

geologische Reichsanstalt; and under these circumstances Prof. Zittel of Munich has pointed it out to the author of the present paper as a promising field of study. Mr. Dale's work will certainly be of considerable use to future explorers of the district, though not carried out in sufficient detail to warrant, in his own case, any very important generalisations. Indeed, the memoir consists almost wholly of transcriptions of notes and rough drawings of sections relating to a number of different localities which are indicated by reference to a key-map. The author's general conclusions, so far as they go, are shown in a very clear and useful table, from which it appears that at this point of the Alps, the Jurassic and Rhætic strata (including in the former the Tithonian) have a united thickness of from 6,000 to 7,000 feet. Vast as is the estimate, no one acquainted with this or the surrounding districts will be inclined to regard it as excessive.

Mr. Dale has evidently made good use of his opportunities, so far as they have gone, and has given us in this memoir the results of a piece of well-directed observation. We hope to have further details from his pen concerning the same interesting region. The list of *errata*, which is rather long for a memoir of the proportions of the present, does not by any means exhaust the whole of the printer's errors. We are tempted to fear that Mr. Dale is not sufficiently careful in keeping so distinct from one another, as behoves a working geologist, his notes relating to various subjects; for, by some strange chance a stray page of a sermon seems to have fallen into the hands of the compositor and to have been set up by him at the end of the author's geological notes.

J. W. J.

LETTERS TO THE EDITOR

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"Geographical Distribution of Animals"

I FIND that Mr. Wallace in his new work on the "Geographical Distribution of Animals" when stating the limits of his Ceylon sub-region (vol. i. p. 327), gives among mammals the genus *Tupaia* and among birds "a species of *Myiophonus*, whose nearest ally is in Java" as characteristic of that sub-region. Further, in the tabular statement (vol. ii. p. 187), *Tupaia* is altogether omitted from the Indian sub-region.

It is not my intention to enter here into the general question of the divisions of the oriental region which Mr. Wallace has adopted. The subject has I know been undertaken by at least one well-known Indian naturalist. My object at present is simply to record the fact that I have found both *Tupaia Elliotti* and *Myiophonus Horsfieldi* ranging together far to the north of the limits given by Mr. Wallace for his Ceylon sub-region.

Tupaia I first met with at an elevation of about 1,500 feet in the Sutpuru Hills, near the *Pachmari* plateau in the Central Provinces (P.I.A.S.B., April, 1874), lat. 22° 20'. Subsequently I found it in Sambalpur, which is the most eastern district of the Central Provinces (lat. 21° 30'). But the former does not even give its extreme northern limit as it has been found in the Kurrucpur hills of the Monghyr district (lat. 25°).

Myiophonus Horsfieldi I first shot in Sirguja—a native state in Western Bengal (lat. 23°). Afterwards in the Sutpuru, where it occurred with *Tupaia* as above, and finally I obtained it also in Sambalpur, where it was found at elevations under 1,000 feet above the sea. Still further north it has been obtained at Mount Aboo ("Stray Feathers," vol. iii. p. 469), lat. 25°.

Myiophonus is, it is true, included in Mr. Wallace's list of Oriental genera in Central India, but its special employment as a characteristic form of the Ceylon sub-region seems scarcely compatible with a knowledge of its now ascertained wide range through continental India.

During the ensuing field season I expect to be engaged in the geological examination of one of the widest and least known parts of India—the area between the Godaveri and Mahanudi Rivers. I have great hopes of discovering there further facts regarding the range of species whose limits are now only imperfectly known. In the meantime I may state that during the

present year I have shot *Harpactes fasciatus* in Sambalpur, thus confirming the late Col. Tukell's statement of its occurrence in the same general tract of country. The above allusion to *Tupaia* leads me on to record here that I have met with two other species of the genus.

During an ornithological tour which was made in 1873 by a party of which I was a member—through the islands of the Andaman and Nicobar groups—we obtained a species of *Tupaia* on the Island of Preparis. Our specimen appears to be identical with *T. Peguensis*, which occurs from Pegu to Sikkim. On the Great Nicobar we shot a specimen of the species described in the Novara account as *Nicobarriensis*, and considered then to be worthy of generic distinction.

In Preparis, it may be added, we also shot a small grey squirrel which is allied to if not identical with *S. Assamensis*. These, with a monkey (*M. carbonarius*?), pigs, and probably rats and bats, constituted so far as we could ascertain the mammal fauna of the island.

Preparis I should perhaps explain is the most northern of the Andaman group lying between Cape Negrais and the Cocos.

Mr. Wallace has I observe included the Nicobar Islands in the Malayan sub-region and the Andamans in the Indo-Chinese. This separation of the two groups is, I believe, fully justified by the facts.

Some years ago when working at the avifauna of these islands (J.A.S.B., 1872, p. 274), while recognising the fact of a number of species being common to both groups, I could not resist a conviction as to the existence of a strong Malayan stamp upon the birds which are peculiar to the Nicobars.

In conclusion Mr. Wallace's magnificent work needs no praise from me; but as a field worker and observer I may perhaps venture here to offer my thanks for the valuable mine of information which it affords.

V. BALL,
Calcutta, September 28 Geological Survey of India

European Polygalas

IN view of a monograph of the order Polygalaceæ which I have in preparation, may I make use of your columns to say that I should be greatly obliged to any correspondents who can send me specimens of any of the less common European *Polygalas*, especially *P. exilis*, *monspeliaca*, *microphylla*, *saxatilis*, *Prestlii*, *niacensis*, *flavescens*, *raseae*, *sibirica*, *supina*, *venulosa*, *anatolica*, or any well-marked varieties. I shall be glad to offer in exchange specimens of some of the rarer British plants.

6, Park Village, East, Regent's Park, London, October 28 ALFRED W. BENNETT

The Solidity of the Earth

IN his opening address to the Mathematical and Physical Section of the British Association, Sir William Thomson affirmed "with almost perfect certainty, that, whatever may be the relative densities of rock, solid and melted, or at about the temperature of liquefaction, it is, I think, quite certain that cold solid rock is denser than hot melted rock; and no possible degree of rigidity in the crust could prevent it from breaking in pieces and sinking wholly below the liquid lava," and that "this process must go on until the sunk portions of the crust build up from the bottom a sufficiently close-ribbed skeleton or frame, to allow fresh incrustations to remain bridging across the now small areas of lava, pools, or lakes" (NATURE, vol. xiv. p. 429).

This would doubtless be the case if the material of the earth were chemically homogeneous or of equal specific gravity throughout, and if it were chemically inert in reference to its superficial or atmospheric surroundings. But such is not the case. All we know of the earth shows that it is composed of materials of varying specific gravities, and that the range of this variation exceeds that which is due to the difference between the theoretical internal heat of the earth and its actual surface temperature.

We know by direct experiment that these materials, when fused together, arrange themselves according to their specific gravities, with the slight modification due to their mutual diffusibilities. If we take a mixture of the solid elements of which the earth, so far as we know it, is composed, fuse them, and leave them exposed to atmospheric action, what will occur?

The heavy metals will sink, the heaviest to the bottom, the lighter metals (*i.e.* those we call the metals of the earths, because they form the basis of the earth's crust) will rise along with the silicon, &c., to the surface; these and the silicon will oxidise and combine, forming silicates, and with a sufficient supply of