In geometry; the second, third and fourth books of Euclid. In algebra; quadratic equations, or indeed any equation, surd or rational, for one or two unknown quantities, except such as ultimately demand the solution of a non-factorial cubic or biquadratic; the simplification of surd quantities and expressions and problems in ratio and proportion.

Trigonometry has to be taught from the beginning through the equations of identity between functions of the ratios and the values of the ratios of the simple angles to the logarithmic solution of oblique triangles, with proofs of the requisite formulæ. A sufficient knowledge of logarithms is demanded from the student to prove the ordinary logarithmic laws—no reference is made in the entire syllabus to the theory of indices—and to prove the numerical laws of characteristic and mantissa belonging to the decimal system of logarithms. He must also be able to adapt and use—for any possible logarithmic computation—a few seven-figure logarithms given at the end of his examination paper, and obtain by means of proportional differences a result corrected to six significant figures.

All this work is to be taught between September and May to pupils who, throughout the country, are generally accorded two hours a week for the subject, and who, as evening students otherwise employed through the day, are seldom able to give much time to study.

In some parts of the course—for instance, the equations set for solution—a pedant's ingenuity is used to find novelty and—for the beginner—difficulty. In other parts—as, for example, the surds and logarithms—the monotony of treatment year by year is one of the mainstays of the examination-teacher.

I have not exhausted the possible complaints against the course. Its first four stages are almost equally bad throughout, though the second is certainly the worst. But I have, I hope, said enough to convince any experienced teacher of the subject under other conditions of the urgent need we feel for changes.

I wish to guard myself against one possible personal imputation. I am not complaining because I have failed; I have been, I believe, at least averagely successful in obtaining the examination-product that South Kensington demands, and I have, I hope, also taught some mathematics. But I protest that my efforts towards the one end should be so severely handicapped by the necessity of attaining the other.

Plymouth Technical School. C. J. FORTH.

Birds Capturing Butterflies in Flight.

MR. MCKAY'S letter in NATURE of January 16 (p. 247) is of interest in pointing out that some butterflies are normally exposed in flight to danger from certain birds. Nevertheless, I believe this to be exceptional so far as this country is concerned. At the present moment I have in my possession a specimen of the day-flying moth *Orgyia antiqua*, which my friend Mr. D. F. Taylor saw seized when on the wing by a house-martin, which relinquished its hold in consequence of a luckily aimed stick from my informant. The left fore-wing shows plainly the mark of the bird's beak, which, however, did not tear the wing, but merely left a triangular area denuded of scales. So far as I am aware, house-martins do not, as a rule, feed on Lepidoptera, and this instance is probably to be regarded as a mistake on the part of the bird. It is possible that other isolated examples of similar mistakes may have been noticed, but their bearing on the general question of the coloration and markings of butterflies must be very slight. OSWALD H. LATTER.

Charterhouse, Godalming, January 17.

An Unusual Rainbow.

ON June 16 last I was at Lucerne, and at about 4 p.m. there was a remarkably brilliant rainbow over the lake. It was, however, unlike any previous rainbow ever seen by me, inasmuch as in addition to the ordinary bow of seven colours there was a second band of orange colour and a second band of purple, added to the other seven colours on the underside, but distinctly part of the same unbroken and continuous band of colour; in other words, it was a bright broad rainbow composed of nine instead of seven bands of colour. I have, since my return, met with no person able to explain this phenomenon. I was quite alone at the time. The rainbow lasted several minutes. It has been suggested to me that possibly some scientific reader of your paper could explain this very unusual appearance; or, at any rate, some other traveller at Lucerne on the day referred to may be able to confirm my description of what appeared to me so very unusual that I should almost have hesitated to accept any other person's description of it. THOMAS FULLER.

Bristol, January 17.

Change of Pitch of Sound with Distance.

IN Mr. West's letter in NATURE of December 12, 1901, he suggests that a lowering of pitch with distance may have been noticed, although his experience has been the reverse. My grandfather, the late Mr. Henry Knaüff, who, during his lifetime, was an organist and organ builder in Philadelphia, mentioned having noticed this lowering of pitch on several occasions. In long churches, with the organ over the front doorway, he claimed that the voice of the celebrant at the altar sounded distinctly flat to a listener at the organ, but on advancing to the altar this flatness disappeared. I have never noticed this myself, but I have not his ear for small differences of pitch.

PAUL R. HEYL.

Boys' High School, Reading, Penna., U.S.A.

TO THE MOUNTAINS OF THE MOON.[1]

MR. J. E. S. MOORE has undoubtedly written an interesting and original book on the lake region of Central Africa, a book which in many respects deserves to rank with that remarkable pamphlet (it was little more in volume) by the late Prof. Drummond on Nyasaland (miscalled in this instance "Central" Africa). Prof. Drummond's journeys up and down the Zambezi-Shire and the length of Lake Nyasa, with a climb on to the Nyasa-Tanganyika plateau superadded, were wholly unremarkable as a work of exploration, but Drummond contrived to see and put into pithy sentences what a legion of African explorers had seen but never expressed before. Drummond's little book should long remain a classic, and many of his expressions are quoted by the more modern African travellers with force, but without acknowledgment. Mr. Moore avows his indebtedness to Drummond on more than one occasion, but his own work is quite as original in its way, though perhaps dashed with a spitefulness which was absent from Drummond's writings. Mr. Moore's book is a true account of what he has seen, but a partial one, that is to say, he has told no untruth, but he has left untold at least a third of the whole account. In order to be original, in order to counteract the rather wearisome optimism of most works of African travel written during the last ten years, he has been careful to insist on all the faults which a white man may legitimately find with the climate, soil and insalubrity of Central Africa. He deliberately ignores much that might be permanently attractive to the European settler, much that is profitable to European commerce, and much of the good that has been done by European pioneers, whether Government officials, missionaries or traders. It is a pity in some respects that Mr. Moore's work is not complete, that he should have striven so much after originality as to refrain from writing a perfectly balanced book conveying an impartial verdict. It is, perhaps, best and fairest to regard Mr. Moore's work as a "two-thirds" book, a description giving two-thirds of the whole truth and leaving the reader to supply the missing third from the many other publications describing East-Central Africa between the White Nile and the Zambezi which have appeared since 1890. There is no doubt that Mr. Moore is eminently readable; he is so interesting that his occasional descents into sheer flippancy and his carelessness in the spelling of names may easily be forgiven, except, perhaps, by those whose names are incorrectly spelt! By a curious fatality there is scarcely a single European surname or a native place-name of any importance in the whole book which is not incorrectly spelt.

1 "To the Mountains of the Moon." By J. E. S. Moore. Pp. xvi+350 (London: Hurst and Blackett, Ltd., 1901.)

The illustrations supplied to the work consist of photographs and drawings, the latter singularly vivid if occasionally crude. Mr. Moore succeeds almost better than any other African traveller whom we know, able to use pen and brush, in giving an idea of the wonderful cloud effects to be seen in these African skies. We have stigmatised his black and white drawings as crude—as such they must appear to the ordinary European—yet in extenuation of their hard light and shade must be quoted the undeniable fact that there is something about the African atmosphere which gives these violent effects. A vivid (and the reviewer is able to say a truthful) picture is that facing p. 76—"Storm-clouds, Mountains and Bananas on the East Coast of Tanganyika."

Rift Valley occurred through the uprising of the Mfumbiro volcanoes, is probably correct. It is certainly original. The lacustrine fauna of Kivu is apparently similar to that of Albert Edward, and quite distinct from the remarkable marine fauna of Tanganyika.

With regard to Mr. Moore's attempted ascent of the Ruwenzori range, furnished with guides by Mr. Bagge, the Government official at Fort Portal (a place which Mr. Moore persists in calling Fort Jerry), he attacked the mountain by the Mubuko Valley. According to his own account he probably reached a total altitude of 14,900 feet. Sir Harry Johnston, who ascended the mountain some months later, tells us that he, following the same route, could get no higher than 14,800 feet. Subsequently

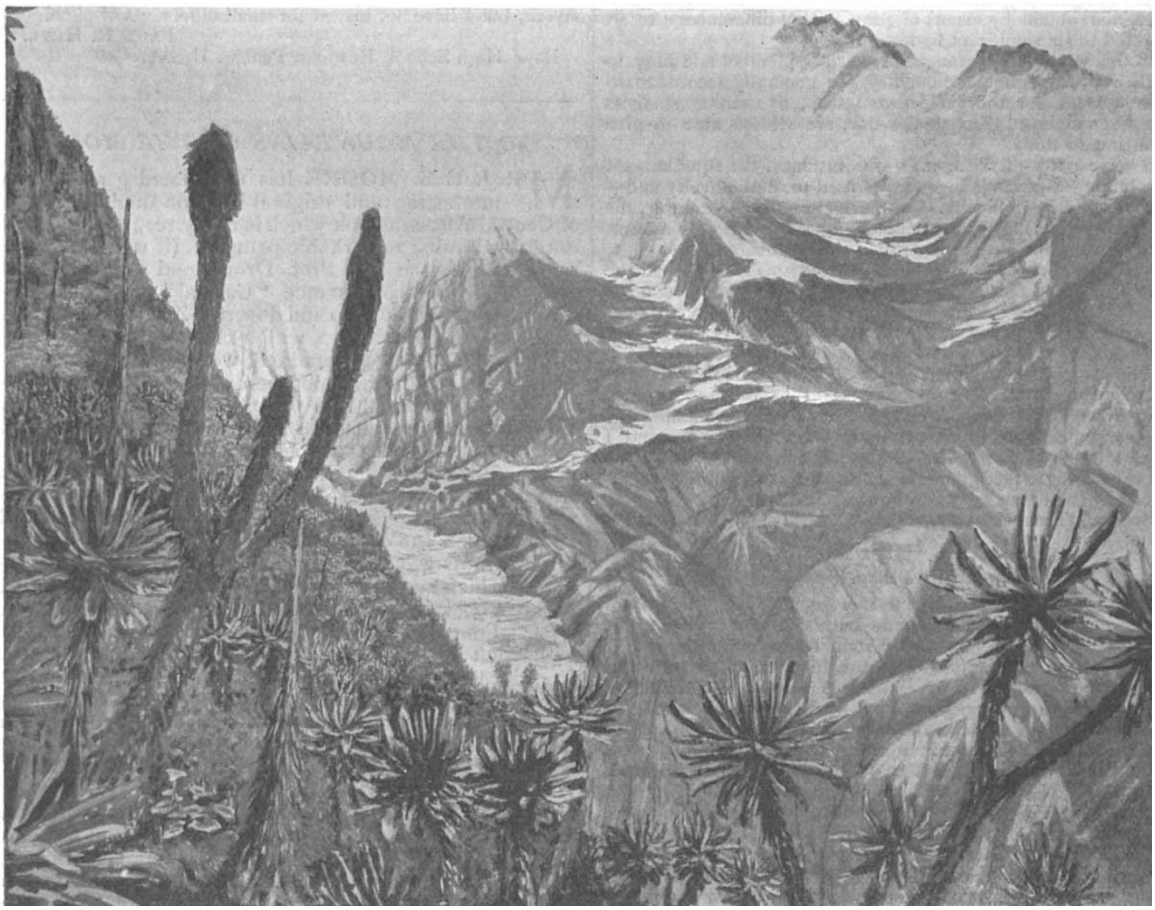

FIG. 1.—View of the small glacier between the Northern Snow Ridge of Ingomwimbi and Kanyangogwi from the former, at a height of 13,600 feet.

As regards the scientific results of Mr. Moore's expedition—the point of view from which most readers of NATURE will be interested or uninterested in the book—we are able to say very little, because Mr. Moore is reserving his reports on his biological studies for another volume. The chief matters of interest to scientific students of Africa in the work under review consist of the ascent of the still active volcano of Kirunga cha gungu and a plucky attempt to ascend one of the summits of the Ruwenzori range. Interesting observations were also made on and around Lake Kivu; and Mr. Moore's opinion that this lake was probably once connected with Albert Edward and the Nile system rather than with Tanganyika and the Congo, but that the severance between Kivu and the Nile in the Albertine

Mr. Wylde, of the Uganda Administration, also reached a point which he describes as under 15,000 feet in altitude. As Mr. Moore's and Mr. Wylde's observations were only taken by aneroid whereas Sir Harry Johnston's was by boiling-point thermometer, it is probable that all three explorers reached the same spot in total altitude, all being stopped there by the same obstacles of rocky precipices. Mr. Moore believes that the spot he reached was on the actual ridge of Ruwenzori, from which, theoretically, one might look down on the Semliki Valley or on Eastern Toro. Now from Sir Harry Johnston's observations, as given in his lecture of November 11 last, and his paper recently published in the Geographical Society's magazine, it is clear that this altitude of just under 15,000 feet is nowhere near, is

perhaps a couple of thousand feet below, the top of the ridge which connects all the Ruwenzori snow-peaks. Assuming this ridge to be at something like 17,000 feet in altitude, the high peaks of Ruwenzori would again rise two or three thousand feet higher, and thus the supreme altitude of 20,000 feet of the highest point of Ruwenzori which has been predicted by Major Gibbons, Sir Harry Johnston, Mr. Wylde and others is more likely to be nearer the ultimate truth than Mr. Moore's assertion that the greatest height of Ruwenzori is probably not more than 17,000 feet in total altitude.

Mr. Moore makes some very interesting remarks on the causes which probably led to the formation of the park-like scenery so characteristic of tropical Africa. On recently formed alluvial flats those strange and hideous

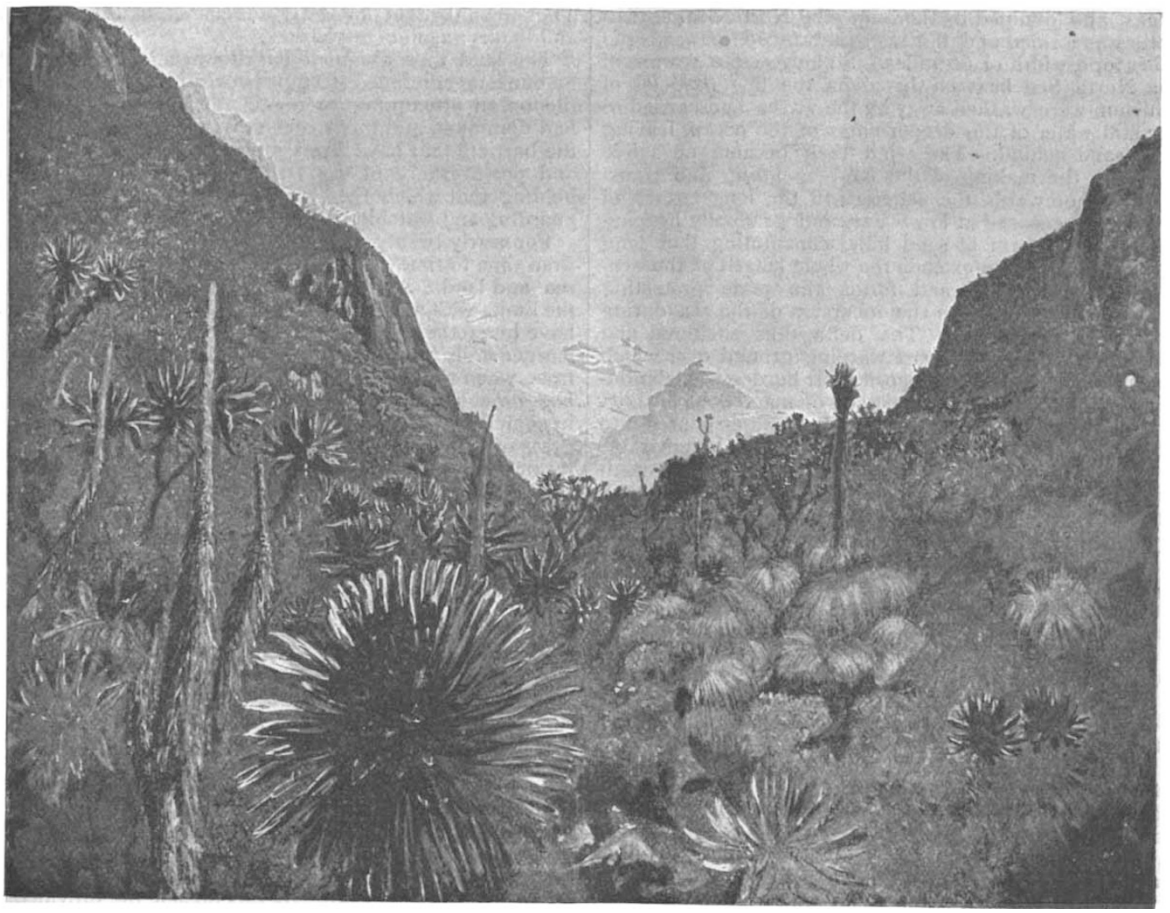

FIG. 2.—The Northern Snow Ridge of Ingomwimbi from a point about 12,500 feet.

fleshy euphorbias commence to grow on what is, to begin with, a shadeless, sandy wilderness, where all seedlings which might form forest trees are burnt up and withered by the scorching sun. The euphorbia, however, resists the sun's rays, being distinctly a plant of the desert. As its candelabra branches increase in numbers and spread out to the right and left they create shade, while the fallen branches decay and form vegetable soil. Under this protection and by this nourishment seedlings of palms and forest trees survive and flourish. When they have got a good hold on the soil the original euphorbia is long since dead or hidden, and the park-like clumps of handsome trees have become a permanent feature over what was once a wind-swept, sun-scorched, barren plain.

We strongly recommend Mr. Moore's book to the attention of all who are interested in tropical Africa His pessimistic description, however, of the future prospects for European trade with these countries can be easily corrected by a glance at the statistics issued by the African Protectorates. Countries the trade of which has risen in a few years from an annual value of 30,000*l.* to a quarter of a million, while their local revenue has grown from nothing a year to 50,000*l.* or 60,000*l.*, cannot be such hopeless investments for European commerce and enterprise as Mr. Moore would have us believe.

Mr. Moore was accompanied on his journey by a surveyor, Mr. Malcolm Ferguson, whose surveys are certainly one of the valuable results of the expedition. If Mr. Ferguson is to be regarded as more accurate than his predecessors his work will result in the shifting of the northern end of Lake Tanganyika nearly half a degree further to the west, while he will also have supplied us with the first approximately correct delineation of Lake Albert Edward.

THE RECLAMATION OF THE ZUIDERZEE.

IN a recent consular report from the Netherlands, issued by the Foreign Office, reference is made to a Bill which was introduced in the Second Chamber of the States General, for the purpose of obtaining authority to carry out the works required for the first portion of a scheme for reclaiming 800 square miles of land from the Zuiderzee, and for raising the necessary funds, estimated at eight million pounds, the cost of the entire scheme