LETTERS TO THE EDITOR.

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The Possibility of Reducing Mosquitoes.

IN his able review of James and Liston's interesting "Monograph of the Anopheles Mosquitoes of India," published in your issue of May 25, Dr. Stephens recapitulates the arguments of these authors in favour of their hypothesis that "the task of materially reducing the number of Anopheles in any place will undoubtedly be one of great magnitude." As the subject is one of the greatest sanitary importance, it may perhaps be advisable to add that the validity of these arguments is by no means accepted by all students of the subject. They are based for the most part on the results of some anti-mosquito work done at Mian Mir by Dr. Christophers and Captain James. Perhaps those of your readers who are not medical men may not be cognisant of the fact that an exhaustive and, I think, destructive criticism of this work has been published by Colonels Crombie and Giles, Captain Sewell, and myself—vide *British Medical Journal*, September 17, 1904, and *Journal of Tropical Medicine*, 1904. My own conclusions were that the operations cost too little to be effective, and that no exact method was employed for enumerating the numbers of mosquitoes present before and after their commencement. So far as I am aware, Dr. Christophers and Captain James have not replied to our criticisms, and I therefore feel justified in assuming that the case has gone against them by default. I should add that I hear on very good authority that the operations at Mian Mir are now being continued on a better basis.

The principal argument of our authors appears to be that the local reduction of mosquitoes will be wholly or largely impracticable because of immigration of the insects from outside. Thus they mention four methods by which Anopheles are dispersed, namely, by flight, by streams, by carriages, and by gradual spreading in all directions "by short stages," and think that the last method is "overlooked by those who have no intimate knowledge of mosquito habits, but who readily draw up schemes for their wholesale destruction." I fear that these very self-evident facts were well known and carefully considered long before the authors commenced their researches, and, moreover, that they do not by any means establish their case. It is quite obvious that a considerable number of mosquitoes must always find their way by diffusion into any area of operations; but this is not enough. What the sceptics have to prove is that the number of immigrants must be so large as nearly, or completely, to compensate for the local destruction. This is quite a different proposition, and one which will, I think, tax their ingenuity to maintain. If the local mosquito-density is to remain the same in spite of local destruction, it can only be by means of an abnormally large compensatory immigration setting in coincidentally with the commencement of the work of reduction. But what is there to determine such an extraordinary and suicidal influx? Mosquitoes do not, like a gas, exist under a pressure which compels them to fill up a vacuum, and we can scarcely suppose that they voluntarily move in the direction of their own destruction. But, even if they do rush in to fill the local vacuum, they must, in order to do so, forsake the outlying tracts of country (which will be correspondingly benefited by their absence), so that the total average reduction over the whole area influenced by the operations will be exactly the same whether migration takes place or not—an argument which appears to have been overlooked by the sceptics.

Owing to the fact that the to and fro movements of all random wandering must tend to annul each other—that is, that the vectorial sum of such movements must tend to zero—I think that migration is not likely seriously to counteract the effect of anti-propagation measures. I should like to refer those interested in this part of the subject to a paper by me, published in the *British Medical Journal* for May 13, in which I have endeavoured to

approach the subject analytically. My results agree with those of the late Mr. Ronald Hudson, who kindly commenced a similar analysis for me shortly before his lamented death, and also, I may add, with general experience, which shows that though a few mosquitoes may occasionally wander to considerable distances, the large bulk of them remain near their breeding pools. I venture to think that those who would prove the converse must do so, not by citing individual cases of long wandering, but by making a much more exact numerical determination of the amount of immigration than they have yet attempted, and by showing that it greatly exceeds the local birth-rate—a somewhat difficult task. That their observations are not always those of others may be seen from the following quotation from Dr. Malcolm Watson's report on the highly successful anti-malaria measures carried out in the Federated Malay States (*Journal of Tropical Medicine*, April 1, p. 104):—"A definite improvement in the health of Klang was evident when only the swamps nearest to the main groups of houses had been dealt with, and while other swamps within the town were still untouched. The mosquitoes from these did not appear to travel any distance, and there has been no evidence of dangerous immigration of Anophelines from the extensive breeding places which until the middle of 1904 existed just outside the town boundary, and some of which still remain."

So far as I can see, the case must be the same for mosquitoes as for most other organisms, including man. We should be very much surprised if anyone were to maintain that the population of the British Isles, for instance, would remain the same after abolition of the birth-rate. Why, then, should we assume such a proposition for mosquitoes? RONALD ROSS.

The Romance of the Nitrogen Atom.

THE letter of Dr. F. J. Allen (*NATURE*, May 4) on the critical temperature of living substances has interested me immensely. The ideas contained in it have often presented themselves to me in a crude way, and I hope Mr. Allen will find opportunity for elaborating them. I have often thought, when pondering over what one may venture to call the *versatility* of nitrogen, that a useful book might be written on the chemistry of the nitrogen compounds, including the mineral and organic compounds of that element in one view. If it did no other service it would help to save the mind of the chemical student from being enslaved by the phrase, "the chemistry of the carbon compounds." If the phrase "Ohne Phosphor kein Gedanke" is true, may we not with equal truth say "Ohne Stickstoff kein Leben"? The marvellous powers stored in the carbon atom are sufficiently *en evidence* in chemical science; yet may we not recognise the nitrogen atom as the magic "demon" (borrowing a figurative term from Clerk Maxwell) that holds the wand, that (under given conditions such as are noted by Dr. Allen) turns the atoms of oxygen and hydrogen hither and thither in the multiplex atomic relations of growth and metabolism in the living organism, and especially in that little understood complex we call chlorophyll? We know that the inert N_2 molecule of the atmosphere is made up of atoms which, in the nascent state, are possessed of great chemical energy, and we may fairly, I think, explain the inertness of ordinary atmospheric nitrogen by the stability of its molecule (N_2) as arising out of a difference in the ionic constitution of the two atoms which form the molecule. Is it not here that we may seek for the explanation of the otherwise puzzling fact that in the extremely stable compound NH_3 the nitrogen atom is trivalent, while in the oxides, halides, &c., it is pentavalent? The action of the nitrogen atom, in the way suggested by Dr. Allen, is illustrated by the well known necessity in the fertilisation of soils for the conversion of NH_3 into nitrates of alkaline bases, in order that the nitrogen in a *more unstable state of combination* may do its special work in the internal economy of the plant. I recollect discussing this matter some years ago with Dr. Voelcker, when I had the pleasure of meeting him at an agricultural gathering in this neighbourhood. The modern idea of ionisation of atoms seems also to throw light upon the fact that N_2

and H_2 combine to form NH_3 under the influence of the silent electric discharge, while at the temperature of the spark-discharge NH_3 is again split up into N_2 and H_2 . The running down also of HNO_3 through the whole series of oxides into ammonia in the Grove cell is full of interest from this point of view, and the subject, with its manifold ramifications, is a fascinating theme for a thesis.

Bishop's Stortford, May 30.

A. IRVING.

An Inverted Slab in a Cromlech.

THE remarkable articles on Stonehenge and other monuments by Sir Norman Lockyer have naturally stimulated reflection upon all that concerns megalithic remains, and therefore, perhaps, the following curious circumstances may be of some interest.

At Henblás, in Anglesey, is a cromlech, or rather, I suppose, a dolmen, of remarkably rude and massive aspect. Two uprights remain, the larger of which is about 15 feet high by 9 feet thick, and both are very rough and irregular in shape. Resting against these, at an angle of about 20° or rather less from the horizontal, is a thinner stone, about 3 feet thick and some 13 feet square, presumably a top-stone. All are of a hard quartzite, which occurs among the schistose rocks of the district. No good exposure of this is known within a mile or so of the cromlech (a fact which Captain Evans, of Henblás, informs me was pointed out to him long ago by Sir Andrew Ramsay). But at the base of the uprights are some obscure exposures that appear to me to be *in situ*, and I am inclined to think, therefore, that the materials were obtained on the spot.

Now the supposed top-stone is rough, like the uprights, on its upper surface, but its under-side is beautifully and finely ice-worn! It is clear, therefore (for it is certainly not a boulder), that it has been turned upside down.

Further, not only is it ice-worn, but the *direction* of the ice-movement can be made out, there being distinct lee-sides to its finely striated bosses, and these lee-sides look to N.N.E. But the natural direction of glaciation in the district is to S.S.W. Therefore, the stone has not only been turned upside down, but turned round as well.

If the materials were brought from some distance, these facts are, of course, of less interest. But if, as I think much more probable, they were obtained on the spot, it is clear that they throw a little light upon the proceedings of the builders in their work of lifting these great stones.

Achnashean, near Bangor.

EDWARD GREENLY.

The Cleavage of Slates.

I FIND that I owe Mr. Fisher some apology for a carelessly worded allusion in my notice of Dr. Becker's memoir (p. 20, May 4). In pointing out that the theory which I criticised had been anticipated by Mr. Fisher, I ought, perhaps, to have mentioned that the latter had somewhat qualified his original hypothesis, though the postscript notifying this qualification was, I believe, only privately printed.

Mr. Fisher's further contribution to the question (pp. 55, 56, May 18) is of interest. If it be granted that the cleavage of the Westmorland slates coincides with the plane of greatest distortion, it becomes less necessary to urge the case of the colour-spots in the Llanberis slates; but the suggestion that these have been formed subsequently to the cleavage seems to raise some difficulty. I have seen examples in which the ellipsoidal green spots are shifted by small faults, which are quite obsolete as planes of weakness. This seems to imply that the faults, and a *fortiori* the spots, are older than the cleavage-structure.

ALFRED HARKER.

St. John's College, Cambridge, June 7.

The Inheritance of Acquired Characters.

Is the following an instance of such inheritance? Lately I heard a missionary at a May meeting tell of the marvellous facility with which Chinese children memorise whole books of the Bible; the four Gospels, and sometimes the Acts also, being an easy feat for children of ten or twelve years. Having carefully sought information

from other authorities, I find these facts confirmed, and that the same applies to Mohammedan children. We are aware that for ages their ancestors have been compelled to memorise long portions of their sacred books, and although occasionally we meet with a child of any nation with a gigantic memory, that differs widely from the case of a people where it has become a general characteristic.

June 7.

W. WOODS SMYTH.

THE UTILITY OF AN ANTHROPOMETRIC SURVEY.¹

THE Government which has shown so scientific a spirit as to create a Council of Defence, a constant spirit of intelligence to safeguard the Empire amid the development of armaments of other nations, might surely devote attention to that recommendation which stands first in the report of the interdepartmental committee on physical deterioration:—"With a view to the collection of definite data bearing upon the physical condition of the population, the committee think that a permanent anthropometric survey should be organised as speedily as possible. . . ."

What are the results to be expected from such a survey as was sketched out at the Cambridge meeting of the British Association last summer? An improvement in the education of the people will surely follow.

At the time of the Elementary Education Act, 1870, the re-distribution of the populace, that progressive change by which the increasing majority become citizens and cease to be country folk, was not realised. The increasing demands of intellectual exercises upon the time of the children and loss of domestic education were not foreseen, or their effect in making the requirement most urgent that the physical side of education should be brought under educational authority or otherwise definitely provided for. Hence a generation passes and there is an outcry for physical education. Let us hope a coming generation may not be crying in turn that the moral side of education suffers from want of due attention.

The effect of registration—the national survey of deaths—has been a clear guide and a very great safeguard to the public health. One may quote some of the words of Dr. Farr which are to be found in his first letter to the first annual report:—"Diseases are more easily prevented than cured, and the first step to their prevention is the discovery of their exciting causes"; again, "indirect influence (of these reports) upon practical medicine must have been very great. The constant endeavour after exactness of diagnosis and precision of nomenclature is itself a wholesome discipline, which reacts inevitably upon treatment." Who at that time could prophesy the value, topographical and historical, we now find in these reports?

The anthropometric survey will have upon the sphere of education an equally large and discriminating, if often indirect, influence; it will react upon medicine as well as upon education; it will detect any deterioration of the young adult that is due to the factory and workshop; it will determine the influence of environment upon physique, and, as Mr. John Gray says, "without an anthropometric survey, we are in this important question of sound national physique 'like a log drifting nowhere'; with a survey, we should be like a ship, steering by chart and compass to its destination."

In the influence of body and mind upon one another, it is to anthropometry we must look for certainty of judgment. Mr. H. G. Beyer pointed out to the

¹ Physical Deterioration; being the Report of Papers and Discussions at the Cambridge Meeting of the British Association, 1904, on the Alleged Physical Deterioration of the People and the Utility of an Anthropometric Survey. (Occasional Papers of the Anthropological Institute, No. 2.)