11.15 P.M.—A deep red glow from E. to W. by S. along the horizon. Fourteen parallel bands of a silvery colour, with dark bands between them. They lie south and north, occupying nearly the whole southern hemisphere as far as the eye can reach, and are flanked at east and west by patches of blood and cherry red.

11.24 P.M.—The bands have disappeared. There is a deep red glare at E.S.E. and a lighter one at W.S.W.

11.28 P.M.—A few faint bands on either side of Canopus. A red light on their western, but none on their eastern side.

11.31 P.M.—A dark red glow at W.S.W., about 12° above the horizon.

11.33 P.M.—Clouds gathering in the lower regions of the atmosphere.

11.37 P.M.—Two parallel faint beams of whitish light 2° to 3° east of Canopus. A faint red glow at W.S.W., about 10° above the horizon.

11.42 P.M.—Two broad bands of faint whitish light to westward and three to eastward of Canopus. A patch of red light still at W.S.W. near horizon.

11.46 P.M.—Clouds gone. Aurora gone.

11.49 P.M.—A faint red glow at W.S.W. about 10° above the horizon, and a band of faint greyish light about 2° west of Canopus.

11.51 P.M.—The glow at W.S.W. is brighter and higher.

11.58 P.M.—Much fainter.

0.34 A.M.—A segment of dark red light from S.E. by S. to W.S.W., and rising at its middle to about 45° above the horizon.

1.20 A.M.—A bright red glow from S.E. to S.W. Intensest below the Centaur. Soon died away. J. MELDRUM

Royal Alfred Observatory, Mauritius, February 6

## GEOLOGY

### Supposed Legs of Trilobites*

MR. HENRY WOODWARD, of the British Museum, in a reply to the paper by the writer in vol i., p. 320, of the present series of this Journal, supports the view that the supposed legs are real legs. He says that the remark that the calcified arches were plainly a calcified portion of the membrane or skin of the under surface is "an error, arising from the supposition that the matrix represented a part of the organism." But Prof. Verrill, Mr. Smith, and myself, are confident that there is on the specimen an impression of the skin of the under surface, and that this surface extended and connected with the arches, so that all belonged distinctly together.

Moreover the arches are exceedingly slender, far too much so for the free legs of so large an animal ; *the diameter of the joints is hardly more than a sixteenth of an inch outside measure ; and hence there is no room inside for the required muscles.* In fact, legs with such proportions do not belong to the class of Crustaceans. Moreover the shell (if it is the shell of a leg instead of a calcified arch) is relatively thick, and this makes the matter worse.

We still hold that the regular spacing of these arches along the under surface renders it very improbable that they were legs. Had they been closely crowded together, this argument would be of less weight ; but while so very slender, they are a fourth of an inch apart. Mr. Woodward's comparison between the usual form of the arches in a Macrouran and that in the trilobite does not appear to us to prove anything. We therefore still believe that the specimen does not give us any knowledge of the actual legs of the trilobite. Mr. Woodward's paper is contained in vol. vii., No. 7, of the *Geological Magazine.*

J. D. DANA

## PHYSIOLOGY

### Blood Crystals

AN interesting volume has just been published by M. W. Preyer on Blood Crystals. The literature of this subject, which dates no farther back than 1840, is already extensive, no less than 143 authors being quoted in the "Bibliography," some of whom, as Böttcher, Hoppe-Seyler, Kühne, Lehmann, Rollett, Valentin, and M. Preyer himself, have written many separate essays on points bearing more or less directly upon the crystallisation of the blood. Though blood crystals were first observed by Hünefeld, the merit of discovering them is due to Reichert, who first recognised their nature. The fact of the crystallisation of a complex organic substance like blood was first received with some amount of incredulity, but the corroborative testimony of many microscopists soon cleared away all doubt, and a variety of methods were suggested by which the crystals could be obtained. The best plan for obtaining them is thus given by M. Preyer. The blood is received into a cup, allowed to coagulate, and placed in a cool room for twenty-four hours. The serum is then poured off, and a gentle current of cold distilled water passed over the finely divided clot placed upon a filter until the filtrate gives scarcely any precipitate with bichloride of mercury. A current of warm water (30°—40° Cent.) is now poured on the clot, and the filtrate received in a large cylinder standing in ice. Of this a small quantity is taken, and alcohol added drop by drop till a precipitate falls from which an estimate may be made of the quantity required to be added to the whole *without* producing a precipitate. The mixture, still placed in ice, after the lapse of a few hours, furnishes a rich crop of crystals. The forms of the crystals obtained from the blood of different animals do not vary to any great extent, and are all reducible to the rhombic and hexagonal systems. The vast majority are rhombic prisms, more or less resembling that of man. The squirrel, however, with several of the Rodentia, as the mouse and rat, and the hamster, are hexagonal. The hæmoglobin of several corpuscles is required to form a single crystal. All blood crystals are double refracting. The animals whose blood has been hitherto examined and found to crystallise, are—man, monkey, bat, hedgehog, mole, cat, lion, puma, fox, dog, guinea pig, squirrel, mouse, rat, rabbit, hamster, marmot, ox, sheep, horse, pig, owl, raven, crow, lark, sparrow, pigeon, goose, lizard, tortoise, serpent, frog, dobule, carp, barbel, bream, rudd, perch, herring, flounder, pike, garpike, earthworm, and nephelis. The spectrum of blood-colouring matter when oxidised with its two absorption striæ between D and E of Fraunhofer's lines or in the yellow part of the ordinary spectrum, and the single band of deoxidised hæmoglobin, are now well known. M. Preyer states he has not been able to obtain a spectrum from a *single* blood corpuscle, but that the characteristic bands are visible where certainly only a very few are present. The specific gravity of dry hæmoglobin he gives at about 1·3—1·4. The solubility of the crystals obtained from different animals varies considerably. Those of the guinea-pig and squirrel dissolving in water with great difficulty. Hæmoglobin is insoluble in absolute alcohol, æther, the volatile and fixed oils, in benzole, turpentine, chloroform, and bichloride of carbon. It is easily soluble in alkalies ; acids rapidly decompose it. He calculates out for it the fearful formula of $C_{600}\ H_{960}\ N_{154}\ Fe,\ S_3\ O_{179}$, as agreeing very accurately with the percentage results of its analysis. Its equivalent is 4444, 4. Many pages of M. Preyer's work are occupied with an account of the action of various reagents upon it. The plates contain the forms of the principal crystals, and thirty-two spectra lithographed in colours. He describes five crystallisable products of the decomposition of hæmoglobin, namely, hæmin, hæmatosin, hæmatoidin, hæmatochlorin, and hæmatolutein, and several uncrystallisable, such as methæmoglobin, hæmatin, and hæmathion.

H. P.

* From the *American Journal of Science and Arts* for March 1872.

## SCIENTIFIC SERIALS

*Annalen der Chemie und Pharmacie*, September 1871.—Kochlin has continued his researches on "compounds of the camphor group." By the action of nitric acid on camphor the author has obtained a new body, $C_9H_{12}O_5$, which he calls camphoronic acid, and which has the property of forming salts in which $H_2$ and $H_3$ are replaced by metals. By distillation with potassic hydrate, butyric acid is produced ; with bromine in presence of water camphoronic acid is oxidised, yielding oxy-camphoronic acid ; this acid forms salts, in which $H_1$, $H_2$, and $H_3$ are replaced by metals.—An important physiologico-chemical paper follows by Hlasiwetz and Habermann on "Proteids," and a paper by Naumann on the length of time for the evaporation and condensation of solid bodies," which, however, do not possess much general interest.—Bender contributes a paper on the "hydrate of magnesic oxychloride." This substance, however, does not appear to be very stable, or to have very marked properties.—Mulder has experimented on allantoin and bodies derived therefrom; by the action of nitric acid two substances are obtained, allanic and allanturic acid.—An interesting paper on a new series of aromatic hydrocarbons, by Zincke, follows; by heating together benzol, benzyl-chloride and zinc powder, or finely divided copper, a reaction sets in with the evolution of hydrochloric acid gas, and the partial formation of a metallic chloride; the principal reaction seems to be, however, $C_7H_7Cl + C_6H_6 = C_{13}H_{12} + HCl$. Benzyl-benzol is a solid crystalline body, melting at 26°—27°, and boiling at 261°—262°; by oxidation it is transformed into $C_{13}H_{10}O$, a crystalline body belonging to the monoclinic system, which fuses at 26°—26·5°. Benzophenon, however, has the same composition, but crystallises in the rhombic system, and fuses at 48°—49°; the body obtained above is therefore an isomeric benzophenon, it, however, easily passes into the modification fusing at 48°—49°. The composition of benzyl-benzol will therefore probably be $C_6H_5—CH_2—C_6H_5$.—This number concludes with the translations of two papers by Messrs. Friswell and Armstrong respectively, which have already appeared in the English journals.

The *Geological Magazine* for January (No. 91) opens with a paper on a subject connected with an important branch of geology which is too much neglected in this country, and, indeed, has but few cultivators anywhere, namely, the microscopic structure of the so-called igneous rocks. This is Mr. S. Allport's notice of the microscopic structure of the pitchstones of Arran, the appearance of the sections of which under the microscope is, as described by Mr. Allport, exceedingly beautiful; and it is to be hoped that this paper and the illustrations accompanying it may induce others to enter upon this most interesting and important line of research.—The Rev. O. Fisher contributes a note on "Cirques and Taluses," with reference to Mr. Bonney's paper in the December number of the magazine. Mr. Fisher ascribes an essential part in the excavation of cirques to glacial action.—Mr. D. Forbes communicates a severe criticism of some remarks made by Mr. A. H. Green in his account of the geology of part of the county of Donegal.—"The Age of Floating Ice in North Wales" is the subject of a paper by Mr. D. Mackintosh; and Mr. James Geikie publishes the second part of his "Memoir on Changes of Climate during the Glacial Epoch."—The number includes the usual notices and reviews.

*Memoires de la Société des Sciences Naturelles de Cherbourg.* Tome xv. (Deuxième Série, Tome v.) 1870. "On the Swell and Roll of the Sea," by W. Bertin.—"Notes on the Comora and Seychelles Archipelagos," by M. Jouan. These islands were visited in 1850; a very brief list of the flora and fauna is appended. The list of birds has been apparently overlooked in the Zoological Record for January 1870.—"Notes on the Tubercles met with in *Callitriche autumnalis*," by MM. Karelschtikoff and Rosanoff, with a plate.—"On the *Lophobranchs*," by M. Dumeril.—"Notes of a Visit to Aden, Point de Galle, Singapore, and Tché-fou," by M. Jouan.—"On the Influence of Climate on the Growth of some Resinous Trees," by M. Békétoff.—"Geological Essay on the Department of La Manche," by M. Bonissent. "Supplementary notes to a paper on the Swell and Roll of the Sea," by M. Bertin.—Works received by the Society from July 1869 to August 1870.

*Proceedings of the Natural History Society of Dublin*, for the Session 1869-70, 1870-71, vol. vi., part i. (Dublin 1871) contains the following papers by Dr. A. W. Foot:—1, Notes on Irish Lepidoptera; 2, On Goitre in Animals; 3, On the Breeding of some Birds from the Southern Hemisphere in the Dublin Zoological Gardens; 4, Notes on Animal Luminosity; 5, Notes on Entomology; 6, Notes on Irish Diptera; 7, On some Irish Hymenoptera; and the following by Mr. William Andrews:—1, On the Inhabitants of the Rock-pools and caves of Dingle Bay, records, as new to the fauna of Ireland, *Aiptasia couchii*, *Stomphia churchiæ*, *Balanophyllia regia*, *Capnea sanguinea*, and "a deep-water species of stony coral, formed by hydroid animals, and related to the Tabulate Madrepores, which is nearly allied to, and indeed considered identical with, *Millepora alcicornis* of Linnæus;" 2, Ichthyological Notes; 3, On *Orthagoriscus oblongus*, with two plates; 4, On some rare Crustacea from the south-west of Ireland; 5, On the Ichthyology of the south-west of Ireland; 6, Notes on Hymenophylla, especially with reference to New Zealand species; 7, On some Irish Saxifrages; also papers by Prof. Macalister, on the mode of growth of Discoid and Turbinated shells; by G. H. Kinahan, on the Ferns of West Connaught and the south-west of Mayo.

## SOCIETIES AND ACADEMIES

### London

Royal Society, March 7.—"On the organisation of the Fossil Plants of the Coal-measures.—Part III. *Lycopodiaceæ.*" By Prof. W. C. Williamson, F.R.S. An outline of the subject of this memoir has already been published in the Proceedings in a letter to Dr. Sharpey. In a former memoir the author described the structure of a series of Lepidodendroid stems, apparently belonging to different genera and species. He now describes a very similar series, but all of which, there is strong reason for believing, belong to the same plant, of which the structure has varied at different stages of its growth. The specimens were obtained from some thin fossiliferous deposits discovered by Mr. G. Grieve, of Burntisland, in Fifeshire, where they occur imbedded in igneous rocks. The examples vary from the very youngest half-developed twigs, not more than $\frac{1}{12}$th of an inch in diameter, to arborescent stems having a circumference of from two to three feet. The youngest twigs are composed of ordinary parenchyma, and the imperfectly developed leaves which clothe them externally have the same structure. In the interior of the twig there is a single bundle, consisting of a limited number of barred vessels. In the centre of the bundle there can always be detected a small amount of primitive cellular tissue, which is a rudimentary pith. As the twig expanded into a branch, this central pith enlarged by multiplication of its cells, and the vascular bundle in like manner increased in size through a corresponding increase in the number of its vessels. The latter structure thus became converted into the vascular cylinder so common amongst Lepidodendroid plants, in transverse sections of which the vessels do not appear arranged in radiating series. Simultaneously with these changes the thick parenchymatous outer layer becomes differentiated. At first but two layers can be distinguished—a thin inner one, in which the cells have square ends, and are disposed in irregular vertical columns, and a thick outer one consisting of parenchyma, the same as the epidermal layer of the author's preceding memoir. In a short time a third layer was developed between these two.

When the vascular cylinder had undergone a considerable increase in its size and in the number of its vessels, a new element made its appearance. An exogenous growth of vessels took place in a cambium layer, which invested the pre-existing vascular cylinder. The author distinguishes the latter as the vascular medullary cylinder, and the former as the ligneous zone. The newly-added vessels were arranged in radiating laminæ, separated from each other by small but very distinct medullary rays. At an earlier stage of growth traces of vascular bundles proceeding from the central cylinder to the leaves had been detected. These are now very clearly seen to leave the surface of the medullary vascular cylinder where it and the ligneous zone are in mutual contact; hence tangential sections of the former exhibit no traces of these bundles, but similar sections of the ligneous zone present them at regular intervals and in quincuncial order. Each bundle passes outwards through the ligneous zone, imbedded in a cellular mass, which corresponds, alike in its origin and in its direction, with the ordinary medullary rays, differing from them only in its larger dimensions. At this stage of growth the plant is obviously identical with the *Diploxylon* of Corda, with the *Anabathra* of Witham, and, so far as this internal axis is concerned, with the *Sigillaria elegans* of Brongniart. The peculiar medullary vascular cylinder existing in all these plants is now shown to be merely the developed vascular bundle of ordinary Lycopods, whilst the exogenous radiating ligneous zone enclosing that cylinder is an additional element which has no counterpart amongst the living forms of this group.

Though the central compound cellulo-vascular axis continued to increase in size with the general growth of the plant, it was always small in proportion to the size of the stem. The chief enlargement of the latter was due to the growth of the bark, which exhibited three very distinct layers,—an inner one of cells with square ends, and slightly elongated vertically and arranged in irregular vertical rows, an intermediate one of prosenchyma, and an outer one of parenchyma. These conditions became yet further modified in old stems. The exogenous ligneous zone became very thick in proportion to the medullary vascular cylinder, and the differences between the layers of the bark became yet more distinct. These differences became the most marked in the prosenchymatous layer; at its inner surface the cells are prosenchymatous, but towards its exterior they become yet more elongated vertically, their ends being almost square,