ment, and that governors will seek to redeem these institutions from the mere curiosity shop style into which too many have developed, and to render them valuable educational instruments.

Interested in geology, I have been pleased, in occasional visits with pupils to our local museums, to note the gain to accurate knowledge as the diagrammatic illustration of the text-book is exchanged for the fuller teaching of fossil and specimen, and where, to chronological and stratigraphical plan, the characteristic fossils are indicated by special labels, and the time range shown by variously coloured mounts, the advantage is considerable. I would further suggest the desirability of numbering important objects, as in a picture gallery, and furnishing the visitor with an attractive catalogue. Where several museums exist in the same town could not the authorities, by mutual agreement, economise space and effort by division of labour, each one becoming to some extent exhaustive in a special direction?

In one of our best arranged museums I recently found, for pure want of room, Cambrian trilobites associated with basic rocks, and a fossil neatly stowed away in a case of Vesuvian products.

Bright, convenient, and well-keyed, our museums ought to increasingly attract students and gather in recruits from time to time from the inquiring public. A good supply should in this, as in some other educational difficulties, create demand, and stimulate public sentiment until our museums become so commodious and well-appointed as to bear comparison with the excellent models Prof. Dawkins refers to as established by our Continental neighbours; and the natural sciences gain in dignity amongst us until they enter into healthy rivalry with the elder and established studies of numbers and letters.

Manchester, June 2

WILLIAM GEE

I SEE with pleasure that Prof. Boyd Dawkins has again raised his voice urging the importance of museums as a means of education, but as there is one point regarding their management to which it may be useful to call attention, I shall be glad if you will allow me to do so through your pages.

Undoubtedly English museums compare most unfavourably with foreign ones, and this partly arises from the idea which is so prevalent that one man ought to be able to arrange and determine anything from New Zealand birds, plants, or fossils to a collection of Egyptian idols. The consequence is that we see such incongruities as were pointed out by Prof. Dawkins, to which I should like to add another, from one of the leading technical institutions of London; there a few years ago (and I suppose there are still), among building materials, some large Nummulites (a genus of fossil foraminifera), marked portions of brick made by the Israelites for the Egyptians when they were allowed no straw.

In a middle-sized foreign town in any of the other civilised countries of Europe there is a museum in charge of men who have given their attention to various branches of science; even in Italy, which is much behind in this matter of museums, we find in such towns as Turin a well-arranged museum with a considerable staff of curators, with the minerals in the hands of one man, the fossils in another, the vertebrates have, I believe, two or three of the staff to work at them, while the invertebrates are in the hands of another, and in the same way the historical and technical portions are no doubt under adequate management.

When we turn back to England we find such a humiliating thing as a town like Manchester with no museum worthy of a fourth-rate town.

It will no doubt be some time before their importance is fully recognised and therefore as museums are likely to be for a long time insufficiently manned, might it not be a great advantage if a number of local museums joined together to employ specialists to determine different groups? Such work might no doubt be done very cheaply, for such men would often be glad of the opportunity of so much material passing through their hands.

A naturalist who was making any group, such as corals or crustacea, his subject, might visit the museums and would in a very short time be able to determine and arrange the greater part of the local collection, and might have those which required further research sent up to London for investigation at leisure upon the completion of his tour.

ARTHUR WM. WATERS

Alderley Edge

The Antiquity of Man

HAVING carefully perused the proceedings that took place at the recent "Conference" on the subject of the antiquity of

man at the Anthropological Institute, I confess to a feeling of disappointment. I had looked, if not for new geological facts, at least for something novel in the treatment of what was already known, instead of which the geological speakers seem, for the most part, to have merely reiterated opinions with which their names have been for some time identified. Thus my able opponent, Prof. Boyd Dawkins, does no more than restate views and conclusions which have already been controverted more than once, and to which, therefore, I need not reply here, as in so doing I should be only summarising what has been stated at length elsewhere. Mr. Dawkins's "case" and my own are now so fully before our fellow-hammerers that we may be well content to leave them for judgment to the future—a future which is probably not far off. Prof. Prestwich, again, while quite open to conviction that man may have lived in England in pre-glacial times, is yet strongly of opinion that all the human relics hitherto obtained in the south of England are of *post-glacial* age, because they occur in deposits that overlie "the boulder-clay." Now this conclusion would certainly follow if it could be shown that the "chalky boulder-clay" of East Anglia represents, as Prof. Prestwich thinks it does, the glacial period. Unfortunately it only represents one phase of that period. There is an *older* boulder-clay than that "chalky till," and there are two separate boulder-clays which are *younger*, as Mr. S. V. Wood has demonstrated. The East Anglian chalky boulder-clay was laid down, as I believe, during the climax of glacial cold, and is consequently much older than the upper boulder-clays that occupy the surface of Scotland and the North of England. For the evidence which has weighed with me in coming to this conclusion I must refer Prof. Prestwich to the account of the English glacial deposits, which is given in the second edition of my work on the Ice Age. The proofs and argument are too long to recapitulate here. That the East Anglian chalky till belongs to a much more ancient date than the upper boulder clays of Yorkshire and the North, must strike any one who will take the trouble to compare them. The East Anglian deposit has been subjected to long-continued and powerful erosion, and everywhere bears the impress of extreme antiquity, while the younger tills of the North have a comparatively recent appearance. Nor is this by any means all, for between the accumulation of the chalky till and the formation of the most recent boulder-clay or till of the North there certainly intervened one mild inter-glacial period. (There were in reality, as I believe, two such periods.) Now during the "last inter-glacial period"—that, namely, which preceded the deposition of the youngest boulder-clay of Yorkshire and the North—there certainly existed a land-surface in England over which the pleistocene mammalia roamed. The proofs of this are found in certain fresh-water and estuarine deposits which are met with near Hull and elsewhere, and which have yielded mammalian remains, and thousands of *Cyrena fluminalis* and other shells. Prof. Prestwich has himself described these beds and classified them as *post-glacial*, partly because they repose upon boulder-clay and partly on account of their fossil contents. But since the date of Prof. Prestwich's visit to the locality in question, the section (near Burstwick) has been much better opened up, and now one may see *resting upon these so-called post-glacial deposits a thick mass of tumultuous boulder-clay*. This boulder-clay is in my opinion as truly the product of glacier-ice as any ground-moraine or till in Scotland, Norway, or Switzerland, and points to a time when all Scotland and the northern districts of England, down as far as the valley of the Humber, were shrouded in snow and ice.

With reference to the recent discoveries by Mr. Skertchly near Brandon, which Mr. Evans and Prof. Hughes have convinced themselves lend no support to the view that man is other than *post-glacial*, I would ask geologists to suspend their judgment until they have had an opportunity of hearing the other side. Let them exercise a little of that "caution" which Mr. Evans desiderates, and not too readily acquiesce in his and Prof. Hughes' ruling. Mr. Skertchly, who has mapped the ground about Brandon and Thetford, and whom we may suppose, therefore, to be more intimately acquainted with the geology of that district than either of his opponents, has no doubt that certain implement-bearing brick-earths are covered by boulder-clay *in situ*. I have also carefully examined the sections in question and feel quite sure that Mr. Skertchly is right, and that the overlying accumulation is a true glacial deposit, and an integral portion of the so-called chalky boulder-clay. Prof. Ramsay, who has likewise recently visited Brandon, is, I believe, of the same opinion. But the occurrence of flint implements underneath the chalky till of East Anglia is, after all, no proof that

these relics are pre-glacial. The most one can say about them is simply this, that the folk who used them lived in England before the climax of glacial cold. When human relics are got in beds of older date than those at Cromer, we shall then have a demonstration of the pre-glacial age of man in Britain. At the same time the presumption is (as many geologists will admit) that some portion of our ancient river-drifts and cave-deposits with flint implements do really belong to pre-glacial times. In short, after carefully reading the proceedings at the recent Conference, I find nothing to shake me in my present belief that none of the palæolithic deposits belongs to post-glacial times, but that all must be relegated to inter-glacial, and probably pre-glacial ages, and consequently that the palæolithic is separated from the neolithic age by the intervention of the last cold period of the glacial epoch. My opinion, therefore, is still as strong as ever that "until we clearly understand what was the succession of changes during the ice age, it is premature to speculate upon the geological age of those deposits which yield the earliest traces of man in Britain." In concluding, may I be allowed to suggest to the anonymous writer whose communication on the subject of the Antiquity of Man appears in the number of this journal for June 7, that before he again essays to criticise my views he might do well to become better acquainted with them. JAMES GEIKIE

Perth, June 15

BEFORE your readers accept the statements of Messrs. Evans and Hughes respecting my discovery of flint tools beneath the great chalky boulder-clay, as announced in NATURE last year, may I ask them to remember that as yet I have not published the evidence upon which I founded my statement? The delay has arisen from official and other causes; and although my paper is now written, it is, I have just learned, too late for reading during the present session at the Geological Society. Neither of the two gentlemen named is aware of the extent of my evidence, for I have not, as yet, told any one about it, except the two geologists mentioned below. As I shall show, there are now known to me about forty localities in which the brick-earths in question occur, and in most of them their relation to the boulder-clay is very clear; and even in the two or three spots in which that rock is not seen in the actual section, it overlies the implement beds near by on the same outcrop. The brick-earths have naturally suffered much denudation by the boulder-clay, and I have a splendid series of sections showing every phase from almost undisturbed material beneath the boulder-clay to small fragments (boulders, in fact) in that deposit. I wish, also, to state, that instead of four implements from two localities, as originally announced, I know at present nearly 150 from six different spots. The evidence is so clear and overwhelming when seen *en masse*, that it must be convincing to all who carefully weigh it. The boulder-clay which overlies the brick-earths in question is part and parcel of the great mass of the chalky boulder-clay, a formation which I have spent eight years in examining in the field almost daily, of which I have mapped about 2,000 square miles, and upon which I feel quite competent to form an opinion.

Prof. Prestwich is perfectly correct in ascribing the well-known palæolithic implements found in the gravel to a time subsequent to the formation of the chalky boulder-clay; but that *only proves those tools to be newer than the last glaciation of this particular area*. Now inasmuch as Mr. Searles V. Wood, jun., long ago proved, and as everybody who examines the ground must admit, that the "purple" and "hessle" boulder-clays are newer than the one we are dealing with, and as Dr. J. Geikie has shown that gravels bearing the same character and possessing the same peculiar fauna as the well-known palæolithic gravels (overlying, moreover, the chalky boulder-clay), pass under these newer beds, it is, to say the least, a misnomer to call these gravels *post-glacial*. They are post-glacial to this East Anglian area, but not to northern England; and the distribution of surface-beds containing palæolithic implements throughout Europe shows that they are confined exclusively to that area which was free from the erosive action of the newer and less intense ice-sheets of the latter part of the "Great Ice Age." Much of the misapprehension in this matter has arisen from the unfortunate name of "upper" given to the chalky boulder-clay. It is "upper" in East Anglia, but it is "lower" in Yorkshire.

My discovery does *not* prove man to have been pre-glacial; it merely shows that he was "pre-chalky-boulder-clay," and I last week obtained evidence to show that the brick-earths in question belong to the "middle glacial" of Mr. Searles V. Wood, jun.; that is to say, they are newer than the Cromer till, but older than the chalky boulder-clay.

Mr. Belt is mistaken respecting the quartzite implements near Brandon. They are found in gravel which is unquestionably above the boulder-clay, as can be seen in hundreds of sections, and the only conceivable source of that material is the boulder-clay. We have, in fact, two horizons of palæolithic implements, one above and one below the boulder-clay, and I am in hopes that the former will be found capable of subdivision, for many facts crop up in the course of my daily work which seem to point in that direction.

Prof. Ramsay and Dr. J. Geikie, who are eminently capable of judging of glacial phenomena, have gone over the area with me, and are perfectly convinced of the accuracy of my determinations. SYDNEY B. J. SKERTCHLY

Brandon

Nicephore Niepce

THERE is an error in one of your "Notes" of last week which you may be glad to have corrected. It is not to Niepce de St. Victor that the citizens of Chalons-sur-Saône (a town, by the way, not to be mistaken for Chalons in the Champagne country) are about to erect a statue, but to his uncle, Joseph Nicephore Niepce, who might well be designated as the first photographer, since he it was who succeeded first of all in fixing an image in the camera. In a "Life of Nicephore Niepce,"¹ recently published by Victor Fouqué, appear letters which leave little doubt that in May, 1816 Niepce had accomplished the feat of fixing shadows in the camera, for in a communication of that date to his brother he incloses four photographs, of which he says: "The pigeon-house is reversed on the pictures, the barn, or rather the roof of the barn, being to the left, instead of the right. The white mass which you perceive to the right of the pigeon-house, and which appears somewhat confused, is the reflection upon the paper of the pear-tree, and the black spot near the summit is an opening between the branches of the trees." The shadow on the right indicates the roof of the bake-house." This, then, is a description of the first camera-picture ever taken, and it was by reason of Niepce's inability to prevent his impressions from fading after a lapse of time that he turned his attention to the bitumen of Judea process, with which he produced photographs as early as 1824, one or two specimens being still among the science treasures of the British Museum.

The name of Nicephore Niepce is little known in England. And yet this should not be. As is well known he came to this country in 1827, and resided at Kew in the hope to receive aid and encouragement, and shortly afterwards, on his return to France, entered into partnership with Daguerre to work out together a more practical process. When Daguerre made known his discovery in 1839, his partner had been dead two years, and no mention was made of Niepce at the time Arago made his famous speech announcing the discovery of Daguerreotype. Specimens of the wonderful process were not long in reaching this country and the first picture was placed in Faraday's hands with the remark that he had never seen anything like it before. But Faraday said he had. A Frenchman, he remembered, had brought him a picture of Kew Church a dozen years ago, with the quaint remark, that "the sun had done it." Faraday was so certain of this that inquiries were at once instituted into the matter, and in the end, a communication was addressed by the Secretary of the Royal Society, Mr. Bauer, to the *Académie* at Paris, a communication which helped materially to substantiate the claim of the Niepce family, and to obtain for the son Isidore, a pension in acknowledgment of the father's services. The deed of partnership between Niepce and Daguerre is still extant, but how much of the latter's published results were due to his dead partner the world will never know.

H. BADEN PRITCHARD

June 16

Japanese Mirrors

THERE is still something to be solved about the Japanese mirrors, which show the figures that appear in relief on the back in the disk of light reflected from the face. Not only does it seem impossible (without some indication which I have not yet met with) to tell which mirrors in a series will perform the feat, but it is equally difficult to say why one bunch of leaves will, and another in the same casting, will not appear in the spectrum.

In reference to Mr. Hignley's quotation of Mr. Prinsep's conjecture (p. 132), "that the thinnest parts, from being the hardest,

¹ "La Verité sur l'Invention de la Photographie."