

Rhyolite-lavas were extruded during the Raub period, and apparently eruptions of acid rocks and andesites occurred alternately. There is no evidence that rhyolites were extruded as lavas later than the Raub period, but eruptions of andesitic composition took place during the formation of both the Raub and Gondwana rocks, and as the eruptions were in full activity during the formation of the earliest Gondwana beds it is possible that they persisted through the period of dry land.

All the Raub volcanic rocks that have been examined were evidently deposited under the sea, and such was the case too with the Gondwana volcanic rocks, though in the latter case it is quite probable that for some time the volcanic vents continued to be above sea-level. Radiolarian cherts are associated with Pahang Volcanic Series rocks at Lubok Plang and on the Main Range in Lower Selangor\*, and it is possible that the silica in the sea-water necessary for the building up of Radiolarian tests was supplied by pneumatolytic emanations from these eruptions. However, no proof of extensive albitization of the Pahang Volcanic Series rocks is available, and this is a serious drawback to the theory that the two rocks are related in origin.

The only intrusion of dolerite that was seen on the Pahang Railway was in a weathered railway cutting near the boundary of Gondwanas and Raubs, and it was uncertain whether or not it penetrated Gondwana rocks. There is no proof whether the dolerite is of Raub or Gondwana age. The absence of dolerite boulders from the beach-deposit can be explained by the scarcity of the dolerite outcrops, and does not prove anything about the age of the intrusions.

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## NOTICES OF MEMOIRS.

### I.—SWINEY LECTURES ON GEOLOGY.<sup>1</sup>

A course of twelve lectures<sup>2</sup> on "The Mineral Resources of the British Empire" will be delivered by Dr. John S. Flett, F.R.S., at the Royal Society of Arts, 18 and 19 John Street, Adelphi, W.C.

#### SYLLABUS.

Lecture I. Tuesday, November 13. INTRODUCTORY.—The mineral industries in peace and war. Relation of mineral production to Colonial development. Distribution of minerals of economic value in the British Empire. Trade between Britain and Colonies in minerals, metals, etc., in normal times. Effect of war on mineral production and distribution in the Empire. Statistics of British Imperial production. Resources of the Empire in minerals.

<sup>1</sup> With the sanction of the Trustees of the British Museum (Natural History).

<sup>2</sup> The lectures will be given on Tuesdays, Thursdays, and Fridays at 5.30 p.m., beginning Tuesday, November 13, and ending Friday, December 7, 1917. To be illustrated by lantern slides. Admission free.

II. Thursday, November 15. GOLD.—World's production of gold at different dates. History of gold-mining in Great Britain. Gold-mining in early times in India, Africa, etc. Discovery of gold in Australia: history and present condition of gold-mining in Australian States. South African goldfields: Transvaal, Rhodesia, etc. Gold-mining in India, Canada, British Guiana, New Zealand, etc.

III. Friday, November 16. SILVER, PLATINUM.—Sources of silver and nature of silver ores. Extraction of silver from lead ores. Silver production of Great Britain. Canadian silver-mines and the history of their development. Australasian silver-mines, especially Broken Hill. Platinum deposits of British Columbia.

IV. Tuesday, November 20. IRON.—Occurrence of iron ores and their origin. Production of iron in Britain and the Empire. Iron-ore deposits of Great Britain. British imports of iron ore and their sources. Iron-ore deposits of Canada and of the Australian States. Iron-ore deposits of South Africa.

V. Thursday, November 22. COAL.—Origin of coal and nature of the different varieties. Properties and utilization of coal. Coal-production of the Empire. Exports and imports of coal. British coal-fields and their resources.

VI. Friday, November 23. COAL (*continued*).—Coal-fields of Canada: their production and reserves. Coal-fields of India. Coal-fields of South Africa, Rhodesia, Nigeria. The coal deposits of the Australian States.

VII. Tuesday, November 27. OIL.—Sources of mineral oil: their method of origin and mode of occurrence. History of oil industry and world's production of oil. Oil shales of Scotland, Australia, and Canada: their treatment and their products.

VIII. Thursday, November 29. OIL (*continued*).—Oil and pitch in Trinidad. Oil and gas wells of Canada. Oil-fields of Egypt, Burmah, New Zealand, Persia. History of mineral oil and geology of the oil-fields.

IX. Friday, November 30. SALT, PHOSPHATES, SULPHUR, ETC.—Deposits of rock salt in Britain, Canada, India, etc. Mineral phosphates in British possessions. Sulphur and pyrites: their distribution and uses. Asbestos mines of Canada, Africa, etc. Graphite of Ceylon. Nickel and cobalt in Canada.

X. Tuesday, December 4. COPPER, TIN, TUNGSTEN, ETC.—Copper and tin mining in Britain. Copper production in Canada, Africa, New Zealand. Tin-mining in the Malay States. Tungsten: the sources of supply in the British Empire. Molybdenum.

XI. Thursday, December 6. LEAD, ZINC, MANGANESE, ETC.—British lead-mining, past and present. Sources of lead and zinc for British industries. Zinc-lead ores of Australasia. Canadian lead and zinc deposits. Manganese ores of India. Antimony.

XII. Friday, December 7. DIAMONDS AND OTHER PRECIOUS STONES.—Indian diamond production. The diamond fields of South Africa and South-West Africa: their geology and history. Australian diamonds. British Guiana. The Burman ruby deposits. Precious stones of Ceylon. Queensland opals and sapphires.

II.—A PALEOCENE BAT. By W. D. MATTHEW. Bull. Amer. Mus. Nat. Hist., vol. xxxvii, pp. 569–71, September, 1917.

**B**ATS with well-developed wings are already known from the Upper Eocene of Europe. A highly specialized skull of a bat has now been found in the still older Basal Eocene (Wasatch formation) of Colorado, U.S.A. According to Dr. Matthew, this specimen represents a new genus and species of the family Phyllostomatidæ, which still exists in tropical America. It has an unusually slender snout and a comparatively small canine tooth.

III.—HUESOS ANORMALES DE LLAMA Y DE CONDOR. By CAYETANO MARTINOLI. Physis (Buenos Aires), vol. iii, pp. 69–74, 1917.

**P**ALÆONTOLOGISTS have long been interested in rare cases of three-toed horses, which recall the condition of the foot in the Miocene and Pliocene Equidæ. Martinoli now describes and figures an analogous case of polydactyly in a llama (*Auchenia lama*). As shown by his figure, the abnormal metacarpus consists of four well-defined bones fused together, and all probably bore phalanges.

IV.—THE ALBERTELLA FAUNA LOCATED IN THE MIDDLE CAMBRIAN OF BRITISH COLUMBIA AND ALBERTA. By LANCASTER D. BURLING. *American Journ. Science*, vol. xlii, pp. 469–72, 1916.

**T**HE Albertella fauna has hitherto been regarded as Lower Cambrian, but certain new facts of stratigraphy are mentioned in this paper to prove its Middle Cambrian age. Text-figures are given of *Albertella bosworthi*, Walcott (British Columbia), and *A. helena*, Walcott (Montana and British Columbia).

#### REVIEWS.

I.—FOSSIL PLANTS; A TEXT-BOOK FOR STUDENTS OF BOTANY AND GEOLOGY. By A. C. SEWARD, M.A., F.R.S. Vol. III: Pteridospermæ, Cycadofilices, Cordaitales, Cycadophyta. 8vo; pp. xviii, 656, with frontispiece and 253 text-figures. Cambridge University Press, 1917. Price 18s. net.

**P**ROFESSOR SEWARD'S book is a continuation of his systematic account of fossil plants, taken up from the end of vol. ii, which appeared in 1910. The author was so rash as to make certain statements in his preface to the previous volume as to the scope and time of appearance of the remaining portion of his work. Hence the explanation in the preface of vol. iii that the promised account of the geographical distribution of plants at different stages in the history of the earth has been crowded out of vol. iii and the following vol. iv, now in the press, and must therefore form the subject of a separate book. This is all to the good from the students' point of view; the subject of geographical distribution in time, if treated in the full and careful manner which we expect from Professor Seward, may well form a separate volume. We trust that the leisure which one associates with the mastership of a college in an ancient