

crops. Thus, potassium chloride replaces potassium nitrate in the manure for leguminous plants, and in some cases a mixture of potassium chloride and ammonium sulphate replaces potassium nitrate; and a few other alterations are suggested in the treatment of various crops. Thomas's basic cinder is not mentioned as a source of phosphoric acid. The lectures themselves, and some controversial matter, are reprinted in their original form, and but little new matter is added.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

The Bird-Collections in the Oxford University Museum.

DURING a recent visit to Oxford I took the opportunity of examining the collection of birds in the University Museum, and beg leave to offer a few remarks upon its condition.

First, as regards the mounted specimens, there are three series belonging to this category:—

(1) The general series in the Central Court. This numbers about 1100 specimens, which are contained in twelve cases, placed in opposite rows of six each, but rather mixed up with mammals, shells, and other objects. The specimens are arranged according to Gray's "Genera," and in most cases correctly named. But many of them are in bad order and not well set up, and should be replaced by fresh examples. The whole series requires renovation and rearrangement, according to some modern system, and the orders and families should be designated by labels, and distinctly separated one from another.

(2) The collection of Arctic birds formed by Mr. J. Barrow, F.R.S., and presented to the Museum by that gentleman. This interesting collection, which has been well described by Mr. Harting in the *Ibis*, is placed in the gallery. It is well mounted and correctly named. But it is a question whether it is desirable to keep it apart from the general series.

(3) The British series, also placed in the gallery, which is in fair order, although it also requires revision and rearrangement according to some modern system. It ought not to be difficult to find some member of the British Ornithologists' Union to undertake this task, provided that the authorities will allow him a "free hand."

Besides the mounted specimens, there are, as I understand, about 4000 skins of birds, most of which are "put away" in boxes in various parts of the building. Of these, the only portion that I was able to see was the Bornean collection formed by Mr. Everett, and partly described by Dr. Bowdler Sharpe in the Zoological Society's Proceedings. These are placed in some drawers in the main hall. The other skins are stated to be "boxed up," and are kept partly in a room on the ground floor, and partly in some "upper chamber," to which no ready access is possible.

I venture to suggest that one of the side rooms in the Museum should be cleared of its contents, and devoted entirely to the bird-skins, and that they should be arranged there in cabinets, so as to be accessible to the ornithologist. It is hardly right for a great and rich University to accept collections from persons who, in the words of the late Prince Bonaparte put forward on a similar occasion, "croyant qu'ils travaillaient pour la science, non pas travaillés que pour les mites." I may add that any assistance that I can give in carrying out this reform will be most gladly rendered. P. L. SCLATER.

3 Hanover Square, London, W., September 4.

Variation and Natural Selection.

IN Prof. C. Lloyd Morgan's Presidential address to the Bristol Naturalists' Society, on "The Nature and Origin of Variations" (of which he has kindly sent me a reprint from the Society's Proceedings), there are one or two points on which there seems to me to be a slight misconception; and as the difficulties suggested have probably occurred to other naturalists,

I wish to make a few observations in the hope of throwing a little light on this obscure subject.

After referring to the proofs of the variability of species in a state of nature which I have adduced in my "Darwinism" (to which proofs Prof. Lloyd Morgan has made some important additions in his recent work on "Animal Life and Intelligence") he remarks:—"We have been apt to suppose that a species is so nicely adjusted to its surrounding conditions that all variations from the type, unless of a very insignificant character, would be rapidly and inevitably weeded out. This, it is clear, is not true at any rate for some species." And a little further on, after discussing the question whether variations in all directions occur in equal proportions—an equality which does not appear to me to be at all necessary, or to have been ever suggested as occurring—he says: "And the candid biologist must, I think, admit that the evidence in Mr. Wallace's third chapter, while conclusive as to the occurrence of variations, gives on analysis little or no evidence of any selective agency at work."

The difficulties here stated appear to me to depend, chiefly, on not taking account of some important facts in nature. The first fact is, that the struggle for existence is intermittent in character, and only reaches a maximum at considerable intervals, which may be measured by tens of years or by centuries. The average number of the individuals of any species which reach maturity may be able to survive for some years in ordinary seasons or under ordinary attacks of enemies, but when exceptional periods of cold or drought or wet occur, with a corresponding scarcity of certain kinds of food, or greater persecution from certain enemies, then a rigid selection comes into play, and all those individuals which vary too far from the mean standard of efficiency are destroyed.

Another important consideration is that these epochs of severe struggle will not be all of a like nature, and thus only one particular kind of unbalanced or injurious variation may be eliminated by each of them. Hence it may be that for considerable periods almost all the individuals that reach maturity may be able to survive, even though they exhibit large variations in many directions from the central type of the species. During such quiescent periods, the chief elimination will be among the young and immature. Thus, with birds probably nine-tenths of the destruction occurs among the eggs and half-fledged young, or among those which have just escaped from parental care; while those which have survived to breeding age only suffer a slight destruction in ordinary years, and this may occur partly among the less experienced, partly among those which are old and somewhat feeble.

The severe elimination that occurs in the earlier stages may be thought to be accidental, but I doubt if it is really so except in a very small degree. The protection and concealment of the eggs and young in the nest will depend chiefly on the mental qualities or instincts of the parents, and these will have been always subject to a rigid selection owing to the fact that those with deficient instincts will leave fewer offspring to inherit their deficiency. And with young birds of the first year there will be an equally rigid selection of the incautious, and of those who are deficient in any of the sense-perceptions, or are less strong and active than their fellows.

The proof that there *is* a selective agency at work is, I think, to be found in the general stability of species during the period of human observation, notwithstanding the large amount of variability that has been proved to exist. If there were no selection constantly going on, why should it happen that the *kind* of variations that occur so frequently under domestication never maintain themselves in a state of nature? Examples of this class are white blackbirds or pigeons, black sheep, and unsymmetrically marked animals generally. These occur not unfrequently, as well as such sports as six-toed or stump-tailed cats, and they all persist and even increase under domestication, but never in a state of nature; and there seems no reason for this but that in the latter case they are quickly eliminated through the struggle for existence—that is, by natural selection.

One more point I will advert to is Prof. Lloyd Morgan's doubt, in opposition to Mr. Ball, "whether a thicker or thinner sole to the foot is a character of elimination value, whether it would determine survival or elimination, and make all the difference between passing or being plucked in life's great competitive examination." This seems to me to be a rather unfortunate objection, since, in constantly recurring circumstances during the life of a savage, this very character must be of vital importance. Whether on the war-path, or in pursuit of game,

or when escaping from a human enemy or from a dangerous animal, the thickness of the sole, its insensibility to pain, and its resistance to wear and tear must have often determined life or death. A man who became sore-footed after a long day's tramp, or one whose thin sole was easily cut or torn by stones or stumps, could never compete with his thicker soled companions, other things being equal; and it seems to me that it would be difficult to choose a single physical character whose variations would be more clearly subject to the law of selection.

With the greater portion of Prof. Lloyd Morgan's very interesting address I am in perfect accord, and it is because his remarks and suggestions are usually so acute and so well founded that I have thought it advisable to point out where I think that his objections have a less stable foundation.

ALFRED R. WALLACE.

A Rare Phenomenon.

THE rare phenomenon to which your two correspondents refer in their letters in your last issue (p. 494) was visible here at precisely the same time, and, viewed from Nottingham Forest, it presented a most interesting sight. It is curious that, as both the time and duration of the phenomenon coincide with its appearance here, its characteristics should be so dissimilar. It had more the appearance of a well-defined display of the aurora. Rays of light springing from the horizon penetrated high into the heavens, lasting about 10 or 15 seconds, and then disappeared, others taking their places. Its centre appeared to me to be almost due north, and, from notes made at the time, the beams or luminous rays reached an angle of about 50°, stars being visible through them. There was no arc visible of the character described by your correspondents, but vertical changing rays, several of which were distinctly orange-tinted.

Nottingham, September 26.

ARTHUR MARSHALL.

YOUR columns record, from Ireland and Scotland, observations of the aurora to which I called attention last week. It was seen also in Warwickshire, the coruscations being so marked as to remind my informant of the search-light at the Naval Exhibition. Mr. E. B. Knobel informs me that, from 8 to 10 p.m. on the 11th, during which time the appearance was visible, active magnetic disturbances were noticed at the Royal Observatory, Greenwich, illustrating the close connection which has been established between auroral and magnetic phenomena.

W. TUCKWELL.

It may be of interest to your readers to know that the "rare phenomenon" mentioned (p. 494) was seen by me from Ryde, I.W., on Friday, the 11th. A streak of light (at first thought to be a ray proceeding from a search-light), was visible near the Pleiades, at about 9.30, extending over an arc of about 45°, the width being probably about 1°. It gradually faded away, and at 10 no trace of it was left.

F. C. LEVANDER.

30 North Villas, Camden Square, N.W., September 28.

Instruments in Just Intonation.

As you have raised once more the question of justly intoned instruments, may I offer the following remarks? It does not seem likely that any arrangement for the organ would be practically adopted unless it permits as much freedom of modulation and of execution as that of equal temperament. To permit perfectly free modulation, with practically perfect intervals, nothing short of the cycle of fifty-three will suffice. Now to construct a key-board with fifty-three notes to the octave which can be played upon with the facility of a twelve-note key-board seems impossible. But the problem may be approached differently: as it is only necessary to use twelve notes at a time, the key-board might remain as it is, and only a mechanical device would be required to make these twelve keys correspond to the right twelve out of fifty-three pipes; if the services of an assistant be allowed (as is often necessary on large organs) the mechanical difficulties could easily be overcome. For example, arrange a number of studs—say 117, as suggested by Dr. Ellis—as a "duodenarium," and connected electrically to the fifty-three trackers; *i.e.* each tracker would be connected to two or three studs—B[♭]h, C[♯]hh, A[♯] studs to tracker 46 for instance.

Opposite these studs would be another set of 117 connected to the twelve keys, *e.g.* C, B[♯], B[♭], D[♯]h, &c., all to the key C. Between the two sets of studs would be a frame carrying twelve contact pieces; the frame would then be moved along guides by the assistant, so that the twelve keys were electrically connected to the right duodene of studs, and hence could be made to open the right group of pipes.

Thus the only alteration in printing required would be to mark the duodene on the music. All the extra complication would be thrown on the mechanical arrangements, and the organist would be left in the same position as now. It seems to me that any more complicated key-board would fail in a large organ, through overburdening the organist.

ROBT. A. LEHFELDT.

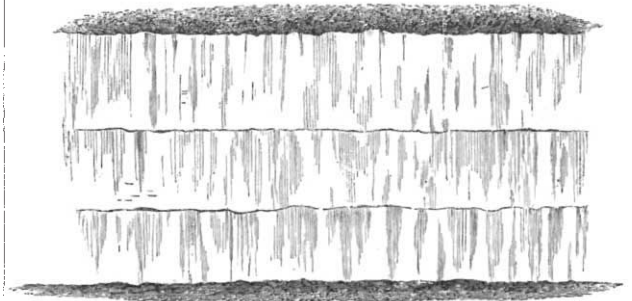
Firth College, Sheffield, September 14.

Unusual Frost Phenomenon.

THE following is extracted from a letter dated Dubbo Creek, near Tumut, New South Wales, July 26, 1891:—

"I noticed the other day a strange effect caused by the late very hard frosts. It was a peculiar upheaval of the crust of the ground by a mass of innumerable threads of ice taking the form of spun glass or fine asbestos fibre. There were five layers of this ice-fibre, the uppermost bearing the raised earth-crust. Every night's frost was shown by its distinctive layer of fibres.

"As perhaps you may never have seen this form of ground frost, I append a rough sketch of its very singular appearance.



I have only shown three layers; there were five, but this may give you some idea of its appearance—quite a columnar basaltic appearance.

"Every morning here after a sharp frost, the whole of the ground, where not covered by grass or rubbish, is raised up thus. On the sides of the cuttings and banks of our claim, these ice-fibres may be seen projecting from the walls in bunches of snowy filaments, like spun glass. The sun, however, soon causes them to drop off, and they lie in heaps of some six inches in depth."

A. H. WHITE.

Richmond, Surrey.

The Destruction of Mosquitoes.

ON two occasions, when proceeding northwards to Arctic Norway, I was much interested in observing the fact that the plague of mosquitoes, which is so intolerable there, especially prevails in latitudes beyond the northern range of the swallow.

This may possibly be a mere coincidence, but I think it is not—an opinion strongly supported by another and very broad fact, *viz.* that in a given district in our own country the gnats become more abundant immediately after the departure of the swallows, martins, &c. If this view is correct, the protection of these birds should be added to the devices named in your review of "Dragon-flies *v.* Mosquitoes." Such protection is very different from the indiscriminate sentimentalism about "small birds" which breaks out periodically at this season in the newspapers, and includes such feathered vermin as the thick-billed, seed-grubbing, pea-shelling, graminivorous sparrow among the objects of its tenderness.

W. MATTIEU WILLIAMS.

The Grange, Neasden, N.W.