the nature of the original material and of the alteration being somewhat like what we have in Wasdale Beck; and in these altered fragments several crystals of anatase occur, similar in all respects to those described. They are not clustered together, but scattered about;—the alteration of the rocks has not proceeded so far as the development of any spots.

NOTICES OF MEMOIRS.

I.—British Association for the Advancement of Science. Cardiff Meeting, August 20th to 25th, 1891.

List of Titles of Papers Read in Section C, Geology.

Professor T. Rupert Jones, F.R.S., F.G.S., President.

The President's Address.

Sir A. Geikie.—Discovery of the Olenellus-zone in the North-west Highlands.

Sir A. Geikie.—On some Recent Work of the Geological Survey on the Archæan Gneiss of the North-west Highlands.

A. Smith Woodward.—Report of the Committee on the Registration of Type Specimens.

A. Smith Woodward.—Remarks on the Lower Tertiary Fish Fauna of Sardinia (see *infra*, p. 465).

A. Smith Woodward.—Evidence of the Occurrence of Pterosaurian and Plesiosaurian Reptiles in the Cretaceous of Brazil.

A. J. Jukes-Browne.—The Cause of Monoclinal Flexure.

A. J. Jukes-Browne.—Note on an undescribed area of Lower Greensand or Vectian in Dorset (see *supra*, p. 456).

A. C. G. Cameron.—On the Continuity of the Kellaways Beds over extended areas near Bedford, and on the extension of the Fuller's Earth Works at Woburn, Bedfordshire.

Prof. W. Boyd Dawkins.—On the Discovery of the South-Eastern Coalfield.

W. Topley.—The Geology of Petroleum and Natural Gas.

O. C. Dalhousie Ross.—The Origin of Petroleum.

Dr. H. Hicks.—A Comparison between the Rocks of South Pembrokeshire and those of North Devon.

W. A. E. Ussher.—Vulcanicity in the Lower Devonian Rocks. The Prawle Problem.

A. R. Hunt.—On the Occurrence of Detrital Tourmaline in a Quartz-Schist west of Start Point, South Devon (see *infra*, p. 465).

C. E. De Rance.—Report of the Committee on the Circulation of Underground Waters.

C. E. De Rance.—Notes on the Discovery of *Estheria minuta* (var. *Brodieana*) in the New Red Sandstone.

O. W. Jeffs.—Report of the Committee on Geological Photographs.

Montagu Browne.—On *Colobodus*, a Genus of Mesozoic Fossil Fishes.

C. Davison.—Report of the Committee on Earth Tremors.

Dr. H. J. Johnston-Lavis.—Report of the Committee on the Volcanic Phenomena of Vesuvius.

Sir R. S. Ball.—The cause of an Ice Age.

Dr. H. W. Crosskey.—Report of the Committee on Erratic Blocks.

Dr. H. W. Crosskey.—Notes on the Glacial Geology of Norway.

Prof. G. Frederick Wright.—Recent Discoveries bearing on the Relation of the Glacial Period in North America to the Antiquity of Man.

Dr. H. Hicks.—On the Evidences of Glacial Action in Pembrokeshire, and the Direction of Ice-flow.

H. Bolton.—On some Boulders at Darley Dale.

P. F. Kendall.—On a Glacial Section at Levenshulme, Manchester.

Prof. G. Frederick Wright.—Recent Discoveries in the Pleistocene Lava Beds of California and Idaho.

B. Harrison.—Report of the Committee on Excavations at Oldbury Hill.

Prof. J. Prestwich.—Preliminary Note on Excavations at Oldbury Hill.

Rev. E. Jones.—Report of the Committee on Elbolton Cave, near Skipton.

J. Storrie.—On the Occurrence of *Pachytheca sphærica*, Hooker, and *Nematophycus*, n.sp., in the Wenlock Beds at Ty Mawr Quarry, Rumney.

Beeby Thompson.—Report of the Committee on the Lias of Northamptonshire.

Prof. J. Hoyes Panton.—The Mastodon and Mammoth in Ontario, Canada.

E. T. Newton.—On the Occurrence of *Ammonites jurensis* in the Ironstone of the Northampton Sand Series near Northampton.

S. S. Buckman.—The Ammonite Zones of Dorset and Somerset.

G. R. Vine.—Notes on the Polyzoa (Bryozoa) of the Zones of the Upper Chalk.

Papers read in other Sections bearing on Geology :—

Section A.—Mathematical and Physical Science.

Prof. J. Milne, F.R.S.—Report of the Committee on the Volcanic and Seismological Phenomena of Japan.

Prof. J. Milne, F.R.S.—On Phenomena which might be observable, if the Hypothesis that Earthquakes are connected with Electrical Phenomena be entertained.

Section B.—Chemical Science.

Prof. W. C. Roberts-Austen, C.B., F.R.S., and *Prof. A. W. Rücker, F.R.S.*—The Specific Heat of Basalt.

Section E.—Geography.

Dr. Phené.—Changes in Coast Lines.

Section H.—Anthropology.

E. Seward.—On the formation of a Record of the Prehistoric and Ancient Remains of Glamorganshire.

II.—Remarks on the Miocene Fish-Fauna of Sardinia. By A. Smith Woodward, F.G.S.[1]

THE author referred to a series of fragmentary fish-remains from the Miocene in the neighbourhood of Cagliari, Sardinia, collected and submitted for examination by Prof. D. Lovisato. A memoir on the subject by Prof. F. Bassani (see *infra*, p. 476) had lately appeared, and the present communication contained only brief supplementary observations. In addition to the Selachian genera and species recognized by Bassani, the author identified teeth of *Scymnus*, *Oxyrhina Desori*, *Galeus*, *Aprionodon*, and probably *Physodon*, besides dermal scutes of *Trygon*. The collection comprises no evidence of ganoid fishes, and most of the remains of teleosteans are too imperfect even for generic determination. Traces of Scomberoids and Labroids occur, and there is evidence of a new species of the Berycoid *Holocentrum*. Teeth of *Chrysophrys*, *Sargus*, and other common Mediterranean genera are abundant; and a few detached yellow teeth represent an indeterminable species of *Balistes*.

III.—On the Discovery of a New Species of Fossil Fish (*Strepsodus Brockbanki*) in the Upper Coal Measures Limestone of Levenshulme, No. 6 Group, from the Railway Cutting at Levenshulme, near Manchester. By James W. Davis, F.G.S. Mem. and Proc. Manchester Lit. and Phil. Soc. [4], Vol. IV. 1891 (reprint paged 1–3).

VERY fragmentary remains of *Strepsodus* in the collection of Mr. W. Brockbank, F.G.S., form the subject of this note. "The teeth differ from those of *Strepsodus sauroides*, Young, in the greater breadth in proportion to the length; the surface striation is similar in the two, with the exceptions that in *S. Brockbanki* the striæ are larger, and there is no evidence of bifurcation, and whereas in *S. sauroides* the base of the crown is ovoid and laterally compressed, and the apex twice bent nearly at right angles, in this species the base of the crown is circular, and the point is not twisted to the same extent."

IV.—On the Occurrence of Detrital Tourmaline in a Quartz Schist west of Start Point, South Devon. By A. R. Hunt, M.A., F.G.S.[1]

WHILE examining the Devonian cliffs near Street Gate at the north-east end of Slapton Sands, South Devon, in company with Mr. W. A. E. Ussher, F.G.S., the author selected a hard micaceous sandstone of fine grain, occurring as a band between softer rocks, for comparison with a micaceous quartzite or quartz-schist, previously noticed by Mr. Ussher at a point on the coast south of Start Farm and west of Start Lighthouse. The quartz-schist occurs as an impersistent band among the mica-schists west of Start Point.

[1] Abstract of paper read before Section C (Geology), Brit. Assoc., Cardiff, 1891.

Mr. A. Harker, F.G.S., on examining the sandstone, at once pointed out the presence of tourmaline and white mica, of detrital origin; and considered that the rock had the appearance of having been derived from a tourmaline-bearing granite.

On a careful examination of two slides of the quartz-schist,[1] the author detected a single grain of tourmaline. Six additional slides were forthwith prepared, and detrital tourmaline was found in them all. One of these slides contains a pellucid grain of quartz with fluid inclusions and active bubbles; another contains a grain crowded with hair-like inclusions and with one fluid inclusion whose bubble is easily moved by the heat of a wax match. Both these grains could be easily matched in the quartzes of different granites.

The derivation of the quartz-schist from granites of more than one character, but one of which must have been schorlaceous, seems clearly indicated.

The above facts have two distinct bearings, viz. as to the age of the metamorphic schists of South Devon, and as to the derivation of the tourmaline.

The two rocks under consideration, viz. the quartz-schist and the Devonian sandstone, are related to each other in four particulars, insomuch as they contain four constituents common to both, viz. detrital tourmaline, detrital mica, quartz of fine grain, and iron.

It seems difficult to avoid the conclusion that such similar rocks must be of like age and derivation; and that as the sandstone is undoubtedly Devonian, the quartz-schist, one of the metamorphic schists of South Devon, must be of Devonian age also, and not Archæan, as has been supposed by some geologists.

The derivation of the tourmaline is a more difficult question. Whatever may be the age of the mass of the Dartmoor granites, those of a schorlaceous character seem to be post-Carboniferous. Moreover, no tourmaline has been noticed in the granites trawled in the English Channel. There is thus no recognized source of pre-Devonian tourmaline in the neighbourhood of South Devon, yet the source of derivation of the rocks under discussion could not seemingly be remote, or the tourmaline, quartz, and mica could scarcely have kept together. The tourmaline granites of Cornwall would meet the case, if any of these are of pre-Devonian age; but on this point the author has no information.

Besides the tourmaline observed in the rocks at Street Gate and Start Point, the author has noticed the same mineral, occurring in the same way, in a sandstone from near Tinsey Head in Start Bay, and in a sandstone from near Charleton on the Kingsbridge estuary, both of Devonian age.

[1] The hand-specimen selected for slicing was kindly placed at the author's diposal by Mr. A. Somervail, of Torquay.