by the latter relationship, which contains the influx term, than by the former.

Since the temperature at the height of the *E*-layer was considered to have a negligible diurnal temperature variation, the relationships derived above degenerate to the conditions usually assumed for the *E*-ionospheric layer.

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Uncertainty Principle

WRITERS appear either to introduce or to illustrate the uncertainty principle by supposing that a fundamental particle such as an electron is viewed through a microscope to determine its position at the same time as measurement is being made of its momentum[1]. The error in the position of the particle is accepted to be δx in the formula for the resolution power of a microscope, namely, $\delta x \sim \lambda/\sin\theta$. This formula is derived in optics from a study of the diffraction of light from two equal disks placed close together and from one disk alone.

Now the diffraction ring patterns of the disks are brought about, according to the quantum theory itself, by the action of quanta in the mass, and each individual quantum merely energizes a particular spot in a pattern. I cannot see that the optics formula, which essentially gives the effect of the mass action, can be applied to the action of an isolated quantum or photon. The appearance of a single photon on a screen cannot furnish any information about the direction from which it came before striking the screen, and even less can it indicate the point from which it emanated. If, as we are told, the wave phenomenon of light is due to mass action of photons, then we require proof that the wave formula can be applied to an individual photon, because we know that the behaviour of a single molecule of a gas is different from the mass behaviour of molecules producing sound in a gas.

A second difficulty is that the optics formula does not so much give a fundamental limit to observation, but rather a formula of convenience. It implies that it is difficult for the unaided eye to differentiate between the two sets of ring patterns, but it makes no claim that no difference exists between the patterns. The analysis admits that the set from one disk alone is circular, whereas that from two disks close together is oval. The formula gives the condition that the inner rings from the two disks change over from dumb-bell shapes which can readily be associated with two disks, to approximately elliptical ovals which cannot. By employing accurate methods for measuring shape and the intensity distributions in the fields, we can proceed considerably beyond the limit represented by the formula. An astronomer, for example, is justified in deducing that a star is a double star if the ring pattern he obtains from it is oval.

Perhaps the quantum theory can put this matter right, but I find the classical arguments so full of gaps that they are far from convincing.

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[1] For example, Gurney, "Elementary Quantum Mechanics", p. 49. Dustman, "Elements of Quantum Mechanics", p. 12. Heisenberg, "The Physical Principles of the Quantum Theory", p. 15 (German).

Early Man and Fossil Vertebrates on the Island of Celebes

OUTSIDE Java, which has yielded many important finds of fossil remains from the *Pithecanthropus* group of mankind and an abundance of fossil vertebrates, as well as two distinct palæolithic industries (the Patjitan chopper chopping-tool complex with an intrusion of 7 per cent Acheul hand-axes, and the Sangiran flake industry), palæolithic finds have not hitherto been made in the Indonesian Archipelago.

Prehistorical research on Celebes has now shown, however, that early man inhabited this island in Pleistocene times, since palæolithic tools have been discovered, associated with fossil bones of vertebrates of Asiatic origin. The newly discovered site is situated in the southern part of the island near Tjabenge and is bordered by the Walanae River on one side and by the Great Sinkang depression on the other.

Dr. D. A. Hooijer, of the Rijksmuseum van Natuurlijke Historie at Leyden, has studied the fossil fauna and has distinguished among the small collection five different forms, of which three are extinct: (1) a new genus of a large pig, *Celebochœrus heekereni* Hooijer[1]; (2) a dwarf archidiskodont elephant which is very closely related to the Lower Pleistocene *Archidiskodon planifrons* (F. and C.) from India and China[2]; (3) a large tortoise, *Testudo margœ* Hooijer[3]. The other two fossils are *Anoa depressicornis* (Smith) subsp. and *Babyrousa babyrussa beruensis* Hooijer[4], which are two typical elements from the recent fauna of Celebes, thus proving that those mammals had already evolved in Pleistocene times.

Celebes was, perhaps, never connected with Java (and Borneo), as the islands are separated by the deep Strait of Macassar and the Flores Sea. This is the so-called 'Wallace's Line', which indicates a faunal break between the Indo-Malayan and the Australian fauna (1860). This theory was at first generally accepted by zoologists; but now it is known that 'Wallace's Line', which was geologically well founded, separates a zone with rich animal life from a badly impoverished one, as Ernst Mayr has rightly pointed out. Migration to Celebes took place via land-bridges, which connected this island with the Philippines, Formosa and southern China. The newly discovered palæolithic industry is very closely related to the Sangiran flake industry.

Systematic research in this part of Celebes will no doubt lead to other important finds.

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