tion will no longer be a bothersome doubtful question.

Comparative histology stands in the center of the great science of zoology, and interprets the meanings of its many branches. Moreover, cytomorphosis and morphogenesis are new lamps to histology and embryology that must be utilized studiously for, without them, pathology is a meaningless smudge.

Comparative histology, inspired by modern cytology and genetics, gives meaning to anatomy, physiology, and pathology. It is inspiring discipline, and is the cornerstone of modern liberal arts and social culture; it gives fresh insight into much that is basic in our culture. Any truly liberal education should include an introduction to this most basic of the biological sciences. It is the real foundation of the healing arts. Premedical and medical students should concentrate on cellular biology since this is the most direct, natural, and least costly approach to many medical problems, those that they must solve as students and those which they will meet as practicing members of their profession.

Comparative histology, based on comparative anatomy, tells much about the nature of man. For this reason, it is a most comprehensive and enlightening discipline. Because of its comprehensiveness, it should begin in high school, and be enlarged upon in the liberal arts and teachers' colleges, and in the universities. Like English, it should be required for all students in intermediate and higher education. The results should be better citizens, parents, teachers, preachers, physicians, better men, and a more perfect society, which is the purpose of education. It should always be borne in mind that nothing can justifiably take the place of knowledge based on truth; no discipline can tell as much about the true nature of man as can modern comparative histology.

So This Is an "Air Fern"?

ARTHUR J. BAKER, Biology Instructor, Crystal Lake Community High School, Crystal Lake, Illinois

"How does that plant take in food?" "I thought all plants had to have water." "Is it really a fern?" "Please tell us what it is." "I have never seen a plant just that color."

A little bunch of frilly green lying on the laboratory table was the genesis of this growing curiosity. John has brought it in. He was most pleased about it. It was an "Air Fern," and we had just been studying Pteridophytes. I displayed it on a table, thinking I had never seen an air plant resembling this one.

After two weeks, the plant looked as refreshingly green as it had the first day, and it was taking longer at the beginning of each period to quiet the persistent questions. My candid remark, "I really don't know," was kindling curiosity. It was now time to act.

The next two days proved to be among the most gratifying of any in my teaching experience. I laid out microscopes, hand lenses, teasing needles, glass slides, cover slips, scissors, beakers, bunsen burners, flasks, test tubes, and a sprig of the mystery plant at each table. My remarks at the beginning of the first period were brief: "Many of you have had questions concerning our 'air fern.' Some of you have asked how it lives without soil or water; some have suggested that it is not a plant at all, but something artificial resembling an air plant. Well, what are we waiting for? Let's find out. The materials are before you."

It took ten minutes that day for my pupils to become convinced that I meant what I said. This period was marked with a hesitant, "May I really use the microscope, sir?" Or, "Did you lay these hand lenses out for our use?" All questions received an affirmative nod, followed by a short period keynoted with questions on the best approach to the experiment. I assured them that it was entirely up to them.

Now the room was bursting with feverish activity. Books were taken from the shelves; they were grouping themselves into two's and

Larry and Dick, with the display of their work which received FIRST rating in the Illinois Junior Academy of Science District and State Contests.

three's and getting a real foothold on the task before them.

The last five minutes of this first period were turned over to any pupils who wished to report on findings. Those who had worked with the microscopes reported that they were convinced it was a real plant. Dick presented the most startling revelation when he announced that the green coloring of the plant was readily dissolved in water, and followed that by dramatically reading from a book that chlorophyll is non-soluble in water. He was of the opinion that the plant was dyed.

Dick and Larry, who had teamed up, asked if it would be possible to make sections of the stem to compare the structure with that of a true fern. I gave them a book on microtechnique. Several pupils were interested in methods of analyzing gases given off by the plant, and these too were referred to adequate sources.

A summary at the end of the second day illustrates the productive ability of adolescent enthusiasm. Dick and Larry were gathering the necessary materials for the proper embedding and sectioning of the plant. Two other boys had set up apparatus to measure and analyze gases given off by the plant. Iodine tests for the presence of starch had been carried on. One section of the plant had all light shut off from it for the purpose of determining the relationship of its color to the possible presence of chlorophyll.

In the opinion of their instructor, this type of procedure could not have been successfully extended beyond two days. There were several in each class who had reached their limit of individual investigation, yet several in all classes were spending their free periods in the laboratory and working after school in an effort to discover more facts about the "air fern."

Dick and Larry had been at it six weeks now and had not finished yet. They had proven that the green coloring matter is something other than chlorophyll, and had taken samples of it to chemist friends in an effort to find out just what the dye is. They had successfully embedded tissue. Before sections could be made, it was necessary for them to repair an old microtome. The subsequent microscope slides showed no relationship to real ferns. Considerable library work, in an attempt to classify the "air fern," proved unsuccessful. In the end a college professor assisted us. The air fern is in reality a Bryozoan—a simple marine animal.

These two boys had shown real innate ability since the beginning of the school year and, therefore, had been encouraged to enter the Biology Club where it was possible for them to give a fuller expression to their abilities in the form of research projects. These projects would later be entered in competition at district and state science contests sponsored by the Illinois Junior Academy of Science. Both boys had been very hesitant when I mentioned this possibility to them.

It took the "air fern" to set them afire. They were now begging me for the opportunity to organize their materials in such a way that they could enter it in the district science contest.

The success of their project in the district and state science contests is a real tribute to their interest and enthusiasm. They received 1st Division Ranking in each.

This experience has illustrated to me that the average secondary school pupil has the ability to apply the scientific method to new

circumstances. Properly motivated, he has the necessary inquisitiveness and patience to carry on original investigation. The classes learned about photosynthesis, how to collect and analyze gases, the effect of light on the plant, and starch tests and how to manipulate them and what meaning they have to plant development. They learned that everything green is not chlorophyll, that everything called a "fern" is not a fern, that everything that looks alive is not alive, that everything that looks artificial is not artificial, and that some things that look like plants are really animals. For two days our classes successfully carried on original investigation. On no day in the whole school year did they seem as happy and contented as when they were doing original, productive, unassigned work.

Their attitude toward advertising, and what a thing is and why a thing is what it is, is greatly changed. Can't you see Dick coming into my room this morning, picking up a sprig of the plant that is lying on my desk, raising one eyebrow quizzically, giving me a broad wink, and saying, "So *this* is an air fern?"

Flightless Birds of New Zealand; Extinct and Near Extinct*

KATHERINE V. W. PALMER, Paleontological Research Institution, Ithaca, New York

If one were asked where there could be found the remains of enormous extinct flightless birds, the answer would be New Zealand. If asked where one could find a small flightless, ostrich-like bird, the answer would be New Zealand, and if asked where there is a flightless bird which was thought to be extinct but rediscovered, the answer would still be New Zealand.

New Zealand is that three-main-island Dominion, the size of the Atlantic Coastal states of Rhode Island, Pennsylvania, Maryland and Delaware; by sea 1200 miles east of Australia, 6000 miles west of South America, and 1100 miles south of the Fiji Islands.

Thus it is surrounded by water. But for man it would be isolated today, as it has been for about 70 million years since the Cretaceous period. Consequently, because of this long separation, New Zealand was and is unique in the lack of native ground mammals combined with the presence of flightless birds. Of the latter there were a large woodhen (a rail) (*Aptornis*), a goose (*Cnemiornis*), another rail, the takahe (*Notornis*) and the ostrich-like birds, the kiwi (*Apteryx*) and the moas. The moas were the goliaths. These, with the flightless goose and giant woodhen were extinct before the white man (pakahe) took over in New Zealand. The smallest of the group was the kiwi. It, as well as the takahe, survived the trespassing of man into their domain.

The ancestry of the moas and kiwis goes back two to eight million years. Fossil bones of both have been found beneath the lava flow of an extinct volcano. The lava flow in turn lies below clay silt deposits of extensive glaciers of former days. Thousands of years ago, great numbers of moas lived in both islands from the mountains to the sea. Though the legends of the native people, the Maoris, tell of a fierce monster—"bird or person—which dwelt in a cavern on a precipitous side of a mountain," no Maori ever saw a living moa. Representatives of one of the families of the moas were known to the pre-Maoris or earliest moa hunters. Those birds were not of the height of the earlier giants but about as large as the present day emu of Australia. Moa bones by the thousands have been found and represent birds from four to twelve feet high.

There were six or seven genera of moas with from one to six species in the genera. The largest moa, *Dinornis maximus*, adult stood from 10 to 12 feet tall, and the smallest forms $4\frac{1}{2}$ to $5\frac{1}{2}$ feet. Today ostrich-like flightless birds are the ostriches of Arabia to South Africa, about 7–8 feet high, the emus of Australia, about 7 feet, the cassowaries of Australia and the Papuan islands, about 5 feet,

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