

reflection on the science masters. If the genius of the schools were something more than classical, if boys could get the same promotion for science that they do for classics, the opportunities of the science master would be increased a hundred-fold, and scientific knowledge would become the rule instead of the exception.

Throughout the article on the position of science at Oxford, I referred to public schools, only once to science masters, and that once in a complimentary sense. It should have been sufficiently clear, in spite of my unguarded sentence, that it was the spirit, the general scheme of education of our public schools, that I was attacking. Mr. Latter's letter justifies my attack. There are points in his letter which I would willingly discuss, but space forbids my entering into them now. As to the questions of Greek and the precedence of chemistry and physics over biology, there is much to be said on both sides. I will only say this: Mr. Latter is an accomplished zoologist, and his love of his subject perhaps leads him to under-estimate the intense interest which many young boys take in chemical and physical problems. After watching carefully a group of very small boys with whom I have familiar relations, I am convinced that they go after butterflies and fishes, not by preference, but because they have this opportunity of satisfying their thirst for natural knowledge, and have not the same opportunities for cultivating chemistry and physics. At any rate, if I offer to make hydrogen, or to exhibit an air-pump or an electric battery, the insects are deserted at once. Being a biologist myself, I write without prejudice in favour of the more exact sciences.

THE WRITER OF THE ARTICLE.

#### The Salaries of Science Demonstrators.

I FANCY the incident referred to in the fable quoted by "O. J. L." (p. 271) must have happened some time ago, possibly when "O. J. L." was a tadpole himself. I am sure he would not think so lightly of our grievances if he fully realised the state of affairs in this pond of late years. At one time every tadpole who did good work had a reasonable prospect of developing into a frog on attaining a suitable age. Now there are scores of tadpoles, some of them grey-haired, who attend meetings, and croak to the best of their ability, and read papers bearing the name of some frog as joint author, but who seem fated to end their days in the tadpole stage because they cannot get sufficient food to enable them to develop into frogs.

This state of affairs is, I take it, largely attributable to the following cause. As all naturalists are aware, our ponds at certain seasons of the year are choked with frog-spawn. Under the old *régime* this spawn had to take its chance; some got dried up in the sun, and some got washed away by rain, so that only one occasional *ovum* here or there hatched. This process of survival of the fittest led to the production of a race of frogs eminently adapted to hold their own in the struggle for existence, and many of these have now acquired world-wide reputations. But Mother Carey, fearing lest any of the eggs that perished might contain the latent germs of some remarkable genius, has carefully tended this frog-spawn and hatched it in a laboratory fitted up with all the most modern incubators and other appliances, and has sometimes even nurtured it with County Council and other scholarships. So far so good. But as soon as the tadpoles are hatched, Mother Carey turns them adrift into our pond to fish for themselves, and takes no more notice of them. The result is that, where we had one tadpole formerly, there are now hundreds, struggling and starving each other out. Every morsel of food dropped into our pond (even if it be only a matter of £60 a year) leads to a terrible scramble, in which the best of us do not always come off first. I consider that we have a genuine grievance against Mother Carey on the ground that, after having devoted so much energy to hatching large numbers of tadpoles annually, she gives so little thought about finding us proper food at the time when we most need it. If we cannot all live on dry land, let us, at any rate, have a fair chance of developing our power of swimming like frogs in the water.

"AN AGGRIEVED TADPOLE."

#### The Date of the Glacial Period.

MR. DAVISON has laid geologists under many obligations to him for his mathematical investigations of vexed or obscure questions. His suggestion in the *Geological Magazine*, that the glacial period would probably have left a long-enduring mark

upon the iso-geotherms, seemed to me, as I dare say it did to other students of glacial geology, a promising one; and though a comparison, which I made of the gradients in thirty-seven cases within the glaciated area of Britain with sixteen in the unglaciated portion, failed to reveal any significant difference, still I have been disposed to ascribe the failure rather to the imperfection of the data than to any fault in the method. When, however, Mr. Davison (*NATURE*, June 11, p. 137) extends the application of his formula to a comparison of two hemispheres, the insufficiency of the data is such as to entirely vitiate any results.

In the northern hemisphere there were available in 1885, when Prestwich wrote his memoir published by the Royal Society, 231 series of observations on the temperature of mines, tunnels and bore-holes, and it was only by what appeared to be the rather arbitrary elimination of an immense number of the records, that anything like an agreement could be obtained.

What, however, is the body of evidence employed in the determination of the temperature-gradient in the southern hemisphere? One bore-hole in New South Wales! Whatever confidence we may feel in the care exercised by the observers, I cannot think that any general conclusions should be based upon this single series of observations.

There are several well-known bore-holes in the northern hemisphere in which the gradient is as far from the average given by Mr. Davison as is that of the Australian one, and, though various explanations were suggested, none was regarded as satisfactory. If Mr. Davison had referred to the Wheelton bore-hole in the 19th and 20th reports of the British Association Committee on underground temperatures, he would have found there a series of observations, made by a practised physicist, and repeated after an interval of a year under varied conditions, with practically identical results; yet here the increase of temperature was only  $1^{\circ} F.$  per 70 feet. The St. Louis bore-hole, again, gave an average gradient of 88 feet; and though the result was regarded as erroneous, it was acknowledged that every care had been exercised, and no specific source of error could be suggested.

Taking all the circumstances into consideration, I think it will be generally conceded that, interesting as this Australian record may be, it throws no light whatever upon the vexed question of alternate glacial periods in the two hemispheres.

PERCY F. KENDALL.

Yorkshire College, Leeds, July 16.

#### TAXIDERMISTRY AND MODELLING.<sup>1</sup>

THAT taxidermy has been almost an entirely neglected art is obvious to the least scientific visitor to even the best of our museums, when he regards the "deformed, distorted, and disproportioned" effigies that represent our commonest species. Every means, therefore, be it by example or precept, which will have the effect of impressing on the taxidermist the importance of his share in the exposition of natural history, and which will tend to raise what is at present little better than the knack of distending, more or less cleverly, the skins of animals with wool or shavings, to the science and art of where and why to "stuff" and reproduce, and how to pose, will be welcomed by all those who are responsible for instructing, by forms made up to simulate life, those desirous of becoming acquainted with the likeness and gait of animals which they have few or no opportunities of observing in a state of nature; and by those who turn aside to our museums to refresh their spirits with the sight of species which they have learned to love in the fields or in the sea.

The title of the work which heads this article is from the pen of Mr. Montagu Browne, the Curator of the Leicester Museum. That institution has obtained a considerable and deserved reputation for the excellence of many of its mounted groups, birds especially, as examples of the taxidermist's art, prepared by the skilled hands,

<sup>1</sup> "Artistic and Scientific Taxidermy and Modelling: a Manual of Instruction in the Methods of Preserving and Reproducing the Correct Form of all Natural Objects, including a chapter on the Modelling of Foliage." By Montagu Browne, F.G.S., F.Z.S., &c., Curator of the Leicester Corporation Museum and Art Gallery; author of "Practical Taxidermy," &c. With 22 full-page illustrations, and 11 in text. Pp. xii + 463. (London: Adam and Charles Black, 1896.)

we believe, of the curator himself. A work, therefore, on the subject in which he is an expert deserves attention. Taken as a whole we may at once say, that its careful perusal will well repay the practical taxidermist and modeller, for he will find the book to be a very detailed guide to the more important methods of reproducing animals and plants for exhibition purposes. Curators of museums, even though they are neither taxidermists nor modellers, will derive many excellent suggestions from its pages.

The object of the work, the author informs us, is to pave the way for the "happy combination" of qualities which he thinks the taxidermist should possess. "The future and hope of taxidermy will be," he says, "the welding of the educated artist, designer, modeller, sculptor, biologist and naturalist; and the two last are by no means synonymous terms, as some might suppose. When this happens—and there is no reason why all these

various attitudes, and whichever of these he desires to reproduce he will have noted in his preliminary study of his subject. He has but to copy faithfully—neither to create, nor to use the painter's "poetic inspirations."

Following a short account of the origin and progress of taxidermy, the succeeding seven chapters (some 290 pages) deal with the skinning and setting up of vertebrates, and the preserving of invertebrates, by various methods; and also their reproduction by casting and modelling in paper, glue, &c. On these subjects Mr. Browne writes with undoubted authority and wide experience, and his instructions and descriptions are, therefore, of the greatest value. Besides the processes and methods long known and widely practised, the author claims to describe "methods of taxidermy and modelling not yet published, most of which are indeed absolutely novel, and at present confined to the Leicester Museum"; specially noteworthy among them is the mounting of the



FIG. 1.—Model in Paper of the Headless Body of a Tiger.

attributes should not be combined in one individual—taxidermy will become an exact science relieved as painting is at present by poetic inspirations." In this opinion Mr. Browne but supports what Dr. Shufeldt, whom he quotes, has written on the subject of the taxidermist's training. Such a concatenation of qualities in one person will, we fear, remain a dream of the future. Life is not long enough for one individual to master a series of professions each arduous enough in itself for most men. Indeed, we hardly desire such a "professor" of many callings. Knowledge is never useless, but in our opinion it appears unnecessary to insist that the taxidermist of the future shall possess a scientific training in biology, or should know more anatomy and osteology than may be gained in his apprenticeship, and by very careful observation of the bodies of the animals he has to deal with; for he has to reproduce only the external surfaces as affected by

skin, which is fully described, upon a model of the body in paper, a process which, though tedious and demanding much labour and care, will probably prove to be a great improvement on that involving a "mannikin." An illustration of a model in paper of a headless tiger, on which the skin is to be fitted, is, through the courtesy of the publishers, reproduced here (Fig. 1).

We are surprised to observe that Mr. Browne strongly decries the use of "arsenical and mercurial [corrosive sublimate] soap," as being very inefficient and too dangerous for use, and recommends in its place "a non-poisonous preservative soap" (of chalk, lime-chloride and musk) of his own devising. Notwithstanding this, we read on page 35, "the most perfect preservatives are probably those which contain [which the author's preservative does not] with alcohol a certain percentage of bichloride of mercury," and on other pages several formulæ so com-



pounded are recommended for use for skins infested with insects, for it prevents insect pests and mildew "ever appearing afterwards." Great care is always necessary in the use of poisons; but as there is no greater danger in using arsenical soap containing bichloride of mercury than an alcoholic solution of the salt, we are at loss to understand his strong denunciation of the evidently more efficient medium. The present writer has found no preservative equal to it, and has used it for thousands of skins, bird and mammal, in various regions of the globe, and cannot recollect to have lost one by moth, mite, or dermestæ—except when the soap was insufficiently applied. Many of them also, after lying for years as dry skins, have been relaxed, and have proved all that could be desired. The alcoholic solution of corrosive sublimate applied to a tender skin renders it very brittle, a result entirely obviated when the salt is incorporated in the soap. Several formulæ, of which Mr. Browne claims the

to the study of botany, which even the best prepared herbarium can scarcely be said to do. How naturally such plants can be modelled may be seen from the second plate (Fig. 2), which we are kindly permitted to reproduce. The volume, which is dedicated to the *doyen* of museum reformers, Sir William Flower, is so beautifully printed, illustrated and bound, that we feel we cannot close our commendation of the author's part without a word of appreciation of the publishers' share in its production.

#### PROGRESS IN STEREOCHEMISTRY.

TO the stronger minds among men of science, exercised in abstract conception, and independent of such aids to the imagination as are embodied in drawings of atomic arrangements, models of molecules and even formulæ of atomic groupings, there is no doubt something almost repulsive in the representation of the

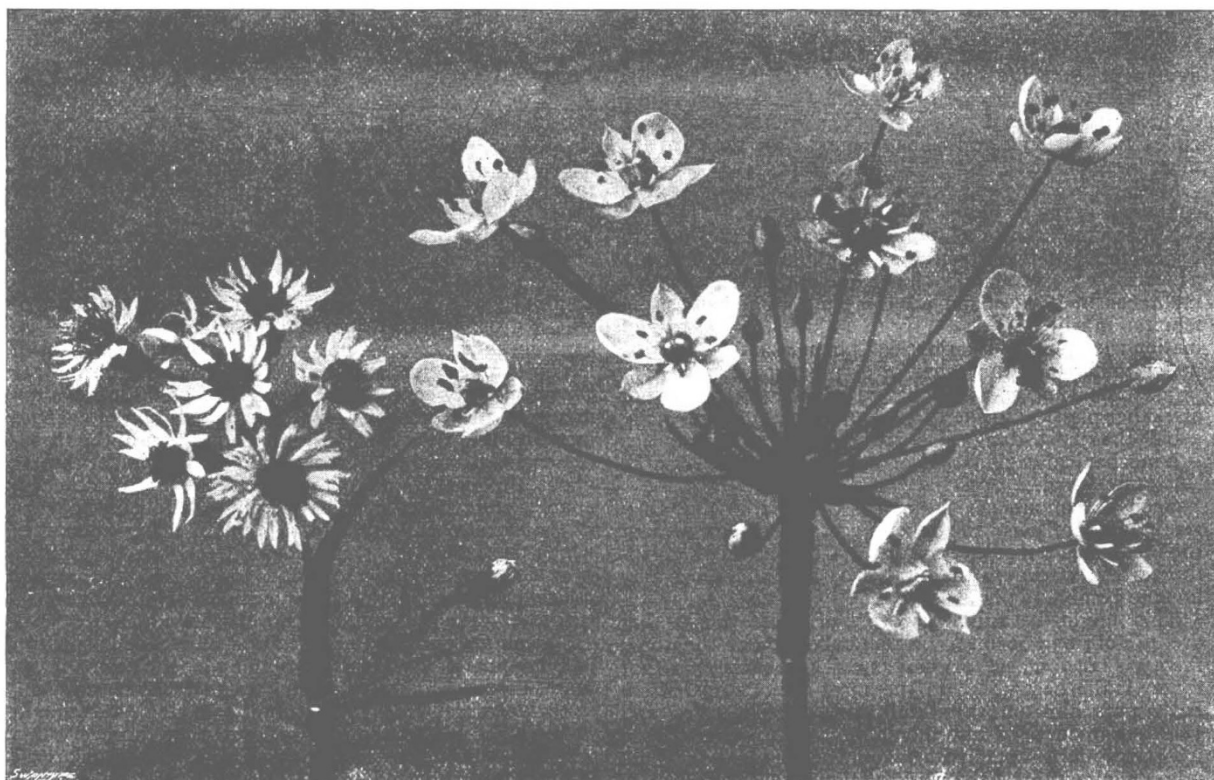


FIG. 2.—Models, in Fabric, of Sea-Aster and Flowering Rush.

authorship, are given for the preservation of cartilage; but we miss any reference, either in the book itself or in the bibliography at the end, to Prof. Jeffery Parker's methods. He was one of the first, if not the first, to preserve cartilaginous fishes as "dry" specimens in museums, by very similar, if not essentially the same, processes as Mr. Browne.

Not the least valuable section of the book is the ninth chapter, describing "casting and modelling from natural foliage, flowers, fruits, algæ, fungi, &c., and their reproduction in practically indestructible materials,"—the Mintorn Art Fabric. This is quite a recent branch of the taxidermist's art—if it really belong to it—which is as important, and demands equal care an ability as the mounting of the specimen which it is to enhance. The reproduction in this material of the species of the British flora in our museums would prove a very great incentive

molecule as a machine, a combination of mechanical powers. It is nearly forty years since the screw was suggested (by Pasteur) as a symbol of the atomic arrangement in tartaric acid, and now we find the lever introduced in such phrases as "the moment of a chain of atoms varying with its length." The wheel-and-axle has not yet been pressed into the service to explain atomic vagaries; and of the philosopher who shall venture to take this further step, the abstract thinkers of to-day will surely say, as Kolbe said of the chemist who was destined to succeed him in his professorial chair at Leipzig: "Hereby he declares that he has left the ranks of men of science, and has gone over to the camp of those philosophers of ill-omen, who are separated from the spiritualists by only a very thin *medium*!"

Yet as surely as Kolbe was succeeded by the stereochemist whose doctrines he denounced, so surely will the