

of states tends to infinity and the total energy of the system remains finite, the Dirac interpretation demands that all states whose energy is smaller than a finite negative energy $-B$ are occupied ($N_\alpha = 1$ for $\alpha < -B$), while all states of positive energy above a certain positive energy B are empty ($N_\alpha = 0$ for $\alpha > B$). If ν is a finite positive integer, and if A tends to ∞ , the first sum in the right hand term disappears and the second one equals ν , which is the desired result (2).

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¹ Fock, V., *NATURE*, **138**, 1011 (1936); *C.R. Acad. Sci.*, **4**, 229 (1936).

Nigeria and the Sahara

SOME passing remarks in the article entitled "Soil Drift in South Australia" in *NATURE* of December 19 (p. 1039) may give the casual reader the erroneous impression that the northern part of British Nigeria is threatened by the "encroaching desert". A glance at any adequate map of Africa will show that the northern frontier of Nigeria runs through the western

Sudan and that the Sahara lies well to the north in French West Africa. The geological evidence is clear, as I pointed out twenty-five years ago¹, that the desert pulsates, that its margins expand and contract, and that the most recent movement has been one of contraction with the consequent spread of more humid conditions over the country between Lake Chad and the River Niger. There is no evidence that existing climatic conditions are deteriorating.

There may be room for some adjustment of stocking policy, but comparison with the Dominions is to be deplored. It should be remembered that in Nigeria the Africans themselves are the stock farmers, following ancient methods in unfenced communal pastures. They are happy and contented, and problems arise only when the industry is unduly stimulated by ambitious administrators or ardent tax collectors.

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Dec. 21.

¹ "The Geology and Geography of Northern Nigeria" (Macmillan, 1911).

Points from Foregoing Letters

REFERRING to criticisms by Dr. Broom, the Keeper of Geology in the British Museum (Natural History) defends the removal of matrix and the sectioning of type-specimens in museums, in the interests of morphological research. He quotes Prof. D. M. S. Watson to show that the value of the fossil reptiles referred to by Dr. Broom were in no way impaired, but rather enhanced, after their treatment by Dr. Boonstra.

New experiments on sound 'beats' produced in the inner ear (by means of electrical stimuli, undergoing periodic phase reversal) are considered by C. S. Hallpike and Prof. H. Hartridge to supply additional evidence in support of the Helmholtz hypothesis, which postulates indirect excitation of the nerve elements by a resonance mechanism.

Preliminary results obtained by means of a new technique in utilizing monochromatic X-rays in crystal analysis are described by Dr. I. Fankuchen, and photographs are submitted indicating the spurious nature of the innermost halo observed in ordinary spectrograms of tobacco virus. Crystals of pentaerythritol ground at a suitable angle were found convenient for the purpose of increasing the concentration of the monochromatic X-rays.

An X-ray photograph of a rotating crystal, showing interference phenomena, is submitted by Chr. Finbak and Prof. O. Hassel. The authors consider that the effect is partly due to direct interference of the characteristic radiation emitted by the excited atom, and that a secondary interference of the primary fluorescence radiation also plays a part in the phenomenon.

A table showing the concentration ranges in which 'electron compounds' ('Hume-Rothery' phases) are formed in binary alloys of various metals (zinc, copper, silver, gold, cadmium, aluminium) is supplied by M. Hara. The existence ranges and also the solubility in the α and γ solid phases are considered by the author in relation to the difference in the atomic diameters of the components.

Various non-pigmented one-celled organisms (flagellates) have been grown by Prof. E. G. Pringsheim in peptone medium to which various organic substances (fatty acids, esters, etc.) were added. All organisms investigated thrived on acetic acid and on ethyl acetate but differed in their ability to assimilate other compounds. Succinic acid was also used by a large proportion of the organisms, and malic, lactic and pyruvic acids to a lesser extent.

A pure strain of mice in which degenerative changes in the adrenal glands develop spontaneously before the animals are one year old have been found by Dr. W. Cramer and E. S. Horning to be likewise very susceptible to cancer. The females have a higher rate of spontaneous mammary cancer, and in the males mammary cancer can be induced by administration of the sex hormone, oestrin.

Photographs of two locusts with abnormal wings, reared under glass in conditions which usually produce normal flyers, are submitted by Prof. T. F. Dreyer. The abnormal individuals also show lower resistance to micrococcus infection, indicating that wing abnormality is associated with changes in the organism as a whole. This, the author claims, supports the 'holistic' view of genetics.

Referring to the early history of the reaping machine, Prof. James Hendrick states that the Rev. Patrick Bell of St. Andrews built a practical reaping machine in 1828, several years before McCormick took out his patents in the United States.

Sir Richard Paget writes that the symbolism of human speech is not primarily dependent on association between sound and objects, but arose after man had succeeded in analysing events and expressing the various components by separate bodily gestures.

Referring to recent criticism by Prof. V. Fock of the neutrino theory of light, Prof. E. G. C. Stueckelberg states that, while a configuration space representation of operators is impossible, if the number of particles concerned is infinite, there exists a configuration space method for a finite number of particles, which leads in the limit to Prof. Jordan's result.