

As a matter of fact, it would not be difficult to find scores of just such mixed professorships and instructorships in colleges all over this country. I think it would be safe to assert that it is only in the larger universities, relatively few in number, that specialization has been carried to anything like the degree suggested.

The cases of the colleges in this state may be cited as examples. In one, geology is taught by a professor of astronomy, in another by a professor of agricultural chemistry; in a third a professor of chemistry teaches mineralogy. And it is only fair to these several professors to say that in each case the instruction given is excellent.

That Maine is not unique in this respect is indicated by notices of vacancies in college faculties that have come to my attention during the past two years. In one case an instructor was needed in chemistry and geology, in another an associate professor in zoology and geology, in colleges one of which was near the Atlantic coast (not in Maine), and the other not far from the Pacific.

In my own teaching experience I held for a number of years a position in which I was expected, and did make a brave attempt, to teach chemistry, geology, botany and zoology, with a little physics thrown in for good measure; this in an institution which would be called a college almost anywhere outside of New England.

There are potent reasons why this condition of affairs exists still, and must go on existing for some time to come, whatever may be said as to its desirability; the most obvious being the limitations placed upon our colleges by lack of money. However, I am not altogether certain that the condition is undesirable.

I realize, of course, that Professor Gortner and I are not thinking of exactly the same thing. His attention is, naturally, on the more advanced courses, in which students are, and should be, in charge of more or less narrow (I use the word in no derogatory sense) specialists; mine is on the more general courses, in the conduct of which teaching ability and personality are at least as important as erudition. There is still a large and important field for the old natural-history type of instructor, and

I for one sincerely hope that his species will not soon become extinct.

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SHARK AND REMORA

TO THE EDITOR OF SCIENCE: The account by Dr. Spaeth in SCIENCE of October 21 of symbiotic relations between a shark and a remora recalls some observations made by the writer in San Diego, Cal., in November, 1920. The head of a Tuna Shark, *Isuropsis glauca*, had been cut off by the writer and carried to the laboratory of the Scripps Institution, at La Jolla. After some dissections had been made there was found on the table a small remora, three inches long, that had evidently taken refuge in the mouth or gill-chamber of the shark.

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SCIENTIFIC BOOKS

Life of Alfred Newton, Professor of Comparative Anatomy, Cambridge University, 1886-1907. By A. F. R. WOLLASTON. With a preface by SIR ARCHIBALD GEIKIE. New York: E. P. Dutton & Co., 1921. 332 pp.

The loose organization of English University affairs, the lack of coherence in the scheme of the institutions, have had their advantages and disadvantages. When in Cambridge a number of years ago, I met an eminent writer whose original and heterodox ideas about religion had lately been published in a book. "What do the orthodox divines of the University think of him?" I asked a resident. "They do not even know that he exists!" Perhaps that was a slight exaggeration, but the independence of the teachers is such that they do very nearly as they please, and wax or wane in reputation and even income according to their ability to command attention or win support. The centrifugal tendency has dominated the intellectual life of the place, increasing with the inevitable specialization of modern times. Each department is, as it were, at the end of a long lane, which no one

cares to explore unless particular business calls him.

We are now awaiting the report of the recent Government Commission, which visited Oxford and Cambridge during the last year. As a result of the war, or perhaps we should say of a necessary process hastened by the war, the ancient universities need government support. With support must go responsibility of a new kind, and possibly some sort of unification of the system. Is it possible that definite standards of equipment and teaching will eventually be required, enforced through some process of inspection? These are weighty matters for us here in America, for in many places we stand at the parting of the ways. The old freedom is difficult to maintain in the presence of a population requiring to be educated *en masse*. It matters too much if things are badly or wrongly done. At all hazards, we must maintain our intellectual integrity, but we necessarily sacrifice something of our independence. Does that mean that the best minds will gradually be robbed of their originality, grown prematurely inelastic and old? England, the home of the independent worker, has produced more original thinkers than America, whether we consider the sciences or the arts.

There is another and opposite side to the picture. The strong individuality of the leading English scientific men has had a profound influence on their colleagues, and this has been accentuated by the smallness of the country and consequent ease of communication. Professor Alfred Newton, whose teaching in certain of its aspects seemed so amazingly inadequate, was a very center of light and learning for an ardent group of ornithologists, through whom his influence radiates to this day. His "Dictionary of Birds" has no real competitor, and is one of the indispensable books to students of the subject. Throughout the Biography, here and there, we find a note of half regret that the Professor was so set in his ways, so peculiar, so amazingly conservative. Yet perhaps had he not developed freely in his own manner, his power would not have been so great. His old friend Dr. Guillemard thus sums up his impressions:

Such strength of individuality I can not recall in any other person I have known. It can safely be said that, having carefully envisaged his question and decided it, no human power could make him alter his mind. Yet one almost hesitates to say it, lest a wrong impression should be conveyed, for he was one of the most lovable of men, and inspired an unusual degree of personal affection in the many young men who frequented his rooms. The influence he exercised upon them was remarkable, not only upon the ornithologists, but upon men like Adam Sedgwick, Bateson, Frank Darwin, Lydekker, and a host of others in different fields. It would, I think, be correct to describe him as the founder of the modern Cambridge scientific school, developing the good seed sown by Henslow, who was to a former generation, I imagine, very much what Newton was to mine.

The statement about the modern scientific school applies of course only to the biological, or more specifically zoological, field. Even in the field of zoology Newton's knowledge was quite limited, but it was extraordinarily exact. His interest in birds was so wide that it led him into various fields, as for instance that of philology. Thus he combined what might be considered narrowness with a remarkable breadth of view, which undoubtedly added greatly to his beneficial influence on his students.

Sir Arthur Shipley, who was a student under Newton, gives a lively account of his lectures:

Newton's lectures were desperately dry and very formal. The Professor sat before a reading desk and read every word of the discourse from a written manuscript, written in his minute hand with a broad quill, so that all the letters looked the same, like the Burmese script. At long intervals there was drawn the outline of a tumbler. Whenever the Professor came to these outlines he religiously took a sip of water. Whether it was the time of day [1 p. m.] or whether it was that we students were all absorbed in comparative embryology and in morphology, the attendance was always small. I went during my second and third year, and at times was the sole auditor. Not that that made the least difference to the Professor. He steadily and relentlessly read on—"the majority of you now present know," "most of my audience are well aware," and similar phrases left me in considerable doubt

as to what parts of me were "the majority" and which the "most."

About the year 1884, Newton prepared courses of lectures on Geographical Distribution and Evidences of Evolution. He was to lecture on Monday, Wednesday and Friday at noon. He discovered, however, that the lectures, as written, would not stretch over a whole term, so he told the class that next Monday he would unfortunately not be able to lecture owing to urgent business, and this would continue throughout the term.

Dr. Guillemard, in the passage quoted above, has referred to the difficulty of changing Newton's well-considered opinions. It must be added, however, that he was able to keep an open mind on certain subjects of great importance to him. Thus he readily appreciated Darwin's theory at the time of its publication, and only four days after the publication of the Darwin and Wallace papers by the Linnean Society wrote a long letter on the subject to Canon H. B. Tristram. This led to the circumstance that Tristram was the first zoologist of note to publish his adherence to the doctrine, though unfortunately he was reconverted to the old faith shortly after. He also came to see that the old classification of birds was faulty, and recognized the necessity for fundamental revision.

Professor Newton was an ardent field naturalist, and in his earlier days visited the West Indies (St. Croix and St. Thomas), Iceland, Spitzbergen and other countries, always making interesting observations. He did his best to discover the haunts of the great Auk in Iceland, but although he talked with men who had seen it, it was apparently extinct before his visit. He left copious materials for a history of the great Auk, which he intended to publish had his life been prolonged a few more years.

Newton died in 1907, his last wish being "may the study of zoology continue to flourish in the University." Since then, much good and important work has been done, but there is great need for more room, more assistance, more apparatus, and adequate salaries for the staff. The whole British Empire is concerned in this matter, for in such centers must be

trained the men who go out to solve the innumerable problems of the dominions and colonies. Nor is it merely a matter of training specialists, for modern life requires that the leaders in all fields shall know something of biology. Thus, even if conditions in Newton's time could have been described as adequate (which they were not), they would no longer suffice for modern needs.

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ACOUSTICAL NOTES

Musical Notation.—The recent interesting letter in SCIENCE describing a new musical notation and proposing a new keyboard therefor, calls for a brief historical note, even though it should make two ingenious gentlemen "curse those who said our good things before us."

It is obviously true that the staff which best conforms to our chromatic scale of twelve equal steps to the octave, and best appeals to the mind accustomed to grapho, is one of 12 (13) equally spaced lines for an octave; or since it is difficult to distinguish among so many lines alternate lines may be omitted so leaving a 6-line or whole-tone scale. These facts are so obvious that both forms have been invented repeatedly, as is shown by patents long since expired. The earliest use found was by Joshua Steele in "Melody in speech," London, 1775. To distinguish between the numerous lines he superposed the ordinary five lines and used some dotted lines. For many years I have found this notation very convenient for writing non-harmonic scales or music and have referred to it occasionally in print, but it seems never to have appealed to musicians.

Modifications of this many-lined staff have been proposed; one uses only four or three lines, but any note, as C, will come in the same position in all octaves; sometimes the note-heads are of different shapes. The most frequent modification is to retain only the five lines that correspond to the black keys of the piano—a scheme closely analogous in principle to the old tablatures. This was