LETTERS TO THE EDITOR.

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An Assumed Instance of Compound Protective Resemblance in an African Butterfly.

Hamanumida dadalus, Fabr., generally quoted by its better known synonym *Aterica meleagris*, has been recorded as a good instance of protective resemblance.

Mr. Wallace ("Darwinism," p. 207) writes:—"A common African butterfly (*Aterica meleagris*) always settles on the ground with closed wings, which so resemble the soil of the district that it can with difficulty be seen, and the colour varies with the soil in different localities. Thus specimens from Senegambia were dull brown, the soil being reddish sand and iron-clay; those from Calabar and Cameroons were light brown with numerous small white spots, the soil of those countries being light brown clay with small quartz pebbles; while in other localities where the colours of the soil were more varied the colours of the butterfly varied also. Here we have variation in a single species which has become specialized in certain areas to harmonize with the colour of the soil."

Now in the Transvaal this butterfly never settles on the ground with closed wings, and the only example sent from Durban by Colonel Bowker to Mr. Trimen was described as "settled on a footpath with wings expanded" ("South African Butterflies," vol. i. p. 310). I have seen and captured a number of specimens in this country, and always found them with wings expanded and nearly always on greyish coloured rocks or slaty hued paths, with which the colour of the upper surface of their wings wonderfully assimilated. We have large tracts of bare ground of a reddish-brown colour with which the under surface of the wings would be in perfect unison, and for months I have watched to see a specimen thus situated and with its wings vertically closed, but without success.

If the reports as to its habits from Senegambia, Calabar and Cameroons are correct, and I believe for the last localities the authority was the late Mr. Rutherford (but I do not possess the necessary reference here), then we not only have a change of habit with difference of latitude, but also what I have ventured to style a "compound" condition of protective resemblance. For we thus see that while in Senegambia, Calabar and Cameroons, where according to report the butterfly always settles with wings closed, and which "so closely resemble the soil of the district that it can with difficulty be seen, and the colour varies with the soil in different localities," here in the Transvaal and Natal where it rests with expanded wings, its protection is almost equally insured by the assimilative colour of the upper wings to the rocks and paths on which it is usually found.

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Pretoria, Transvaal, January.

Cultivation of India-Rubber.

IN NATURE of January 15, in a note on p. 355, a statement is quoted, to the effect that some few attempts have been made to cultivate india-rubber, but as yet not very successfully. As, however, there are extensive flourishing plantations of *Ficus elastica* in Assam, a short account of their origin and present condition may prove interesting.

After some preliminary experiments on a small scale, the Government of Assam in 1873 determined to plant caoutchouc in the Charduar Forest at the foot of the Himalayas, north of Tezpur. Mr. Gustav Mann, the Conservator of Forests, gave me the necessary instructions to start the work in November of that year, and I remained in charge of the plantation till September 1875. The Charduar Forest has an essentially damp climate, the average rainfall at the caoutchouc plantation having been 94.65 inches during the years 1878-85, and during 1886-89, the annual rainfall was distributed as follows:—

Winter Rainfall.	1886-87.	1887-88.	1888-89.
November till March ...	Inches 4.87 ...	7.38 ...	4.78
Summer Rainfall.	1886.	1887.	1888.
April till October ...	99.30 ...	71.55 ...	82.39
Total ...	104.17 ...	78.93 ...	87.17

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Data for the temperature of the Charduar Forest are not available, but the following average figures for ten years, for Sibsagar, which lies to the south-east of Tezpur, across the Brahmaputra River, will give sufficiently approximate results:—

Average annual temperature ...	73° 4 F.
Average monthly for January (lowest) ...	59° 0 F.
Average monthly for July (highest) ...	83° 7 F.

The absolute maximum and minimum temperatures for Sibsagar are not given in the meteorological tables from which the above figures are taken, but, quoting from memory, they are for Tezpur about 95° and 42° respectively.

The relative humidity for Sibsagar averages 83 per cent., being lowest in March, 79 per cent., and highest in January, September, and December, at 85 per cent. It is certainly not less than this in the Charduar Forest, where the moist hot atmosphere in the summer months resembles that of a forcing house. The Charduar Forest contains a vast number of woody species, both evergreen and deciduous, but chiefly the former, nearly pure woods of *Mesua ferrea* and *Altingia excelsa* prevail in the higher parts of the forest, and the undergrowth consists of dwarf palms, small bamboos, and evergreen shrubs, *Coffea bengalensis* being abundant in places, whilst cane palms are found in the damper parts of the forest, and festoon the trees in company with other huge climbers. A few enormous old rubber-trees are disseminated here and there throughout the forest. *Ficus elastica* has here been measured 129 feet high, with a girth around the principal aerial roots of 138 feet, whilst the girth of its crown was 611 feet.

As rubber-trees cannot stand shade, and the seedlings damp off unless fully exposed to light and well drained, the natural reproduction of *Ficus elastica* generally takes place in the forks of stag-headed or lightly foliated trees high up in the crown, where seeds are left by birds; and from such a site the aerial roots in process of time descend to the ground, and develop into a vast hollow cylinder around the foster stem, which is speedily inclosed and completely killed by the vigorous crown of the epiphyte, which eventually replaces it in the forest. In its epiphytic growth, the aerial roots of *Ficus elastica* may take several years to reach the ground, but, once well rooted, nothing can probably surpass it in its native habitat for rapidity of growth and vigour.

As, owing to the above mode of growth, rubber-trees are so sparsely scattered in the Assam forests, and it is therefore extremely difficult to protect them from being tapped in a wasteful manner, the plan of concentrating them in artificial plantations, as proposed to the Government by Mr. Mann, was carried out as follows:—

At first, attempts were made to propagate by cuttings, which struck readily, but it was soon discovered that rubber-seed germinates freely on well-drained beds covered with powdered charcoal or brick-dust, and that the seedlings, though at first small as cress, grew rapidly, and became about 2 feet high in twelve months, and were much harder against drought than plants produced from cuttings. The base of the stem of the seedlings swells out like a carrot, and this fact, no doubt, enables them to tide through the dry season in safety, for, in spite of the humidity of the air, the nearly constant sunshine from November till March is trying to young plants.

In order to imitate Nature as much as possible, some strong seedling rubber-plants were placed in the forks of trees in 1874, and by 1885 only a few of them had reached the ground and were growing most vigorously.

As this method, though much more economical than planting on the ground, gave such slow results, and it was found easy to produce plants in any quantity from seed, large nurseries were formed, in which the plants are now retained until they are 10 feet high, as smaller plants were browsed down by deer when planted out in the forest. The planting lines are cleared to a breadth of 40 feet in strips, separated by alternating strips of untouched forest 60 feet wide.

It was found that the rubber-plants did not get sufficient light with lines less than 40 feet broad, whilst the strips of forest kept the soil and atmosphere moist, and afforded side shelter to the plants, forcing them to grow upwards, instead of branching out near the ground. As this method involves considerable expense in clearing the lines, and wastes the wood, which is frequently unsaleable, Colonel, now General Keatinge, the Chief Commissioner of Assam, in 1874, directed that plantations of *Ficus elastica* should also be made in grass-land near Tezpur. It has been, however, found that large rubber-trees in Tezpur,