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.)