

south. Viewed at 10 A.M., this facet, of the order of 1000 ft. high and 2500 ft. broad at its base, and situated above the 8000 contour, appeared to be coloured light orange-pink and contrasted strongly with the pure white of the snow on the rest of the south-west flank of Shirgun and Javanbin. By 3 P.M. the pink colour had spread all along the south-west slope of Shirgun, a matter of 4 miles, and Javanbin was coloured on its lower slopes although the top 1000 ft. remained white. By this time the original south-facing facet of Shirgun was mottled pink and white.

The phenomenon of 'red snow' is well known to the tribesmen, who associate the colour with rapid thawing of the snow in the early spring.

J. V. HARRISON.

Chulbar, Feb. 14.

#### Forestry Research.

THE articles in NATURE of Feb. 21 and 28, reviewing the work of the Forestry Commission, prompt me to express the wish that they may be perhaps followed by one dealing with certain aspects of forestry research, more especially with recent work bearing on the importance of biological soil factors in relation to tree growth.

For example, the significance of mycorrhiza in nutrition, and the urgent need for laboratory research directed to promote control of its formation in new plantations, have long been matters of concern in the Swedish Forestry Service and are becoming so in those of other countries, that is, in certain of the North American States. In Sweden, a close working alliance between forestry expert and botanical specialist has already produced significant results.

In Great Britain and many parts of the Empire the matter is one of special interest and concern in view of the extensive afforestation of non-woodland soils and the use of exotic tree species.

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Mar. 13.

DR. RAYNER's letter is of value since it voices a matter which has already been commented upon in previous issues of NATURE. The urgent need of a close co-operation between the forester and the specialist, whether botanical, zoological, or chemical, should be beyond dispute. The working alliance which has come into being in Sweden—foresters, timber companies, and scientific research centres—will well repay study, as also the amalgamation of various interested bodies in New Zealand. The great Forest Research Institute at Dehra Dun furnishes a further illustration. Whilst, however, these examples merit the closest study, a slavish imitation of any one by Great Britain may result in wasteful expenditure, and also lead to much overlapping of investigation and research work. There are instances where the creation of Government research laboratories paid for out of public funds are justified, if not indispensable for the time being. In other cases this is not so. Research work can be safely left, and with the certainty of better results, to already existing centres, grants being made by the Government department concerned to cover the cost of certain pieces of investigation work required to be undertaken.

It is hoped to consider this question in fuller detail in a subsequent number of NATURE. Meanwhile Dr. Rayner's recent paper, "Mycorrhiza in Relation to Tree Growth" (published in the *Empire Forestry Journal*, vol. 9, No. 2, 1930), furnishes an illustration in point.

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#### $\beta$ -Transformation.

THE theory of radioactive transformation on the basis of wave-mechanics was initiated by Gamow and Condon and Gurney. The consequences have been worked out in detail by Born<sup>1</sup> and Kudar.<sup>2</sup> But Heisenberg's objection to the construction of particles out of packets of Schrödinger waves, that they tend to spread out in course of time, has not yet been met.

It would be interesting to consider the chances of  $\alpha$  and  $\beta$  particles being omitted from the nucleus as such. Restricting ourselves here to  $\beta$ -radiation and taking into account the relativity variation of mass, it is easily verified that the acceleration (or deceleration) of a fast electron due to the same force is  $(1 - v^2/c^2)^{3/2}$  of its Newtonian value. The electron can, therefore, overcome a higher obstacle under relativity mechanics than under the Newtonian.

If  $E$  is the total energy of particles inside the nucleus,  $E'$  is the minimum energy which enables an electron to jump over the potential barrier,  $N'$  is the number of particles inside the nucleus possessing the energy  $E$  or more, and  $N$  the total number, we see that the radioactive properties would depend upon the number  $N'$ . Using Fermi-Dirac statistics, we find

$\frac{dN}{dT}$  always positive and

$$\frac{dN'}{dT} = \text{const.} \left\{ \frac{E'T}{e^{\alpha + E'/kT} + 1} + \frac{E'}{T} - \frac{\partial E'}{\partial T} + 3 \int_{E'}^{\infty} \frac{E^{1/2} dE}{e^{\alpha + E/kT} + 1} \right\}.$$

Thus  $N$  always increases with  $T$  (the temperature inside the nucleus), and, subject to a certain restriction radioactive properties are a direct consequence of increasing atomic numbers. More definite conclusions depend on precise knowledge, which is at present lacking, of the potential barrier.

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Feb. 10.

<sup>1</sup> *Zeit. f. Phys.*, Bd. 58, 306; 1929.

<sup>2</sup> *Zeit. f. Phys.*, Bd. 53, 61, 95, 166; 1929; Bd. 54, 207; 1929.

#### The Swimming of Cuttlefish.

IN NATURE of June 14, 1930, p. 893, F. S. Russell and G. A. Steven publish some observations on the movements of *Sepia officinalis*, special attention being given to the part played by the siphon. These researches are a confirmation of what was seen by me so long ago as 1912 (*Internationale Monatsschrift für Anatomie und Physiologie*, Bd. 39; 1912) and clearly explained in Figs. 33 and 34 of my paper (p. 129).

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WE are indebted to Prof. Polimanti for directing our attention to his previously published observations on the swimming of cuttlefish. We have not access to the journal in which his work was published, so, unfortunately, have not at the time of writing been able to read it. We felt that so obvious a feature in the swimming of the cuttlefish must have been seen before; being unable to find any reference to it, we published an account in the hopes that the information might eventually find its way into English text-books, in which the use of the siphon in cuttlefish swimming is given as only for backward darting.

F. S. RUSSELL.  
G. A. STEVEN.