals existing on the earth today. It is Comparative Anatomy that assists Paleontology in classifying and arranging into proper groups the animals long unknown to man; and it is Comparative Anatomy that helps to stamp without a doubt the fact that the natural laws established by the Creator to control the animal kingdom are the same today as they were ages ago.

It is not enough that a medical student should know thoroughly only the structure and life of the human subject; for this is, in reality, covering a very narrow scope. His knowledge should extend to all life in general; for then, and only then, will he be able to comprehend and understand the many phenomena his profession must necessarily bring him in contact with.

Our Museum.

EDWARD B. FALVEY, '98.

It has often been stated here at Notre Dame that never again would there be a Biological collection like the one destroyed by the fire of 1879; but I feel safe in saying that, with the late costly collections secured by the University, the Museum of today, not only excels the former one, but is equal to that of any college collection. The greater part of the collection has been secured from Ward's Natural Museum and Scientific Establishment of Rochester, New York, which is undoubtedly the most famous, as well as the largest company of its kind in America, and a place where any form of animal, mineral and fossil specimens can be obtained. In the building of Science Hall, the plan made for the Museum could scarcely be excelled, and the sight presented to a visitor on entering is one to be proud of. The huge walnut cases, the broad stairway, the large fossil specimens—all tend to make the visitor wonder at the beauty of it all.

On the main floor, where are also the chemical and physical laboratories, is the Geological and Mineral Museum, where the various specimens of inorganic nature are represented, along with some of the rarest fossil remains of animal and plant life. Twelve huge cases, where shelf upon shelf of specimens are displayed, were insufficient to hold all the collection, and a circle of cases around the rotunda of the second floor was necessary in order to make a full display of the minerals. Underneath these cases, in the archway of the rotunda, are several fine specimens of deer-antlers and also a valuable stuffed head of that beautiful animal, the American Bison.

Ascending the broad stairway to the second floor we find ourselves in the Biological Department. One can scarcely realize the importance of its exhibits unless he is an initiated biologist; for, what the model is to the artist, that the specimen or skeleton is to the biologist in the study of the various forms of life. The museum is the biologist's library, wherein he can study the grand and complex volumes written in characters only legible to one that is well versed in the science of nature. Without the material, no matter how competent the student or learned the teacher, confused ideas will always reign; for the old adage, "seeing is believing," is one to be followed by the student of nature.

MUSEUM (WEST VIEW).

Another necessity, and one equally as valuable as the specimen, is a good library; and in this line ample provision is made by a careful selection of such works as will prove most beneficial to the student. On this same floor are located the different recitation rooms, also the large biological laboratory, with thirty fine microscopes, and all the necessaries for a well-equipped institutute of biology. The Botanical Department, though not large, is very complete, contains two Herbaria, one of the United States, and one of Canada, along with an almost complete collection of the wood and fruits found within the limits of the United States.

The large zoölogical collection excites the wonder and admiration of everyone, for all the orders of animals, vertebrates and invertebrates, are represented by typical forms, from the unmoulded, constantly changing mass of protoplasm to the highest form of life. The numerous invisible forms are studied by means of the microscope; but still many are represented by cases. Next in order comes the sponges, which are very important to the zoölogist, and here the various forms are found on shelves. Then comes the Hydroids and Corals, the wonders of the sea. The corals are very interesting on account of their forming the well-known Coral Islands. Passing to the next case we find the Echinoderms, or star-fishes and sea-urchins with the beautiful sea lilies.

The collection of shells is typical. The aim has been to have every genus represented by a number of its best species. Half a dozen Tridacne, each weighing about 150 pounds, are always looked upon with wonder.

The collection of crustaceans is fairly complete in its representation of orders and genera, and the principal types of ascidians are also included in this well-arranged and typical collection of marine invertebrate life. The vertebrated animals are not numerously represented, yet enough is found for the student in zoölogy.

The student of Comparative Osteology will find a number of skeletons representing every order from the lamprey to man. Finally, as a special feature of the plan of Science Hall, we may mention that all the class-rooms as well as laboratories open into the museum, and there are no restrictions to students to wander about and study for themselves the various forms of life that are explained to them in the lecture room. They may thus put in practice the knowledge they have acquired from the pages of bulky tomes, and by research learn for themselves what they could never learn from books.

Why Did Not Men Remain Barbarians?

Do not be surprised at this question and do not look for a scientific answer to it. For two reasons. In the first place, the question has often struck me as reasonable, and secondly, it is, to speak paradoxically, not an inquiry concerning the reasons affecting man's change of conditions, but rather a wish that barbarism might again become the proper thing.

Let us see what civilization is here around us, and contrast our present life with what it would be under barbaric conditions. Today we are forced to cover ourselves over with layer upon layer of "Gents' Furnishing Goods,"—refractory collar, high or otherwise; necktie to suit the prevailing fashion and to make your temper uneven; hat, if you are a society man or a turfman, with flats to rent, but if you're a mere presidential candidate or even a would-be congressman, with a plenty of room and to spare; waistcoat and coat for no other purpose seemingly than to supply places for your watch and letters; trousers to cramp your knees and to hold your silver dollars, that is, if you are fortunate enough to have any; shoes of any color and of any style—Gothic, Old Roman or Teutonic—for the sole purpose of growing corns; and many other useless and awkward articles to try the patience and make teem the pocket-book of civilized man. What a blessing not to contract tailor-bills and bad colds by the wearing and change of apparel! Score one for barbarism!

We are responsible in most things to our superiors. We must do this and that and act so and so for Mr. Such-a-one. Society is our great bugbear, always there to frighten us into becoming behavior and to make us stand erect with head thrown back and heels held at the angle of 45.° We must get up and go to bed within a fraction of the hour set by conventionality. We must eat three meals a day, each at a particular hour and these meals we must call by their given names. We must restrain our feelings when an enemy or a friend is present, lest we be called impetuous or enthusiastic. And all these things—duties or tasks, or whatever they have been named—we must do, or face the frowns of conventionality and the sneers, or worse, the pity of society.

Here is an instance in point: I must write an essay. It is hard to get a subject and almost as hard to treat it. I get my subject at last and thoughts come rushing upon me, till I am forced to cry, "Down!" I drag myself out of the scrimmage and retire behind the lines, from which I watch the game as it still continues. Now I can observe, with nicety and precision, each thought as he comes rushing on the one in front of him, and I make notes upon his actions. By and by the rushing is over and I collate and edit my notes. I am tired and much time is spent.

What would my barbarian do all this time? Perhaps the season is deep winter. He covers himself with his bearskin, straps on his snow-shoes, dons his beaver, shoulders his quiver and clasps his bow, and far over the white plains and the forest and the mountains and the valleys he roams. The grisly falls by his steady hand; the deer is at length brought to bay, or the boar tumbles lifeless in his last charge. The freedom of the waste is the hunter's; the bracing air, the cloudless sky (it never rains in the place I mention), the mellow sunshine,—all are his. He struts home loaded with his game, and kicks his dog or his wife, whichever comes within his path. This is life, where you are never dissatisfied with yourself and where instead of having to write essays you are at liberty to go out hunting. And this reminds me—but that is another story, and Kipling is still writing.

A. W. F.

Varsity Verse.

A TALE AND A MORAL.

A wayward youth of inquisitive nature,
(The former much less than the latter, alas.)
Quite unskilled in the strange nomenclature
Of bacteriology, suffered inflature
Of cerebral matter, alas!

He picked up a flask to show he was tougher
Than most boys who had any gumption, alack,
Took out the cotton and poked in his snuffer,
And now he is dead, the poor little duffer,
Consumed with consumption alack!

This story shows us
To keep our long noses
Away from *Bacillus Tuberculosis.*

B. W.

EXACTLY!

When sulphuretted hydrogen
Develops in an egg,
We know that the bacillus,
That looks just like a keg,
And his cousins, micrococci,
Who are so shy and foxy,
Are trying like the d——l
To change the chemic level—
Of the egg.

P. J. F.

The Study of General Biology.

FRANK J. POWERS B. S.

Biology is a science which deals with the phenomena manifested by living matter. The study of the forms of living things, of their actions, nutrition, surroundings, of their relations to one another and to the lifeless world, as well as many other topics lies within the scope of biology. The science embraces the two divisions of the living world called, respectively, botany, the study of plant life, and zoölogy, the study of animal life. The study of general biology, not the study of any particular branch of biological science, is the object. Such a course of study has been established to give a broad and general knowledge of the properties of living matter as they are revealed in the structures and actions of living things, and it is a foundation for a more extended study and research in this branch of science. The object of a course in biology is not, as is too frequently supposed, to serve as an introduction to the study of medicine. True, it is of great advantage to one intending to become a physician, because the study of life in all its forms is almost indispensable to the study of human life itself. The real object, then, of this course is that the mind be trained to observe the different kinds of living organisms, to compare them with one another, both animal and vegetable, and to apply the knowledge thus acquired to the properties of human life.

IN THE BIOLOGICAL LABORATORY.

The course, as pursued at Notre Dame, embraces, besides certain preliminary work, which occupies one year, three years' work: that is, it is begun in the Sophomore year and is continued till graduation. There are, of course, other studies, such as Chemistry, Physics, Geology, Logic, etc., which the student has to take up; and besides he is supposed to have a good primary education. In the Sophomore year the student, who has already in the Freshman year become familiar with the use of the microscope, examines some unicellular forms of animal and plant life and compares them with one another. This is the first step in the study of general biology. The student is then led to disprove for himself that ancient theory, so long held even by men eminent in the science, namely, the theory of spontaneous generation.

After he has acquired a fair knowledge of the relations existing between these lowest forms of life, he next proceeds to investigate the properties of multicellular plants and animals, and in turn compares these one with another, always advancing logically from the lower to the higher forms. As the student proceeds along these lines of study his attention is called to the fact that evolution—that is, the gradual development of species from pre-existing forms of animals and plants—must exist, as is shown, for example, in the relations existing between various species of Zoöthamnium—a genus of unicellular organisms. Various other theories also are discussed, such as the Biogenesis, Heterogenesis, etc. In studying the more complex forms of animal and vegetable life, such as Vermes and Mollusca of the animal kingdom, and mosses and ferns of the vegetable world, the student is enabled to obtain a more correct knowledge of the laws of reproduction—how the sperm cells and the germ cells are developed. To give the student a more practical knowledge, he must be brought into direct contact with the growth, actions, nutrition, surroundings and relation of one form to another, and thus special trips of research are arranged at certain seasons of the year, by which the student's memory is refreshed. To supplement this knowledge and to obviate the difficulty arising from the location, the inclemency of the weather and the natural inability of certain forms to be produced at certain seasons, the Laboratory of Biology is well and copiously supplied with specimens, both animal and vegetable,

Histology.

CHARLES JOHN PIQUETTE, '98.

No study excites more the admiration and astonishment of the student than histology, or the study of the minute structure of both animals and plants. We see the cells forming and arranging themselves into groups so as to constitute the great trees of our forests, or shape themselves into the complex body of man. Each cell takes its respective position and performs its special function, though so very small and invisible to man's naked eye. How could the simple masses of protoplasm become the heart, blood and brain of man, or the petals of the beautiful roses, if it were not by the hand of the Omnipotent Being? The more one studies this subject the more one sees how wonderful are the works of God.

Histology is a great science, and among the many branches of the Biological Course it holds a paramount position. The instrument *par excellence* for this study is evidently the microscope; but there are so many other forms of apparatus required that it seems almost impossible to give to the uninitiated even a vague idea about the instruments and chemicals necessary for a well-equipped Histological Laboratory. First of all, one must have a good microscope. Our laboratory was supplied with one dozen microscopes by Zeiss of Zena, Germany; but most of the instruments and other apparatus were procured from the Bausch and Lomb Optical Company of Rochester, New York. Besides the microscope, one has to become familiar with the other utensils and processes used, namely, the appliance of cover glasses and slides, the handling of dissecting needles, the cutting of sections by means of the microtome, the employment of the turntables, the manipulation of surgical knives and scissors, mounting media, stains, cleaning and fixing agents, cements, imbedding substances, and sundry articles used in preparing and mounting objects.

In our elementary course in histology, the student becomes acquainted with the microscope and many of the apparatus used; though most of the sections required are prepared by the professor. In the advanced course everything in the laboratory is at the student's disposal, and when he has finished the first year in elementary, and two years in advanced, histology, he should be able to make a section of any part of a plant or animal body.

The process of making mounts is not very difficult, and is very interesting to the biological student. The object, if it be animal tissue, is placed in alcohol until it becomes perfectly saturated, then it is removed to a solution of alcohol and chloroform to prepare for the imbedding in paraffin. The paraffin is heated in a water bath until it becomes a clear liquid. The object is then placed in it. The paraffin and object are now removed to a mould and allowed to harden. It is then made into the required shape and is finally ready for cutting. About five thousand sections can be made from every inch of the object. The sections are first placed in turpentine to remove the paraffin, and then in alcohol to get rid of the turpentine. Now they are washed with water, or they may not be, according to the stains, whether alcoholic or aqueous. Some stains color certain tissues and others will not; therefore, it is necessary to use two or more stains. The section is again washed with water and placed in alcohol, and finally in oil of cloves or some other cleaning agent. Now the section is ready for mounting. It is spread out on a glass slide as near the centre as possible. A drop of balsam is placed on this, and then the cover glass is applied. The mount, with a little care, will now remain permanent for years. A good collection of sections, taken from the various parts of the human body, will be very useful to the biological student, if he intends to study medicine. Histology is the foundation of anatomy, and by its means one is able to distinguish a normal or healthy tissue from a pathological form.

Signs of Spring.

The bluebird flits where boughs are bare,
A wingéd sapphire of the air.

A bobolink—the wanton wight—
One flash of fluting black and white,

Above the meadow skims along,
Filling all the world with song.

Upon the dew-starred, springy sod
The tender, half-oped violets nod.

Across the blue of heaven o'erhead
The flecks of fleecy cloud are spread.

An organ-grinder's 'neath a tree,
And "Annie Rooney" comes to me.

And when I hear his grinding drear,
I know that spring is really here.

F. W. O'M.

NOTRE DAME SCHOLASTIC.

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—The SCHOLASTIC is pleased to announce that the Reverend Maurice J. Dorney, LL. D., '96, the distinguished priest and scholar of Chicago, will deliver the Baccalaureate sermon on Sunday, June 13. The selection of Father Dorney for such an occasion meets with approval on all sides.

—We, the regular editors, have taken a short respite from our weekly labors and turned over, for the present issue, to the young men of the Biological course the SCHOLASTIC and all its appointments. They are scientists, as you may see from their articles; they are also poets and jesters and good fellows to boot. With this introduction we will leave you with our friends the "Biologs."

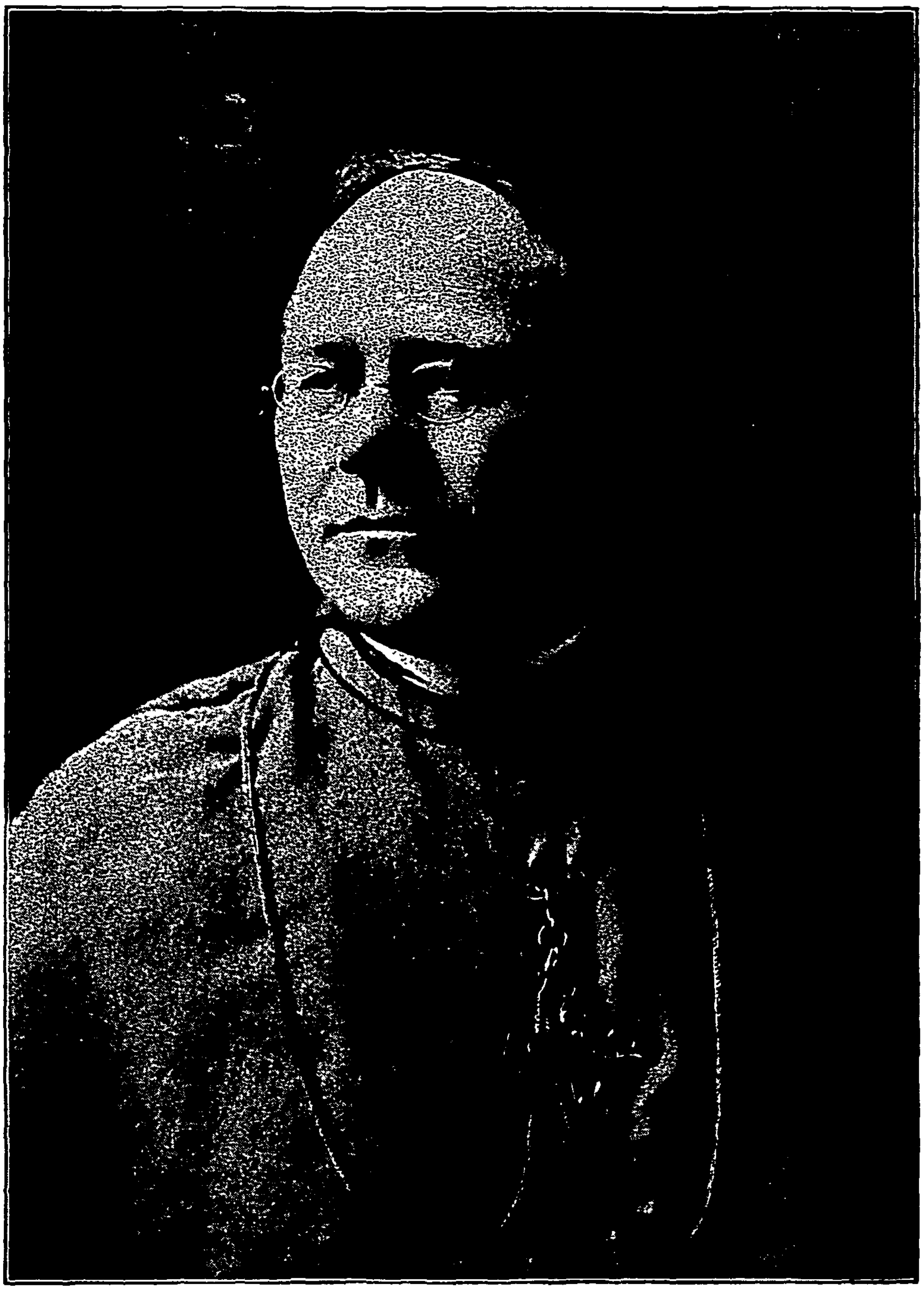
—For judges of the Oratorical Contest, which is to be held next Wednesday evening in Washington Hall, the Faculty have selected three very prominent Chicago men, that are themselves orators of note. They are: the Reverend Daniel J. Riordan, of St. Elizabeth's Church, the Rev. Hugh O'Gara McShane, LL. D., '95, and the Hon. Judge John Gibbons, LL. D. With these gentlemen as judges our young orators will feel confident of receiving careful attention and just appreciation.

First Communion and Confirmation.

Thursday, the Feast of the Ascension, was a day to be remembered at Notre Dame. Bishop Rademacher, the devoted pastor of the diocese of Ft. Wayne, was again among us. His presence brings new light, and each visit he pays us is a pleasure that too soon fades at his quick departure. He was here to administer the Sacrament of the Holy Eucharist to the First Communion class and to confirm them. It was an occasion of great display. Before eight o'clock the ministers of the Mass and the attendants assembled in the college parlor to meet the Bishop. There a procession was formed which advanced along the wide corridor, down the steps of the entrance, wound around the campus to the statue of the Sacred Heart and thence to the Church. It was a beautiful sight, and the sun shone in all his brightness upon the golden vestments of the ministers, while the Band played its choicest marches and the Cadets, in gorgeous full dress, went through their evolutions. The following was the order of the procession: Cross-bearer and acolytes, students of St. Edward's Hall, students of Carroll Hall, students of Brownson Hall, students of Sorin Hall in collegiate dress, the University Band, acolytes, First Communicants bearing candles, subdeacon, assistant priest and deacon of the Mass, the Bishop and Deacons of Honor in golden vestments, master of ceremonies, crozier-bearer, candle-bearers and book-bearer, Companies A. and B., of the Cadets in full-dress uniform. They entered the immense church, and to the grand music of Leonard's Mass the organ sounded and the choir intoned the Kyrie Eleison, after the Bishop and the attendant priests had advanced to the foot of the altar. It was an impressive ceremony—this Pontifical High Mass,—and as the watcher sat in the pew he was made to think of the glory of the Church and the sublimity of the Holy Sacrifice. Here at Notre Dame there is every opportunity of celebrating the feasts with almost all the pomp and splendor of Rome herself. Every detail is carried out, and all with an impressiveness that is wonderful.

The first Communion class were kneeling at the front pews, and after the first Gospel Rev. James French, C. S. C., addressed them with words that they will never forget. He told them many things that were good to hear and in a manner so touching that more than one in the rear was seen to wipe away a tear. At the Consecration the altar, decorated with flowers, shone in the glow of a thousand candles and as the Sacred Host was lifted a hush fell upon the people as they bowed before their God.

The Deacon of the Mass had chanted the Confiteor, and the little boys advanced quietly and solemnly within the rails of the sanctuary to receive their first Holy Communion. As they filed slowly up, big boys and men and women, whose years had not yet destroyed and shall never destroy, the memory of a certain beautiful day of their youth, thought again of *their* first Communion, and for the second time that day, as the Bishop uttered the "Ecce Agnus Dei!" the tears welled up into the eyes of many. The young boys returned to their seats and there, with bowed heads, they entered into communion with their Redeemer.



RIGHT REV. JOSEPH RADEMACHER, D. D., BISHOP OF FORT WAYNE.

In the afternoon the Bishop was again escorted to the church. Here he was again dressed in the robes of his sacred office, and before administering the Sacrament of Confirmation he addressed the young boys before him with words of affection, telling them of the great act of the morning and exhorting them to remain ever good and pure. Of all the students at Notre Dame, the Minims, from whom the majority of the First Communion and Confirmation classes was drawn, love our Bishop most, and it is no wonder that his words were listened to with unusual attention. The ceremonies were then begun, and the Bishop exercised one of his functions, confirming the young boys in the faith that was purified and sanctified that morning by Holy Communion.

It was a great day, not only for those that received the Sacraments, but for their parents, their friends and the students in general. It was an inspiring occasion, for the thought of childhood innocence occurred to many, when the youthful communicants with souls as pure as angels, stepped forward to receive for the first time the Bread of Life. It is easy for us, who are Catholics, to understand the feelings engendered by a First Communion; but to those outside the pale our actions seem meaningless and empty. There is, however, a breath of something indefinable that stirs the hearts of all at the thought of young and innocent boys going up to the altar with so much devotion and reverence, and returning with faces beaming in the Divine Presence. Such a thought struck many a looker-on last Thursday in the Church of the Sacred Heart, and brought back to memory scenes that are dearest in life.

Lost in the Ninth.

Well bunched hits on the part of the visitors in the ninth inning tells the cause of our defeat. At the beginning of the ninth the score was eight to five in Notre Dame's favor, but in the last half of the fatal ninth the visitors made five hits and won the game. Although we were defeated, the home team played the best game it has played this year. Illinois did not put up such a strong game as the Varsity did, but all their hits counted for something. The local men hit the ball well, but their hits were scattered and often counted for nothing. Although our infield has been considerably shaken up, yet it stronger now than ever before. McNichols made a couple of neat stops and captured the batting honors. He made three hits in five times at bat. Follen and Fleming made a couple of fine catches in the outfield. Following is a description of the game.

Notre Dame came first to bat. Brown was given his base on balls, and was advanced to second on Hindel's sacrifice. Fleming and Powers were put out on infield hits. Fulton and Thornton were given their bases on balls but the next three men were easily put out.

In the second inning Notre Dame did not score. Follen made an infield hit which was too slow to handle. The Varsity was retired by two strike outs and an infield hit, and Illinois went out in the same manner. Brown made a hit in the third inning, but the three men next to bat struck out. Illinois was retired by two long flies to Fleming and a neat play by McNichols. Neither side scored in the fourth, although Notre Dame made a couple of hits.

In the fifth inning, after two men were out, Hindel was given his base on balls. Fleming made a hit which would have been a two bagger if the bat had not broken. Powers made a single which brought in Hindel and Fleming. Daly made a three bagger which brought in Powers. Follen came to bat, but before he could make a hit Daly ventured off third and was put out. Hadsall, of Illinois, was given his base on balls. McGill knocked a foul near to third base and was put out by McNichols. Hadsall tried tosteal to second but was thrown out by Gibson. Carpenter, Hazlit and Fulton, who were next to bat, made three hits which brought in two earned runs for Illinois. Thornton went to first on balls, but Follen's catch of Johnson's fly retired the side. Score, 3–2.

Notre Dame filled the bases in the sixth by means of two safe hits and an error on the part of Johnson. Brown was hit by a pitched ball and McNichols scored. Fleming struck out after Hindel had made first on a play which retired MacDonald. Wernham knocked a swift grounder to McNichols who threw the ball to first base. The ball struck the ground in front of MacDonald, who was unable to hold it. Wernham went to second on a wild pitch by Gibson and came home on Hindel's failure to hold a ball which was thrown to cut off Hadsall at second. Score, 4–3.

In the seventh Powers made a two bagger. Daly made three strikes, but McGill dropped the ball, and was so long in deciding what to do with it that Daly reached first in safety. Powers came home on a passed ball by McGill. Follen reached first through Shuler's error, and Daly came home. McNichols fouled out. MacDonald and Gibson singled, and Follen came home. MacDonald scored through Wernham's error. The next two men to bat were put out. A base on balls, a base on being hit by a pitched ball, and two hits brought in two runs for Illinois. Neither side scored in the eighth. Notre Dame made one hit in the ninth, but it did no good. Illinois made three hits in their half and two runs. An error tied the score, and another hit put two men on bases. When two men were put out, McGill made a hit and the game was lost to Notre Dame. Score, 9–8.

THE SCORE:

NOTRE DAME	A.B.	R.	H.	S.H.	P.O.	A.	E.
Brown, s. s.	3	0	1	0	3	3	0
Hindel, 2d b.	3	1	0	1	0	2	1
Fleming, l. f.	5	1	1	0	2	0	0
Powers (C.), c.	5	2	2	0	8	1	0
Daly, c. f.	5	1	1	0	1	0	0
Follen, r. f.	5	1	1	0	2	0	0
McNichols, 3 b.	5	1	3	0	1	2	1
McDonald, 1st b.	5	1	2	0	9	0	2
Gibson, p.	5	0	2	0	0	4	0
Totals	41	8	3	13	26*	12	4

* Winning run made after two men went out.

ILLINOIS	A.B.	R.	H.	S.H.	P.O.	A.	E.
Fulton, 2d b. (Capt).	3	2	2	0	0	3	0
Thornton, r. f.	3	1	1	0	2	0	0
Johnson, 3d b.	4	1	1	1	2	1	1
Shuler, s. s.	5	0	2	0	0	0	1
Wernham, l. f.	5	1	0	0	1	1	1
Hadsall, c. f.	3	0	0	0	0	0	1
McGill, c.	5	0	1	0	13	3	2
Carpenter, p.	4	1	1	0	0	3	0
Hazlit, 1st b.	4	3	2	0	9	0	0
Totals	36	9	10	1	27	11	6

SUMMARY:—Earned runs, Notre Dame, 2; University of Illinois 3. Two Base Hits, Powers, Thornton. Three base hits, Daly. Bases on balls, off Gibson, 6; off Carpenter, 3: struck out by Gibson, 7; by Carpenter, 13. Passed ball, Carpenter; wild pitches, Gibson, 2. Time of game 2:00. Umpire, Cross.

After Fifty Years.

The old student's heart throbbed with joy as the carriage slowly rumbled up the avenue toward the University. He was coming back to the home of his boyhood for the first time in fifty years. In vain he looked for some old, familiar landmark, and his heart began to sink. The carriage passed the graveyard. When he left there was no cemetery in that place. It could not be the old Indian burying-ground, for that was nearer the river. There must have been a pestilence to have filled so many graves in so short a time. He felt like Rip Van Winkle as he stopped at the entrance to the main building. A stranger opened the door, a stranger welcomed him, and strange faces were all about. In the reception room was a picture of Father Sorin, but the face was so aged that he scarcely recognized it. Then he introduced himself and the dull pain caused by the absence of the old faces, was banished by the heartiness of his welcome. He was made to feel that a son of Notre Dame is always welcome at his *Alma Mater*, and that every inmate of the University is a brother to whomsoever has been an inmate of Notre Dame, though years may intervene between them.

The old student went into the office, and was shown the old yellow ledger in which his purchases of years gone by were recorded. His careless, lively boyhood was recalled by the sight of charges for mending materials. Further on, charges for ptisan and mail made him feel his youthful appetite. He heard the click of a type-writer and at the same time he saw an item in which he was charged for quills. What changes fifty years bring forth! There on the ledger was the name of Father Gillespie, who had been his table and "ranks" companion fifty years before. He was told that Father Gillespie had been sleeping for years in the college graveyard, and the ledger was closed. He saw the baseball team on the campus, preparing for a match game, and he told those around him of the games of shinny that were played here in the days when baseball and match games were unheard of at Notre Dame. The old shinny games resulted in many a disagreement, which were settled on Wednesday afternoons when the boys took their trips to the banks of the St. Joe. In those days there was not a railroad in Indiana, and Bertrand, the stage station, was leading South Bend and Niles in the race for first place, but the glory of the past is faded and gone.

Mr. Thomas S. Wallin, '45–'46–'47–'48, was our most welcome visitor on last Saturday and Sunday. It was the first time he had visited Notre Dame since he left it in '48. The many friends he made during his stay will always be glad to welcome him back to his *Alma Mater*.

Personals.

—With deep grief we chronicle the death of George H. Cochrane, who was a student at Notre Dame in the '70's. Mr. Cochrane and his brothers were students at Notre Dame for a number of years, and his sister, Mrs. M. W. Ryan, was a pupil of St. Mary's Academy. The SCHOLASTIC extends its sympathy to the bereaved friends and relatives.

—Another distinguished graduate of Notre Dame was recently honored by Governor Mount, of Indiana. Dr. J. M. Dinnen, who is well known in medical and social circles in Fort Wayne, was selected as one of the members of the State Medical Board of Examiners and Registration. All the doctor's friends will be delighted to hear of his success.

—It is with sorrow that we announce the death of Mr. John Saul, who died at his home in Washington, D. C., on Tuesday, May 18. Mr. Saul was long a friend to Notre Dame. It is to him that we owe much of the beauty of Notre Dame, for it was he who furnished the shrubbery and gave valuable suggestions as to its arrangement. He leaves many sorrowing friends to mourn his death.

—Rev. Dr. Conaty, Rector of the Catholic University, accompanied by Father McGuire, of St. James' Church, Chicago, was the welcome guest of Rev. President Morrissey and other members of the Faculty Monday afternoon. The student body was disappointed in not being able to receive an address from Dr. Conaty during his stay, but they trust that he will visit us again in the near future, and that he will be able to stay long enough with us next time to favor us with a talk.

—We clip from the *Lafayette Sunday Times* a bit of news which should be of interest to the numerous friends of Father L'Etourneau. It is an extract from a reminiscent sketch.

.... I remember that at the University of Notre Dame, in the spring of 1862, one Sunday, Rev. Father L'Etourneau officiated at High Mass. He was then Director of the Brothers' Novitiate—quite tall, very spare and, seemingly, in most delicate health. I do not believe he weighed 130 pounds—and in stature he was over six feet. I recollect that after the services his frail appearance was a subject of conversation in a group where were present several of the college professors, and one of the latter—one I thought well gifted to express an intelligent opinion in the premises—remarked of Father L'Etourneau:—"*Poor man, he won't live to see another snow.*" And, believe me, good old Father L'Etourneau has since then seen the snows ot thirty-six winters—and, moreover, all of the then twelve priests at Notre Dame are dead. Father L'Etourneau has really attended the funeral of every priest connected with Notre Dame at the time the above prediction concerning his probable demise was made.

Father L'Etourneau is still enjoying the best of good health and attending regularly to his duties as Director of the Professed Brother at Notre Dame.

Local Items.

—Lost—A razor. Return it to E. F. Hessel.

—Cypher says he wishes he had a wheel that he would not have to propel himself.

—St. Edward's Park has taken on its usual brilliancy and is now the delight of visitors.

—Chester Atherton, of Sorin Hall, had the great pleasure of entertaining his mother and sister recently.

—George Hanhauser, Brownson Hall, left for his home in St. Marys, Pa., yesterday on account of illness.

—Miss Frances Meyers, of Pekin, Ill., and Miss Anna Trefzger, of Peoria, Ill., were recently the very welcome guests of John Meyers.

—Accounts at the Students' office will be closed on the afternoon of June 3, next Thursday. After that date no credit accounts will be made.

—"Say," said Sambo, as the chief "rooter" gave one of his blood-disturbing yells, "why don't you go pawn that voice and lose the ticket?"

—The ex-Juniors defeated the Carroll Anti-Specials Thursday by a score of 7 to 1. The Carrolls did not secure a single hit off Taylor's delivery.

—The last of the drills for the medal in Company B was held last Thursday. Charles J. Shillington, of Chicago, was the winner, with Shea a close second.

—Father Robert, who conducted the student's retreat last fall, was the welcome guest of the University last week. He was accompanied by Father Bonaventure.

—Some members of the Faculty were much alarmed last Thursday as they beheld a grand rush around the college. It was only the Carrollites sprinting to the lake for a swim.

—The Carrolls and High Moguls played a dull, uninteresting game of baseball on the 23d, the only feature of which was a catch by Walsh. The H. M.'s won by a score of 15–10.

—The Mass on Decoration Day was sung by Very Rev. Chaplain Corby of the Irish Brigade, and honorary Chaplain of the Loyal Legion of Indiana. He made a few remarks apropos of the occasion.

—Very Rev. Father Provincial received from some friends a very nice present which he could not use for himself; but he knew where such a delicacy could be appreciated and he sent it to the Minims, where it was very welcome.

—Rev. Dean Keating, of Ottawa, Ill., Rev. Father Shaw, of La Salle, Ill., and Rev. Timothy O'Sullivan, of Chicago, accompanied Rt. Rev. Bishop Spalding on his visit here last week. They were most welcome guests of the University.

—Mr. Stephen Fleming, well remembered as a student here some years back, was among the ball players last Thursday and donned the uniform of the Varsity. He plays an unusually strong game at short, considering the fact that he is much out of practice.

—The Carroll and Brownson Tennis clubs met in contest on the Carroll grounds Thursday afternoon. Three sets were played, the Brownsons securing two out of the three. Reuss and Foley represented the Carrolls, while Pim and F. O'Shaughnessy, Fadely, Miller, O'Hara and M. O'Shaughnessy were the opposing teams.

—Duffy has been put on the retired list of punsters, but in his place has stepped forth—as sweet as the month of May—Captain Napoleon Franey, who gives promise of outrivaling Golden. "Bob" now springs real live puns and relates clever stories with noticeable ease. He also dodges missiles with greater facility than did Duffy.

—Those who wish to bear away with them a souvenir of Notre Dame could not do better than get a copy of Professor Preston's latest piece of music, the "N. D. U. March," now on sale at the Students' Office. It is in the professor's usual happy vein, and has the double interest of being local in reference and sprightly in movement.

—St. Edward's Park has been undergoing remarkable changes during the past week. The geraniums have been removed from their winter quarters, and now grace the beautiful plot of ground north of the Academy of Music, and "Mike" diligently trains and prunes and digs and hoes until he has turned the place into a paradise.

—The following is the programme and order in the Oratorical Contest to be held in Washington Hall next Wednesday evening:

Our Need of Naval Preparation—T. Tyrone Cavanagh, '97
American Naval Heroes.......Edward E. Brennan, '97
Christian Unity.........................M. James Ney, '97
Orestes A. Brownson..................C. M. B. Bryan, '97
Alexander Hamilton................Sherman Steele, '97

—Mrs. Ludwig, of Chicago, was a most welcome visitor last week. Mrs. Ludwig is the wife of Mr. Otto Ludwig, who was recently mentioned in the SCHOLASTIC, and she is a sister to Thomas Hooley, another old student of Notre Dame. She visited the friends and spots dear to her brother and husband, and at the same time made many firm friends who will always welcome her to Notre Dame.

—We have just released one of our reporters for neglecting to cover his territory thoroughly. The day the Varsity played Chicago University he failed to report a joke that was sprung fearlessly in broad daylight. During the progress of the game a telegram was received, which appeared somewhat exaggerated. "I'll bet that's one of Father M's exaggerated reports," said Wilson, as he viewed it closely. "No, it isn't," said Franey reassuringly, "it doesn't look a bit like his writing."

—On the morning of the 23d wild yells on Carroll campus seemed to point to a tragedy. On arriving at the scene, however, it was discovered to be much worse. The "Tens" of Sorin Hall were contending for the mastery on the diamond under the generalship of "Goldie" Walters and "Hancock" Bill. Features of the game were the pitching of Tomaso, Coxey's coaching, Hindel's umpiring and Sanders' fielding. The score keeper resigned in the second inning under the excuse that he was incapable of dealing with infinite numbers.

—The invitations for Commencement are out. They are beautiful in all that the word implies. They are the best product of the well-known firm of E. A. Wright, of Philadelphia. No invitation of previous years, not even that of the Golden Jubilee, equals the one for 1897. On the front are steel engravings of Sorin hall, the home of the graduates, of the main building and the avenue leading thereto, and of the college buildings as viewed across St. Joseph's Lake. At the top is a raised fac-simile of the Gold and Blue pennant with the letters N. D. U.

—The following were among the parents and friends of those that were confirmed last Thursday:

Mr. and Mrs. Monahan, Mrs. Kilgallen, Mr. and Mrs. Ebbert, Mrs. James Purnell, Mr. and Mrs. Dessauer, Mrs. J. St. Clair Ward, Mrs. Abercrombie and daughter, Mrs. McMahon, Mrs. H. H. Mund, Mrs. Doughtery and daughters, Chicago; Mr. and Mrs. Trentman, Mrs. Fleming and Mr. Stephen Fleming, Miss Summers, Ft. Wayne; Mr. and Mrs. Krug, Mrs. Stengel and daughter, Dayton, O.; Mrs. Ervin, Muncie, Ind.; Mr. and Mrs. Butler, Columbus, O.; Mrs. Hirschberg, St. Louis; Mr. Morgan, Neola, Iowa.

—The following students were received into the Church last Wednesday by Rev. Andrew Morrissey, C. S. C.:—Charles H. Dench, Joseph Pyle and Arthur Phillips. The following made their First Holy Communion last Thursday and were Confirmed by Bishop Rademacher in the afternoon:—

A. Schmitt, A. Krug, J. Berger, F. Mooney, C. Dench, J. Pyle, H. Ward, T. Kilgallen, A. Phillips, J. Lawton, H. Rees, J. Abercrombie, J. McMahon (Illinois), S. Trentman, R. Ryan, W. Dessauer, J. G. McCarthy, F. Ebbert, J. Ervin, R. Clark, W. Lovell, T. Butler, W. Frost, S. Monahan, E. Monahan, P. Dougherty.

The following were also confirmed: C. Gray, W. Desmond, A. Darron, J. Fenton, A. van der Vennett, J. Lahey, W. Malone, F. Phillips, T. Nolan, A. McDonnell, R. Stengel, O. Peterson, J. Morgan.

—The Minims are again indebted to Father Morrissey for a magnificent gift. This time they have been presented with an Everett Grand Piano, which is the delight of the little fellows and their teachers. The Minims are certainly very deserving of the gift and appreciate to the fullest extent the kindness of Father Morrissey. There are among them many clever musicians for their age, and there can be no doubt that they will make good use of the beautiful instrument. The piano, which is to be used principally at entertainments, is a splendid addition to the richness and grace of St. Edward's hall, where beautiful Parisian statuary and paintings from no less a brush that that of the late lamented Gregori adorn the niches and corridors all around.

—Last Saturday afternoon, after a day of very hard work, the members of the Junior and Senior classes of the Biological course gathered in one of the basement laboratories of Science Hall and had a "spread." It was to celebrate nothing in particular, unless the fact that they had worked *hard* that day, but nevertheless it was one of the most enjoyable dinners of the session. Barnetti and Piquette, the celebrated *chefs* of the "Laboratorium," Chicago, prepared the following excellent

MENU:
Blue Points on Half Shell,
Soup, Olives,
Cutlets a là cheval, Celery,
French Peas,
Eggs a la Embryo,
Cranberry, Solanum Tubersum a lá Saratoga,
Puree of Lycopersicum Esculentum,
Arachis Hypogæa, Ice Cream,
Cake,
Thea Niridis, Macaroons.

After the embryo Doctors had dissected, masticated and digested the above samples of the botanical and animal kingdoms, the following toasts were responded to: "The Effect of Over-eating upon a Modern Galvanized Stomach," Mr. Wyllyum Ossa-Fagyn; "Adipose Tissue," Mr. Jacob I. Rosenthal; "Outlook of the Hop Crop," Mr. Chawles Chappé-Piquette; "The Phonograph in the Study of The Sciences," Mr. Burnyette Weaver; "Gay Life in Giddy Paris (Tex.)," Mr. Willie Wando Fitzpatrick. Mr. Fitzpatrick had just begun to talk about the wonderful park system of his native town when the supper bell rang, and Mr. Fagyn moved that the classes adjourn to the refectory, "just to top off with something substantial," as Ossa put it.

—The students of the Biological course had one patient this season, and the patient is now in the happy hunting ground. He, or it, was a poor old decrepit horse, knee sprung, spavined, with symptoms of glanders and blind staggers, a regular "Bonyparte" of the vintage of '62. There is a legend over at the stables that this was the original horse that in his boyhood won a neck-and-neck race down in Kentucky by sticking out his tongue just as he went under the wire. And the Doctors slew him, with the aid of Doctor Rosenthal, Doctor Fitzpatrick, two dollars worth of chloroform and a Texas bowie knife. Mr. Stewart MacDonald led the "Old Battle-Ax" (they have christened him "Old Battle-Ax" after the favorite brand of chewing gum of that name) down to the banks of St. Mary's Lake one bright spring afternoon, and then Wiseacre landed on the horse's neck-tie with his powerful right arm, and "Old Battle-Ax" went down like a log. Doctor Rosenthal applied the two dollars' worth of chloroform, Doctor Fitzpatrick applied the bowie-knife; the blood spurted four feet high and the lake rose three inches. The "late lamented" was afterwards removed to a near-by shed; the skin and flesh were removed and the bones were then taken to Science Hall. After the bones have all been cleaned they will be bleached and then mounted. "Old Battle-Ax" will be the most interesting skeleton of the many in the museum, for all the work connected with the cleaning, bleaching and mounting of the bones will have been done by the students alone.

—On the morning of May 23 was begun one of the most wonderful games of baseball ever played on our campus or on any other campus, for that matter. We say "was begun," for the players have been trying to finish the game ever since, stopping only to eat, sleep and to go to classes. One of the teams was supposed to be made up of the Biological students of Sorin Hall, but as most of them were out looking for stray dogs on that particular morning the Doctors were compelled to fill in their team with other Sorinites. The opposing club was composed of Sorinites from the Classical and English courses. Mr. Hindel, of the Varsity, was chosen umpire, and he has been having a hard time of it ever since. The players want to have the game called and Mr. Hindel has refused to do so until at least five innings have been played: hence the brick bats, fence posts and other knick-knacks that have gone in his direction. The only hope that remains of ending the game before commencement is to play five innings and then to pray for rain. As we go to press this is

THE SCORE:

DOCTORS	A.B.	R.	H.	P.O.	A.	E.
Fagan 3 b., c. f.	42	42	42	4	2	92
Rosenthal ss., 2 b.	42	42	42	0	7	81
Fitzpatrick, 1 b.	42	42	42	0	0	17
Piquette, c. f.	42	42	42	0	0	15
Costello, c., l. f.	42	42	42	0	0	31
Sheehan, p., c., ss.	42	42	42	2	0	101
Delaney, r. f.	42	42	42	0	1	93
Brennan, c. f., p., 3 b.	41	41	41	0	0	26
Bryan, everywhere.	41	41	41	0	0	78
Totals	376	376	376	6	10	444

HEINEY'S	A.B.	R.	H.	P.O.	A.	E.
F. O'Malley, c., 1 b., ss., 2 b.	43	43	43	6	0	0
Golden, 1 b., bench,	1	0	0	0	0	67
Mingey, c. f., p.	43	40	6	0	0	99
McDonough, c., 2 b,	43	41	43	0	0	38
Sanders, c. f., r. f.	43	43	32	0	0	102
Cavanagh, ss., 3d b.	43	43	43	0	0	49
Barry, l. f.	43	41	43	0	0	32
Geoghegan, 2 b , c. f.	43	3	42	0	0	21
Medley, p., 1 b.	42	42	42	0	0	88
Totals	344	296	294	6	0	496

SUMMARY:—Earned runs, Heiney's, 40; Doctors, 0. Home runs, O'Malley, 40. Bases stolen, Rosenthal, 6; Cavanagh, 7. Hit by pitcher, Rosenthal, Cavanagh. Time, indefinite. Umpire, Hindel,

Roll of Honor.

SORIN HALL.

Messrs. Arce, Barry, Bryan, Byrne, Crilly, Delaney, Murphy, Miller, Marmon, Mingey, Medley, McNamara, McDonough, F. O'Malley, O'Hara, Pulskamp, Rosenthal, Reilly, Sullivan, Sheehan, Steiner, Spalding, Weaver.

BROWNSON HALL.

Messrs. Armijo, Arizpe, W. Berry, J. Berry, R. Brown, E. Brown, Brucker Barry, Bouwens, Baloun, Bommersbach, Crawford, T. Cavanaugh, Corby, Campbell, Cuneo, Crowley, Cullinane, Conway, J. Cavanaugh, J. Casey, Dreher, Dowd, M. Daly, Donovan, J. Daly, Dooley, Desmond, Dixon, Ellison, Fetherstone, Foster, Fox, C. Flannigan, Follen, Fehr, Farrell, Franey, M. Flannigan, Falvey, Fischer, Fleming, Grady, R. Garza, Gilbert, Guilfoyle, Guerra, C. Gray, Hoban, Hengen, F. Hesse, Howard, E. Hake, L. Hake, Haley, J. Hesse, Howell, Hay, Hartung, Hindel, Hurst, Jelonak, Johnson, Kidder, F. Kaul, I. Kaul, Kraus, Kearney, Koehler, Lyons, Landers, Lowery, Lutz, J. Mulhall, Meagher, Mullen, Morris, Mulcrone, W. Monahan, Meyers, Monarch, Moorhead, Maurus, Massey, Martin, Miller, T. Monahan, McCarrick, McCormack, McNichols, McGinnis, C. Murphy, McConn, McDonald, McKenzie, Niezer, Nye, F. O'Shaughnessey, M. O'Shaughnessey, O'Hara, Pickett, Putnam, Pendleton, Paras, Pim, Quinn, Quandt, Reinhard, Reed, Rahe, Stearns, Speake, Smoger, Stuhlfauth, Summers, Schermerhorn, San Roman, Schulte, Spalding, Scheubert Thiele, Thams, H. Taylor, Tong, Tomlinson, J. Tuohy, Vogt, Ward, Welker, Wieczorek, Wade, H. Wimberg, Williams, Wynne, Wilson, H, Gray.

CARROLL HALL.

Messrs. Abrahams, R. Armijo, P. Armijo, Alexander, Beardslee, Becker, Berger, Breslin, Burke, Burns,Brand, Cornell, M Condon, T. Condon, Corby, Coquillard Cowie, Curry, Curtis, Conklin, Darst, Davidson, Devine, , innen, Druiding, Drejer, Delaney, Elliott, Ellwanger, Ernst, Fox, L. Fish, A. Fish, Friedman, Fleming, Girsch, Garrity, Hoban, Houck, Heffelfinger, Hinze, Herbert, A. Kasper, F. Kasper, Keiffer, Kelly, Kiley, Kirkland Klein, Kilgallen, Krug, J. Kuntz, Land, Leach, Lovett Lyle, Maher, Meagher, Mohn, Mooney, Morgan, Morrissey, T. Mulcare, J. Mulcare, T. Murray, R. Murray, J. Murray, Moxley, Mueller, Merz, Michels, McCallen, McDonnell, McIntyre, J. McMahon, O. McMahon, McMaster, McNichols, McManus, McDonald, T. Naughton, D. Naughton, J. Naughton, Nolan, Noonan, Newell, Nast, F. O'Brien, O'Malley, O'Neill, Ordetx, Padden, Peterson, Powers, Pulford, Putnam, Pyle, Page, Quinlan, Reuss, Richon, Sample, Sanford, J. Scherrer, W. Scherrer, Schmitt, E. Sheeky, J. Sheeky, Shiels, Shillington, Shea, Slevin, Stengel, Sullivan, Swan, Szybowicz, Swiney, Schwabe, Taylor, Tong, Wagenmann, J. Ward, Wolcott, H. St. Clair Ward, F. Ward, Waite, Walsh, Watterson, Wells, Wilson, Weadock, P. Kuntz, McCarthy.

ST. EDWARD'S HALL.

Masters Abercombie, Abrahams, Allyn Arnold, Beardslee, C. Bode, F. Bode, Bosworth, Butler, Burton, Brooks, Blanchfield, Casparis, Clarke, Cotter, Cowie, Coquillard, Cressy, Cunnea, Craig, Davis, Dorian, Dugas, Dougherty, Dessauer, Ebbert, Engelmann, Ervin, Edgarton, Ellis, Fetter, Frost, Freeman, Frain, Fleischer, Griffith, Garrity, Hall, Hart, Hubbard, Hinsey, Jonquet, Kasper. Kelly, F. Keogh, R. Keogh, Lawton, Lovell, Leisander, Leclerque, E. Manion, P. Manion, Moore, P. McBride, L. McBride, J. McBride, Willie McBride, E. McCarthy, G. McCarthy, McConnell, M. McMahon, J. McMahon, W. McMahon, E. Monahan, S. Monahan, R. McMaster, B. McMaster, C. McMaster, J. McGeeney, E. McGeeney, Mathesius, Paul, F. Phillip, A. Phillips, G. Quertinmont, E. Quertinmont, Rennolds, Rees, Ryan, Redpath, Robbins, Spillard, Steele, Shields, Strauss, Strong, Seymour, Tillotson, Trentman, L. Van Sant, J. Van Dyke, R. Van Sant, F. Van Dyke, Veneziani, Welch, G. Weidmann, F. Weidmann, Wilde, Weber, Wigg.