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Third, the Conference rules forbid a training table. Teams at Conference schools eat together, but they do not call it a training table—officially. Michigan's athletes could still eat at the Union, but when they ate five steaks instead of one they would have to pay for them themselves, instead of having it charged to the Athletic Association. They struggle along under this handicap at Minnesota, and scrape together eleven men who manage to struggle through a football game without dropping of starvation.

Fourth, the Conference rules do not permit freshman teams to compete with outside teams. Freshman teams are organized, with coaches, and are scrimmaged against the Varsity and play games with the Scrubs. On Saturdays, however, they sit on the bench with the Scrubs and study 'Varsity football, observing the men and the methods they are to oppose in years to come. It is to be noticed that when the Freshman schedule goes awry at Michigan the coaches usually remark, "We're glad of it. The boys learn more watching a real game than they do playing with Podunk."

Difficulties Number Five, Six, Seven and Eight do not occur to us at present, so we will allow the anti-Conference enthusiasts to explain them to you in coming issues. These columns are open to them, and comment on the question is particularly desired from both sides. Only the reasons aren't that Conference teams are forbidden to compete with Eastern teams, or that but four, or five football games may be played, or that four football games must be played with Conference schools. The first two rules are dead and buried, and the latter is not enforced. Only we hope we get back and they do enforce it so we won't have to watch any more "games" with Washington University, etc.

STUDYING THE SCIENCES FIFTY YEARS AGO

President Van Hise somewhere makes the remark that it is hard for young people to realize that the person one hundred years old has seen more progress in the conveniences of living than were made in ten thousand years before. During scarcely more than half that time nearly all departments of science as taught in college have made most of their growth. Even without the aid of an instructor Professor Winchell taught geology, zoology and botany in the University of Michigan, and had considerable spare time left for work in the museum and the study of those topics in the field. In the spring of 1856 he met the sophomores daily for six weeks in botany, training them without microscopes till they were reasonably certain in identifying *claytonia virginica*, and *lupinus perennis*. This ended instruction in botany. Zoology and geology were little more formidable. Even these slight introductions to natural science left the writer with a thirst for more in preference to more knowledge in Greek, Latin or mathematics. In 1859, I began teaching in an academy in Union Springs, New York, to get money to pay the expense of further study at Harvard, where

I presented myself in 1862. Against my inclination, I decided to work in chemistry because it would be more likely to help me in teaching. My teacher was a tall circumspect young man, by the name of Charles W. Eliot, whom you all heard of some years later. The start in analytical chemistry received scarcely any helpful suggestions. Twice a week a class of three of us were questioned on lessons in Cook's Chemical Physics and Fowne's Organic Chemistry, without the slightest attempt at experiments or laboratory work,—but were book lessons.

After about ten weeks of chemistry which by that time I thoroughly disliked, I decided to quit and study zoology and botany, with Agassiz and Gray whether they helped me or not; and I have never for a moment regretted the change.

Agassiz was glad to see me, "But why do you want to study zoology; there is no money in it? You must make up your mind to be poor all your life. I shall try your patience. You have read books on zoology, but have not studied the objects. You must not read any books on the objects you are studying." He gave me some dried sea urchins and assigned me to a desk with drawers. "Tomorrow I will call to see how you are getting along." There were nine other students, spending most of their time in studying small animals. I had all the daylight for this work, interrupted by two lectures a week. I used a cheap hand lens, note paper and pencil and settled down for the task, breaking in pieces and sketching as I went along; and by night I believed there was nothing more for me to learn. The next day I was glad to see Agassiz saunter in with a smile, and the question, "Well, Mr. Beal, what have you seen?" He saw the drawings and listened to my talk, saying, "This and this are right, that is wrong." He gave me a few names and said, "Look it over," and with a call of five minutes left me. This is a sample of his daily visits for three weeks. I brought living specimens from Nahant, surprised myself by additional discoveries, becoming able to see the details when my eyes were shut as well as when open. Then he said, "Here are some star fishes to follow the sea urchins. They are composed of similar parts, arranged in a similar manner, how is it?" After two days I was able to tell him. I studied and compared related animals including some spatangoids. Every time a new specimen was studied, I was told to compare them in detail. "It is easy enough to observe isolated facts; any one can soon learn to do that, but when you compare two or more objects, then you take a step in philosophy. I want now to find out whether you are fit for a captain or a major general." Sometimes I made models of what I was studying.

I spent six weeks in studying and comparing a few marine animals allied to the starfish and sea urchins, and during all this time Agassiz in his brief calls never told me a *thing* except to say, "You are right, you are wrong." In like manner I studied corals, fishes, mollusks, crabs and lobsters, and spent six weeks dredging and making notes at Eastport, Maine.

As time went on he talked a little more and mentioned something to read. I was with Agassiz most of the time for a little more than a year, and consider it the most valuable training I ever had in anything. In all my

teaching for fifty years I made use of this plan, adapted more or less to the students in hand.

Dr. Gray was glad to assist me, but agreed with Agassiz that there was little chance to make money, and if I became a teacher, I must make up my mind that some of my students would surpass me, a condition of things that long ago proved to be true. At that time (1862) a small number of students of Agassiz found little demand for services, and of botanists there were only two men in this country, Dr. Gray, of Harvard, and Professor Eaton, of Yale, who earned their living by teaching botany. True, Dr. Torrey was professor of botany of Columbia University, but he had to piece out his salary by doing some assay work for the United States government.

By this time the reader must have concluded that my prospects for success in natural history were not very bright, and wonder why I did not give up the job. I never for a moment thought of such a thing. I was continually joyous in the work. I had some hope for the future, but no prophetic vision of what was to come, nothing like a dream of meeting 500-600 botanists, as was recently the case in New York. The work with Dr. Asa Gray was mostly in his private laboratory, where I was his only student giving my time chiefly to the gross anatomy of seed plants, ferns and their allies, aided by a stage microscope and free use of books, and Dr. Gray was always ready to help over any difficulties, saying that "It wasn't worth while to work under false ideas."

Tuition was \$150 a year, but in my case there was no charge on the ground that I was paying my own way. Some service was rendered by way of collecting specimens for class use.

During one spring Dr. Gray met three of us for lessons in his text book freely illustrated by fresh specimens. The botanical department of Harvard did not own a compound microscope; it had the use of a thousand dollar instrument belonging to the Lowell Institute. A little crude work was done, such as viewing the streaming motion of granules of chlorophyll in leaf-sections of *valisneria*, looking at grains of pollen, sections of ovules, etc. During my time Dr. Gray gave a valuable course of illustrated lectures to juniors in geographical botany. I attended popular lectures given by Professor Agassiz to undergraduates, lectures on elementary chemistry by Professor J. B. Cooke, another course on comparative anatomy by Dr. Jefferies Wyman, several lectures by Professor James Russell Lowell, occasional lectures by Professor E. N. Hosford, Dr. Oliver Wendell Holmes, Professor Lovering, Professor Benjamin Pierce, one by Emerson on the life of Thoreau, one by Senator Charles Sumner, one by John B. Gough, one in Tremont Temple by Wendell Phillips, the day after President Lincoln was assassinated; three or four plays by young Edwin Booth, of whom Harvard and Boston were very proud, one lecture by Artemus Ward, soon to leave for Europe.

Those participating in Junior exhibitions were in black gowns, but failed to draw a crowd.

At a lecture Dr. Wyman at one time exhibited a number of small bottles containing boiled hay and other materials filtered after boiling, some of which were still clear and others turbid. It had been found out that if

boiled three or four times the materials were more likely to remain clear. Reference was made to spontaneous generation, and why boiling did not destroy all traces of life. Here was the beginning of microbiology in America.

When I left the University of Michigan in 1859, there was a grand total of 430 students; on entering Harvard in 1862 there were 814, including divinity, law, medicine, resident graduates, and yet Harvard was 226 years old.

With some interruptions I studied at Harvard about two years, receiving S. B. in 1865; the special examination was held for nearly two hours, conducted by three professors or instructors. I left, going immediately to an academy at \$1,000 a year, gradually increased to \$1,300; later earning more in the old University of Chicago and some private schools. In the summer of 1870 I became one of a small faculty at the agricultural college, teaching several things to a small number of students, holding the job forty years.

During the first decade I was one of the first four teachers in the country to place a compound microscope in the hands of each student of a section of a class; the other professors were Dr. Farlow, of Harvard, Professor Harrington, of the University of Michigan, and C. E. Bessey, of Iowa Agricultural College.

In 1868, I attended the seventeenth meeting of the A. A. A. S. held in Chicago where there were only two sections of the society. There were only three papers presented in botany, by Dr. Asa Gray, Thomas Meehan, of Philadelphia, and Mr. Hilgard, a brother of Dr. E. W. Hilgard, at one time Professor in the University.

Hasn't botany in America made some progress during the last 54 years?
W. J. BEAL, '59.

THE UNIVERSITY HOSPITALS

THE UNIVERSITY HOSPITAL—WHAT IT IS AND WHAT IT SHOULD BE

The University Hospital is one of the largest institutions of its kind in the United States. Including the Psychopathic Hospital which provides for the care of sixty patients, it now has 460 hospital beds for people afflicted with all kinds of maladies.

The hospital authorities are often asked to explain why there should be a need for such a great hospital in a city of only 20,000. With the exception of Rochester, Minn., a town even smaller than Ann Arbor, but known the world over because of the great Mayo clinic, the University Hospital is the largest in the country in proportion to the population of the city wherein it is located.

Four reasons may, I think, be given for the increase of the first University Hospital in 1869 with its twenty beds to a hospital of nearly five hundred beds with a constant waiting list of patients: