quartzite. Dr. Peach describes these as "exactly similar to those which characterise three of the zones into which the upper part of the Cambrian quartzite or 'pipe rock' of the North-West Highlands has been divided by the Geological Survey" (p. 44), and reading between the lines one can see how strongly he has been impressed with the evidence. Yet these rocks are nowhere stated, in map or memoir, to be Cambrian. Most unfortunately the final proof is lacking; careful search in the dark shales of the north of Islay has failed to yield any trace of the fauna of the *Olenellus* zone where its presence might confidently have been predicted.

The reasons for the great caution with which this subject has been handled are not explicitly stated in the memoir; we are left to gather them for ourselves. If the Islay quartzite be Cambrian this carries with it important results in Highland geology, as this quartzite extends into Jura and Scaba. By means of its boulder beds it can be identified with certain quartzites in Argyllshire and with the quartzite of Banffshire. The Cambrian colours would sweep into the mainland, reaching right across Scotland. The Central Highland schists would be a sub-Cambrian formation, not always certainly separated by an unconformability from the quartzite, and much of the folding and metamorphism of these rocks must be of post-Cambrian date. This gives us pause, and we can sympathise with the authors in hesitating to found generalizations of this order on evidence which is not in itself incontrovertible.

The memoir, for the area covered, is a brief one, not cumbered with topographical or petrographical details. It is illustrated with some fine photographic views and contains a bibliography of Islay geology. The editorial work has been well done, and the contributions by the different authors are skilfully joined, so that the chapters read smoothly throughout. The book gives us the impression of minutely careful work, carried out in a spirit of judicial impartiality and described with clearness and reserve. The unsettled problems of the geology of Islay lose none of their fascination from the treatment they receive in the memoir, and Islay remains one of the most beautiful and perplexing of the islands of Scotland.

CORRESPONDENCE.

SOURCE OF AUSTRALIAN ARTESIAN WATERS.

Sir,—In your September issue your reviewer mentions incidentally Professor Gregory's views on the source of Australian artesian waters. These views are perhaps best illustrated by the following quotations. "Most of the water is an old accumulation, some of which may have been derived by percolation from meteoric sources; much of it is probably of plutonic origin; and some of it may be old sea-water from the Cretaceous beds" ("Australasia," pp. 104, 105). "It is therefore possible to explain the occurrence of the deep-water supply in Australia independently of the present rainfall" ("The Dead Heart of Australia," p. 288). I have elsewhere in your columns (November, 1906) shown that the 'plutonic' origin or 'juvenile' state of geyser waters is far from being established. I now desire to

show as briefly as possible, from "The Dead Heart of Australia" itself, that much of the data on which Professor Gregory relies, and to which he often gives the value of established facts, is pure assumption. Professor Gregory assumes:—

(*a*) That subterranean waters may be derived entirely from cooling magmas, and that the steam issuing from volcanoes is so derived. (p. 286.)

(*b*) That the majority of important ore-bodies are due to 'plutonic' or magmatic waters, and that, as there are numerous ore-bodies near the Australian artesian strata, there is consequently an abundance of 'plutonic' water beneath. (p. 287.)

(*c*) That, notwithstanding the general synclinal arrangement of the artesian strata (so far as they are known), and the unlimited motive force presumably inherent in 'plutonic' waters, these 'plutonic' waters would be retained within the strata. Mound springs and hot mud springs certainly do occur, but their yield is microscopic compared with the hundreds of millions of gallons the artesian beds are capable of furnishing daily. Further, it is assumed that there is a complete analogy between the retention within the strata of the Australian hot artesian waters and of the oil and gas of the Caspian and Pennsylvanian districts, despite the synclinal arrangement of strata in the former case and the anticlinal arrangement in the latter. (p. 287.)

(*d*) That flowing wells may be due to the pressure of an overlying sheet of impermeable rock, citing in illustration a tin bottle filled with water, the mouth closed with the exception of a pinhole, and pressure *then* applied to the side (p. 289). The analogy is inexact, since the pressure existed before the water-beds were filled with the water they now hold.

(*e*) That the calculations for rainfall, surface evaporation, and percolation in the neighbourhood of Lake Eyre and in Central Australia are applicable to a water-bed there 2000–3000 feet below the surface, or to an intake area far away in Eastern Australia. (p. 325.)

(*f*) That a complete analogy exists between the cold waters of the quicksands of the Kilsby tunnel near Rugby and Australian artesian waters (p. 300), yet the latter have gained heat and hence power.

(*g*) That the disposition, dip, and character of the deep water-bearing beds are so well known as to preclude the possibility of irregularities in bore pressure being due to these factors (pp. 305 et seq.). But, for example, there may exist at no great depth beneath the surface a north-west prolongation of the Palæozoic rocks that outcrop west of Thargomindah. Some little support is given to the supposition by the shallowness of the Tonko bore, only 250 feet deep. An anticlinal arrangement of water-bearing strata on such a granite ridge would, from the flood-waters of the Barcoo and the Diamantina, feed both a Lake Eyre artesian basin and the great central Queensland basin. The geology of the region is, however, unknown.

(*h*) That the salinity of the unknown beds traversed by the underground waters is practically uniform. (pp. 312–314.)

(*i*) That there are known and well-established criteria of 'plutonic' waters; that 'mineral waters' are of necessity 'plutonic' waters; and that the presence of alkaline carbonates in waters is a sufficient guarantee of their 'plutonic origin.' (pp. 315, 316, 339.)

(*k*) That waters heated to no more than 96° to 139° F. are, by reason of their temperature, 'plutonic' waters. (p. 317.)

(*l*) The impossibility of the derivation of the oil or gas of, say, the Alice Downs well from intercalated sedimentary beds. (p. 318.)

(*m*) That tidal wells are entirely analogous to geysers. (p. 328.)

(*n*) The impossibility of water percolating from overlying sedimentaries into fissures in granite (Oxton Downs). (p. 339.)

(*o*) That "if the water be of meteoric origin, it must continually be enlarging the underground fissures" (p. 340), and this despite the weight of 2000–4000 feet of strata already quoted by the author (p. 289) as a sufficient cause of flowing wells.

Professor Gregory throughout assumes—

(*p*) The impossibility of meteoric waters descending to sufficient depths to gain the temperature observed; and

(*q*) The impossibility of the observed gases and contained solids being derived from chemical interaction within the sedimentary strata.

Finally, Professor Gregory loses sight of the great facts that thousands of square miles of the granite through which his 'plutonic' water is supposed to have come is exposed to our investigation, and that the granite is presumably now in exactly the same condition as during the Tertiary period, when his waters were accumulating. While the fissures in the upper 500 feet of this granite contain water, as in the Queensland and Westralian mining fields and in the numerous bores near Camooweal, yet whenever great depths are reached, as the 2,600 feet at Charters Towers, with lesser depths on other Queensland fields, and the 2,000 feet of the Coolgardie bore and the Kalgoorlie mines, the granites and older rocks are dry. But Professor Gregory's theory demands, in view of the daily yield of 450,000,000 gallons, a widespread present distribution in the granite of fissures filled with hot water and extending to great depths.

With the foregoing protest against the elevation of pure assumption to the commanding position of ascertained fact I am content to leave the full discussion of the subject to the capable pens of my former colleagues in Australia, who have had a wider personal knowledge of the artesian area than I possess.

MALCOLM MACLAREN.

NOMENCLATURE OF AUSTRALIAN SILURIAN OPHIURIDS.

SIR,—A few points in Dr. Bather's article "Australian Palæontologists on Silurian Ophiurids" call for further comment. Taking Dr. Bather's remarks *seriatim*, it would appear that I had flagrantly transgressed certain established rules of nomenclature, since he says that I seem "for the moment to have forgotten the perfectly definite and, one had thought, universally accepted rule of nomenclature, according to which the genus must follow its genotype. In other words, *Sturtzura* must become a simple synonym of *Protaster*." In changing the genotype, reference was made to the Stricklandian Code of Rules of Zoological Nomenclature (which forms the basis of the several later codes), where, in paragraph 5, it says: "When the evidence as to the original type is not perfectly clear and indisputable, then the first person who subdivides the genus may affix the original