but Dr. L. Hartshorn (National Physical Laboratory) raised the question why we believe that atomic standards will be more nearly constant than other material standards. The question can only be answered by the agreement between different experiments and, as Dr. Bullard pointed out, agreement does not always indicate that the answer is correct.

The full proceedings of the symposium are to be published by H.M. Stationery Office in the course of the next few months. M. M. POSTGATE

OLD MOUNTAINS OF NEW GUINEA*

By L. EVELYN CHEESMAN

FOR all taxonomists interested in the west Pacific the fact that New Guinea possesses series of pre-Cambrian rock that have never been submerged has significance which cannot be over-stressed. Their existence indicates a solution of what otherwise would be inexplicable, namely, whence New Guinea derived its Oriental insect fauna and flora.

The huge island was raised from a drowned land-mass by the Miocene–Pliocene tectonic movements. So much is well known; but this furnishes no working hypothesis for botanists or for entomologists. The deductions which appear self-evident actually conflict with biological data; and, owing to their antiquity, it is to the insects and plants that we must turn for convincing evidence of land movements.

Land raised from the ocean bed during the Tertiary, its only subsequent continental connexion being periodically with Queensland and by sundry land bridges to Asia through the Philippines, might be expected to possess a flora and fauna basically Australian with an Oriental influence. Moreover, they should be discontinuous with many lacunæ in their totality. On the contrary, analyses of species belonging to any important group reveal an undoubted Oriental origin. There is an Australian element—more or less strong according to the group. There is a Malaysian influence attributable to a common Asiatic ancestry. There is a very rich peculiar neo-endemism suggesting isolation over a long period which makes Papuasia, that is, New Guinea with adjacent islands and archipelagoes, an extremely distinct zoological sub-region in geologically recent times. The flora and insect fauna are harmonious, their totalities show no serious lacunæ and no important group is unrepresented.

Papuasia therefore ranks with Australia and Asia in its continental full populations and not with neighbouring land-masses, Sumatra, Java and Borneo. These were also raised during the Tertiary, connected for a period with Asia and then isolated; but they possess a discontinuous flora and insect fauna.

Whence then did New Guinea receive its continental populations, since palæogeology apparently does not support the conclusions of botanists and entomologists?

We find on analysis of species that: (1) the average ratio of the older species groups is one-tenth Australian, three-tenths Asiatic, and six-tenths endemic; (2) the nearest genera allied to Papuasian endemic genera are found in Asia; (3) genera which are represented in both Malaysia and Papuasia are also found in India, Burma or China, often in all three countries. This points to a two-branched migration from the continent, which can be foreseen because there has been no land connexion between Malaysia and New Guinea subsequent to the Late Cretaceous. Otherwise the Sumatra tiger and monkeys and apes would have found their way to the New Guinea forests.

Before the War, Prof. Lam, of Leyden, was engaged on an analysis of the flora of Malaysia and Dutch New Guinea. He found that the proportionate representation was approximately the same as in the Insecta, and he agreed also with points (1), (2) and (3). Botanists have a decided advantage over entomologists in such matters because their material collected and determined is far more abundant. As in the Insecta there are no very old forms; the slight South American influence comes through Australia. There are many endemic genera but no endemic family.

The fact that there are two distinct geanticlines in New Guinea belonging to different periods sheds a most important light upon these questions of the distribution of species. The ancient geanticline was investigated by the Australian government geologist, R. C. Stanley, and his results were published in 1923. He directed attention to the existence of this ancient wrecked mountain system represented by relics, some of which have never been submerged, pre-Cambrian and Asiatic in origin. They are situated along the northern coast of New Guinea with the same alignment as the young Tertian central ranges which are Malaysian in origin. It is concluded that as the folding movements raised the central ranges the greater part of this old northern system was submerged. The series comprises south-west New Britain, which is still subsiding and has never been submerged, Finisterre Mountains, Torricelli Range, Oinake Massiv (Mount Bougainville), Cyclops Range which has never submerged, Japen Island, and Waigeu Island.

These form the margin of a drowned land which for my present purpose I have named Cyclopea. All these remnants are characterized by a strong tilting on their ocean side so that valley heads and gullies alone remain above the sea, and on their shoreward side there is a proportional elevation with much weathered cliffs of Cretaceous limestone containing Eocene Foraminifera. There has been land subsidence on a huge scale.

If we conceive this lost land-mass Cyclopea as having maintained connexion with Asia until the Early Pliocene, there we have ancient fully populated land from which the young land would be colonized as it rose from the ocean bed. This is acceptable to geologists and accords with the biological evidence. It is, in fact, the only working hypothesis satisfactory for taxonomists. The drift and overthrust of continents in that part of the globe does not directly concern biologists of New Guinea to-day, because Cretaceous New Guinea of yesterday, which with New Zealand formed the margin of Australia, was submerged, and the stupendous folding movements entirely altered all previous land formation.

Cyclopea has a different history; but whether palæogeologists decide that the land looped, festooned, arched, buckled, or streamed by New Guinea with the Solomon Islands in pursuit is immaterial to us. What we do insist is that they must postulate Cyclopea as a continuous land to Asia through the Moluccas and the Philippines prior to the Early Pliocene, otherwise any hypothesis will be rejected as untenable because of the testimony of botanists and entomologists.

* Substance of a paper read before the Royal Entomological Society on August 15.