of science upon museums, the force of which is apparent when it is remembered that the material pertaining to it therein stored constitutes the vital evidence of the value of all contributions to its advancement, and that without such evidence this branch of science would be reduced to a mass of personal testimony.

In view of the great scientific value of fossil remains the following remarks are offered concerning the precautions which are necessary in their preservation. It is true that most, if not all, these precautions are observed in a large part of the principal scientific museums of the world, but it is also true that much remissness in this respect has occurred in others. Besides the propriety of referring to the latter fact, these remarks are necessary to complete my statement of the claims of science which constitute the subject of this essay.

Three general classes of specimens of fossil remains should be recognised in museum collections, namely, typical, authenticated, and unauthenticated. Under the head of typical or type specimens are included not only those which have been described and figured in any publication, whether original or otherwise, but those which have in any public manner been so used or referred to. While all such specimens as these should at all times be accessible to any competent investigator, the risk of loss or injury is so great that they should in no case be allowed to be taken from the museum building in which they are installed. Such specimens are in a peculiar sense unique, and there can be no substitution and no equivalent in value. Their loss greatly reduces the value of every publication any part of which is based upon them, and to that extent retards the advancement of science. It is not enough that other, and even better, specimens of presumably the same species may be discovered; the former constitute the original, the latter only suppositious evidence. Besides the risk of loss or injury to type specimens by removal from the place of their instalment, their absence is a disadvantage to science. That is, no one investigator should be allowed their use to the exclusion of any other.

The term "authenticated specimens" is here applied to such as have been studied and annotated by competent investigators and properly installed. Such material constitutes the bulk of every important museum collection, and next to the type specimens already mentioned, they are most valuable. Their increased value is due to the scientific labour that has been bestowed upon them, and it needs only the additional labour of publication to constitute them type specimens and to make them of like value. Authenticated specimens when installed are ready aids to all investigators of such value, that even the temporary removal of any of them from a public museum is, to say the least, of doubtful expediency.

Unauthenticated specimens are, of course, those which have not been studied and installed, and they constitute the great mass of material from which authenticated and type specimens are drawn. Among them are those which constitute the material evidence upon which original observations in biological geology are based. If these are accompanied by the records and descriptive notes which are essential to their value, they constitute proper material for acceptance by museum authorities; but if not, their instalment should be refused, whatever their character may be. That is, to apply a statement made in another connection, no specimen of fossil remains should be admitted to permanent installation in any public museum which is not accompanied by such a record of the locality and stratum from which it was obtained, as will enable any investigator to revisit the same. In every case of instalment such records should be so connected with every specimen as to be readily accessible, and so arranged that the danger of loss or disconnection shall be reduced to a minimum.

The foregoing discussion of the claims of science upon museums is intended to embrace reference only to those which are devoted to the preservation of material pertaining to biological geology, but they are of more or less general applicability. These partial claims alone demonstrate the important relation that museums hold to science and to civilisation as centres of learning and conservatories of the evidence concerning acquired knowledge. Museums should not only be made safe treasure-houses of science, but they should be what their name implies—temples of study—perpetually open to all investigators.

The claims of science upon geological organisations cannot be discussed at length here, but because the ratio of power for the advancement or retardation of science possessed by such organisations is so much greater than that of individuals working independently, it is desirable to make this brief reference to them. That power increases also with the ratio of the extent of the organisation, and it is largely centred in the director. His responsibility, especially if his organisation is a large one, is peculiar, and, to himself, of an unfortunate character. That is, while all, or nearly all, the advancement of science that may be accomplished by the organisation is the work of his subordinates, retardation, if it should occur, is mainly due to his failure to require that each branch of investigation should be prosecuted in accord with all others, and the case would be little less than disastrous should he himself favour *ex parte* methods, or fail to require a symmetrical development of the work in his charge. The claims of science upon geological organisations are therefore really claims upon their directors, and they are more responsible than any other class of persons for the preservation of the integrity of geological science.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

AT a meeting of the Council of University College, Dundee, last week, it was announced that the trustees of the late Miss Margaret Harris had allocated a number of securities, valued at nearly £14,000, to establish a chair of Physics in the College, as recommended by the University Commissioners. The Council resolved to institute immediately a chair of Natural Philosophy; and an appointment will be made before the beginning of next session. Hitherto the classes of Mathematics and Physics have been combined. The salary will be £400 with share of the fees.

THE invaluable *Record* of technical and secondary education continues, in the quarterly number just issued, the review of the work done by the Technical Education Committees of the English County Councils, commenced in the preceding issue. A summary is also given of the work of the Scotch County Councils, from which it appears that, out of a total of thirty-three County Councils, twenty-four are devoting the whole, and seven a part, of their grants to educational purposes, while two counties are applying the whole of the fund to the relief of the rates. Out of a total sum of £25,157 distributed among the County Councils of Scotland, £22,491 was devoted to education in the year 1893-94. Mr. P. J. Hartog contributes to the *Record* an illustrated description of the Owens College, Manchester.

THE Town Trustees of Sheffield have (says the *Athenæum*) voted a sum of £10,000 towards the endowment of Firth College, with a view to enabling the authorities to affiliate it to Victoria University. The actual endowment of the College is £23,000, in addition to its income of £1200 from the State and £800 from the Corporation. It is understood that a total of £50,000 would be sufficient, but no more than sufficient, for the purpose of affiliation. A further sum of £5000 has been conditionally promised by Sir Henry Stephenson, and a public appeal is contemplated for the remaining £12,000.

SCIENTIFIC SERIALS.

The Quarterly Journal of Microscopical Science for March 1895 contains:—On the variation of the tentaculocysts of *Aurelia aurita*, by Edward T. Browne. (Plate 25.) Of 359 Ephyræ collected in 1893, 22·6 per cent. were abnormal in possessing more or less than eight tentaculocysts; and of 1156 collected in 1894, nearly the same percentage, 20·9 was obtained. Of 383 adult Aurelia collected in 1894, 22·8 per cent. were abnormal.—On the structure of *Vermiculus pilosus*, by E. S. Goodrich, gives a detailed account of this interesting Oligochæte, found near Weymouth in 1892. (Plates 26-28.)—On the mouth parts of the Cypris stage of Balanus, by Theo. T. Groom. (Plate 29.) "It may be regarded as tolerably certain that: (1) The antennæ of the Nauplius become definitely lost with the moult resulting in the production of the Cypris stage. (2) The biramous mandibles of the Nauplius become reduced at the same time to the small mandibles, the ramus being probably preserved in the form of the small palp. (3) The first pair of maxillæ arise behind the mandibles, and at a later date, as a small pair of foliaceous appendages. (4) The second pair of maxillæ arise still later, just in front of the first pair of thoracic legs (cirri)."—A study of Coccidia met with in mice. by J. Jackson Clarke. (Plate 30.)—Observations on various Sporozoa, by the same. (Plates 31-33.)—Revision of the genera and species of the

Branchiostomidæ, by J. W. Kirkaldy (Plates 34 and 35), enumerates two genera, Branchiostoma (as sub-genera, Amphioxus, Heteropleuron) and Asymmetron. A new species of Heteropleuron, *H. cingalense*, is described.—On Sedgwick's theory of the embryonic phase of ontogeny as an aid to phylogenitic theory, by E. W. MacBride.

June.—On the anatomy of *Alcyonium digitatum*, by Prof. Sydney J. Hickson (Plates 36-39), gives a brief account of our knowledge of the anatomy of Alcyonium, the general morphology, the English species, their geographical and bathymetrical distribution, then the general anatomy, followed by the minute anatomy of the ectoderm, nematocysts, stomodæum, mesenterial filaments, mesogloea, spicules, endoderm, ovaries and testes, the buds, concluding with a note on the circulation of the fluids in the colony and on the digestion. In the history of investigations, Pallas' name is not alluded to, and yet he deserves to be quoted as having even before Savgny assigned correct characters to Alcyonium ("Hist. nat. des Coralliaires," Milne-Edwards, tome 1, p. 114), and the "Contribution a l'anatomie des Alcyonaires," by Pouchet and Myevre, dates, if we mistake not, before Vogt and Jung's account in their "Lehrbuch," and while it may be of little use to the student, it is not without interest, as it figures, after a fashion, the nematocysts in *A. digitatum*, and this possibly for the first time (1870). Prof. Hickson, however, leaves all previous writers far behind in his modern treatment of this subject, and if he keeps his promise of publishing an account of the maturation and fertilisation of the ovum and its development, he will leave us under still further obligations, for except Kowalevsky and Marion's important papers on the developmental history of *Clavularia crassa* and *Sympodium coralloides*, we have but little light on Alcyonarian development —Note on the chemical constitution of the mesogloea of *Alcyonium digitatum*, by W. Langdon Brown. It is chiefly composed of a "hyalogen" prior to the conversion of the hyalogen into hyalin the mesogloea will yield a mucin; it also contains a small amount of an insoluble albuminoid body, whose nature was not determined; it does not contain gelatine or nucleo-albumen. A study of metamerism, by T. H. Morgan. (Plates 40-43). The author in a long memoir, that does not admit of being briefly abstracted, thinks that the cases he cites show very positively that the variations appearing in a radiate animal must have come simultaneously and all together into the antimeres; he thinks few will doubt that the relation existing between repeated organs in a radiate animal is at bottom the same relation existing between the right and left sides of the body of a bilateral animal. Mivart and Brooks have emphasised the further fact that the relation between the right and left sides of the body is the same relation that exists between the serially repeated parts of a metameric animal; and he concludes that if this line of argument be admitted, it puts the problem of metamerism into a large category of well-established facts.—On the Cœlom, genital ducts, and Nephridia, by Edwin S. Goodrich. (Plates 44-45). The chief object of this paper is to call attention to the theory, "that the cavity which is known as the cœlom in the higher Cœlomata is represented by that of the genital follicles in the lower types of that grade."

American Journal of Science, July.—On the pitch lake of Trinidad, by S. F. Peckham. This pitch lake is situated near the village of La Brea, on the Gulf of Paria. At first sight it appears to be an expanse of still water, frequently interrupted by clumps of trees and shrubs, but on a nearer approach it is found to consist of mineral pitch with frequent crevices filled with water. The consistence of the surface is such as to bear any weight, and it is not slippery nor adhesive. It is about 100 acres in extent. It occupies a bowl-like depression in a truncated cone on the side of a hill covered with tropical jungles. The cone consists of both asphalt and earth. A heavy stream of asphalt has overflowed to the sea, forming a barrier reef for a considerable distance. Asphalt has also overflowed to the south, and the general appearance of the escarpment seems to indicate that at some remote period the basin now occupied by the lake had been filled some three feet higher than the present level. It occupies what appears to be the crater of an old volcano. Some diggings have been pushed to forty feet without reaching the bottom. There is a steady outflow towards the sea through the side of the cone. The Trinidad Bituminous Asphalt Company have lately run a tramway from the pier through the lake and back, so as to facilitate the removal of the material. This tramway in crossing the lake is supported on palm-leaves, some of which are 25 feet long, and this plan has answered every purpose.—On some reptilian remains from the Triassic of Northern California, by John C. Merriam. The author gives a description of some of the few Californian Mesozoic reptiles. One of these resembles *Ichthyosaurus*, while the other is described as *Shastasaurus Pacificus*.—A further contribution to our knowledge of the Laurentian, by Frank D. Adams. This paper is accompanied by a map of a portion of the edge of the Archean protaxis north of the island of Montreal, Quebec. There are in the district considered at least two distinct sets of foliated rocks. One of these represents highly altered and extremely ancient sediments, while the other is of igneous origin.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, May 16.—"On Measurements of Small Strains in the Testing of Materials and Structures." By Prof. J. A. Ewing, F.R.S.

The paper describes a new form of "extensometer," or apparatus for measuring the elastic stretching of bars subjected to pull in the testing machine or otherwise. At the two extremities of the length under test, which is usually eight or ten inches, two cross-pieces are attached to the rod by means of a pair of diametrically opposed set-screws. Each piece is separately free to oscillate about the line joining its screw points, since it touches the rod under test at no other place, but the two pieces are caused to engage with each other in such a way that when the rod extends the end of one of the pieces becomes displaced through a distance which is proportional to the extension. The amount of this displacement is measured by means of a microscope attached to the other piece. The whole apparatus is self-contained, and the parts are arranged to have no unnecessary constraint. Its indications show the mean extension taken over the whole section of the rod, and are independent of any small amount of bending or twisting which the rod may undergo as it is stretched. The microscope is furnished with an eye-piece micrometer which reads the extension to $\frac{1}{5000}$ inch, and a calibrating screw is provided for testing and setting the micrometer scale. Two forms of the instrument are described, one suitable for laboratory use when the specimen under test stands vertically, and the other applicable to rods in any position, such as the members of bridge or roof frames *in situ*. In the laboratory use of the instrument the elastic properties of the material are examined by observing the strains under known loads; in the application to structures the object is to determine experimentally what the stress on any member is, from observation of the strain, the modulus of elasticity being assumed.

The author describes a number of observations made with the new extensometer, chiefly on rods of iron and steel. The following readings refer to successive loadings of a bar of steel, which conforms closely to Hooke's Law, the loads being well within the primitive elastic limit. They serve to illustrate the sensibility of the instrument. The zero of the extensometer was set at 400, and the unit of its scale was $\frac{1}{50000}$ inch. The bar was $1\frac{1}{4}$ inch in diameter, and the length under test was 8 inches.

Load in tons.	Extensometer readings.			Differences.		
	First loading.	Second loading.	Third loading.	First loading.	Second loading.	Third loading.
0	400	400	400			
$2\frac{1}{2}$	461	461	461	61	61	61
5	522	522	522	61	61	61
$7\frac{1}{2}$	583	583	583	61	61	61
10	645	645	645	62	62	62
$12\frac{1}{2}$	707	706	707	62	61	62
15	769	768	768	62	62	61
$17\frac{1}{2}$	830	829	830	61	61	62
20	892	891	891	62	62	61
0	400	400	400	492	491	491

In other experiments the rod under examination was allowed to become overstrained, that is to say the load was increased until the elastic limit was passed and permanent set was produced. In this condition the elastic properties of the rod are materially