A DISCUSSION OF THE RESULTS OF THE ROYAL SOCIETY EXPEDITION TO NORTH BORNEO 1961.
E. J. H. CORNER (1964)

Commentary on the general results

By E. J. H. Corner, F.R.S.
Botany School, Cambridge

The importance of Mt Kinabalu was made known to science by the civil administrator Hugh Low, after his historic ascent in 1851. Many expeditions have followed, using the western approach along paths made by the native people. The Royal Society Expedition can claim to be the first to have broken entirely new ground by making its own path through unknown and uninhabited country. The path went up the east ridge from 1800 ft., under high forest all the way to 10000 ft., then along a broken, more or less forested ridge to 11000 ft., where precipices stopped progress. However, Mr Askew by a detour went on to some 12000 ft., but our target of the pinnacle region between the east ridge and the summit could not be attained. Then the expedition made the first east to west traverse of the Pinosuk Plateau, which is a tract of small-leafed forest at 4000 to 6000 ft. in the south-east bay of the mountain. We concentrated, therefore, on the mid-mountain forest, which is, as usual on tropical mountains, the least known. For the first time, too, on such an expedition we had a soil scientist. Mr Askew studied in particular soil variation with altitude, which is a matter of first importance in the detailed understanding of vegetational zonation.

The purpose of this meeting is to discuss the results of the expedition. A general account of the expedition will be published shortly in the *Proceedings of the Linnean Society of London*. The Society, I would remind you, published Stapf's masterly analysis of the mountain flora in 1894, and the account of Miss Gibbs's expedition in 1914, which was the last botanical description of Kinabalu. Our account has been greatly assisted by a grant from Council which has made possible the reproduction of a large number of new photographs of the mountain.

As regards the collection of plants, totalling about 3000 numbers, most of the flowering plants and ferns have been identified by the staff of the Royal Botanic Garden at Kew, mainly by Mr Forman and Professor Holttum. We collected, whenever possible, ten to twelve duplicates and most of these are being distributed to the main herbaria of the world. There are still, nevertheless, many specimens which need monographic revision to establish their true identity. It is impossible, yet, to say how many are new. Professor J. L. Harrison, at the University of Singapore, is still at work on his account of the small mammals and their parasites. Mr Askew is at work on the soil samples. For my part, I have studied the fig collections, and there is nowhere in the world, that I know of, with such a rich fig flora as Kinabalu. It has 78 species (15 endemic), and our expedition discovered 2 new species and 4 new varieties, which fit neatly into gaps in the classification which I have been making. The fig insects are being studied by Dr Wiebes, at the National Museum in Leiden, in our joint effort to write the zoo-botany of *Ficus*. Already, Dr Wiebes has been able to publish a revision of the insect genus *Ceratosolen* which inhabits *Ficus* sect. *Sycocarpus;* he recognizes 32 species of which 23 are new, including 10 from our collections on Kinabalu. I am also at work on the fungi, which have to be collated with my earlier Malayan collections. This work, however, means almost monographic treatment of every group. With the great help of Dr Bas, at the National Herbarium in Leiden, an illustrated account of the genus *Amanita* in Malaya and Borneo has recently been published. We recognize 22 new species out of a total of 30, and this proportion shows the difficulty of pursuing mycology where there are so few names.

Then I must add that the Government of Sabah, as the former territory of North Borneo is now called, is proceeding with the delimitation of the National Park of Kinabalu. A report was sent by the President of the Royal Society at the end of 1961 to the Government, which approved the recommendation to include the whole of the east ridge and the Pinosuk Plateau within the park. Thus, we may hope that this magnificent stretch of lowland to subalpine forest will be conserved for future generations. For instance, a mile south from the base camp of the expedition, in the upper dipterocarp forest, there is a 3000 ft. wall of rock, studded with big trees from every niche, making the south side of the gorge of the Mamut River. From the top of this wall one can survey the primeval forest of hornbill, gibbon, and orang-utan. Both these places, and many more in their primeval grandeur, would otherwise have been destined in the near future for denudation.

I come, now, to the main result of the expedition. It is our meeting. It is the first time that geologists and biologists have gathered to discuss the features of the mountain. The subject is worthy. After a day's journey from the capital town of Jesselton, one can ascend in two more days from the lowland forest of dipterocarp and durian, through *Rafflesia* forest with giant flowers and oak-laurel forest with its southern conifers, past pitcher-plants, rhododendrons, hollies, and magnolias, to a sub-alpine region of *Ranunculus*, *Potentilla*, *Viola*, and *Euphrasia* with temperate grasses, mosses, and lichens. There is no other place in the world that supplies in so short a journey such a stupendous transect of plant-life. The fungus side mirrors that of the green plants. There are the lowland tropical fungi, a belt of

oak fungi related to those of Japan, North America, and Europe, and an upper region with the pasture fungi of Scotland. The eastern slopes of the Andes and the Snow Mountains of New Guinea have higher altitudes, but their plant life is neither so huge nor so varied, and both are relatively inaccessible. The same points apply to the Himalayas and to Mt Kilimanjaro. This is the scientific value of the National Park of Kinabalu.

The fame of the mountain lies not only in its stature as the highest between Burma and New Guinea, but in the fact that it is by far the highest. It reaches 13500 ft., about 4100 m. Modern geological evidence indicates, I believe, that it is very recent. Mr Smythies, in his contribution to the discussion, finds support for this in the bird fauna. Botanists, however, as Professor van Steenis will explain, meet a totally different state of affairs. Modern though it be, the mountain carries relics—I repeat, relics—of an ancient and very widespread sub-alpine flora of bygone Malaysia. It carries relics of a widespread mid-mountain flora, stretching from Sumatra and Malaya to the Philippines, Celebes, and, perhaps, the Moluccas. Round the base of the mountain there ranges the lowland dipterocarp forest of such antiquity that its contemplation carries us back to the beginnings of flowering plant forest. The botanist sees in Kinabalu the latest of many lofty mountains long since worn away between Indo-China and New Guinea. The botanical facts are so many, so diverse, and now so well-established that, being a botanist, I give them first place.

Kinabalu presides in the centre of the richest and, as I have long considered, the oldest of angiosperm vegetation. It inherits, in spite of its youth, mysteries of the past. As I told my companion of the expedition Mr Stainton, I was going to look for the southern beech *Nothofagus* on the upper slopes, having seen its forests at about 8000 ft. in New Guinea. The distribution of the genus from temperate South America to New Zealand, Australia, and New Guinea points to its origin in Malaysia. Likewise, the oaks and chestnuts of the north temperate region point southwards for their origin in Malaysia and, in particular, Borneo. We found not *Nothofagus* but a new genus which Mr Forman has called *Trigonobalanus*. It is, as he will explain, a true oak with beech-nuts, yet so peculiar in other ways that it reveals a glimpse of the lost history of the oak-beech family Fagaceae. This is a proof of my contention. Outwards from what is now western Malaysia, to north and to south, the oak family has spread in diminishing numbers and variety.

This is not a peculiarity of the oaks. I find it in *Ficus*. It has happened with lowland, mid-mountain, and alpine plants at their different altitudes. Thus, botanists have no compunction in conjuring up extinct mountain ranges to explain the geological basis of modern vegetation. They turn to van Bemmelen's theory of mountain-making on the Sunda shelf. (Here, I would interpolate that much to my regret Professor van Bemmelen is unable to be with us today.) Botanists must contemplate what vegetation occurred on the Palaeozoic deposits uplifted during the Mesozoic period, when flowering plants were beginning to evolve. They must consider how their descendants became montane and alpine plants in the tropics of South-East Asia, and were jacked up by other mountains to become, along Cretaceous routes, the vegetation of the north and south temperate. We speak of

Sino-Himalayan and of Australian plants on Kinabalu, but I think we should also consider whether they are not the immediate descendants of bygone Malaysian vegetation that went out to Sino-Himalaya and Australia. We speak of European, Japanese, and North American fungi, because we know them from these regions, but on Kinabalu there is the Japanese shiitake, *Lentinus edodes*—probably the most abundantly eaten fungus in the world—and a close ally of it is in the lowland forest. Under *Trigonobalanus* there grows a fungus extremely close to the beech-russule, *Russula nigricans*, of Europe, and allies of it are in the lowland forest. In the oak-laurel forest of Kinabalu there grows the rare North American cup fungus *Wynnea*. There, too, are *Armillaria mellea*, *Stereum purpureum*, *Chlorosplenium*, and *Fistulina* in abundance and variability. I am sure that we shall have to re-orientate our ideas of fungus distribution as radically as with the flowering plants. On Kinabalu there occurs the monotypic family Scyphostegiaceae, of most problematic position, but, as I found and had long suspected, it has arillate seeds which provide a new clue to its systematic position. More indicative of the antiquity of the flora is the incredible abundance of ferns. I believe that there are many other botanical discoveries of importance to be made on the mountain, but I cannot understand the lack of equally notable animals, except in so far as botany is not zoology.

I conclude that, if ever there was a nexus of natural phenomena demanding biological research, it is around Kinabalu. We shall now take stock of how much more we ought to know. The opportunity is most welcome because there is to be a second Royal Society Expedition to the mountain next year, and we shall be aware of problems that we did not appreciate on the first.

Before concluding these introductory remarks, I must draw attention to a practical problem. When botanists explore, they collect seeds to grow so that they may study the new or little-known plants at leisure. Now the interesting plants of Kinabalu are mostly large trees and climbers, neither hardy nor tolerant of low-land heat. Where can the seeds be grown? I can think only of Tjibodas Botanical Garden in Java; perhaps, also, of Dehra Dun in India. I hope we may be able to persuade the Government of Sabah to establish a botanical garden at the growing centre of Kundasan at 4000 ft. on a spur of Mt Kinabalu.

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