continuity") and in independent sequences (the "test of agreement with other records") are often more important criteria of reality than is the height of the intensity itself. The former test, at least, should never be neglected; it has led me to relegate to my fourth class as merely "possible," several periods, such as those near 11, 17, and 24 years, indicated by high intensities in the whole sequence, but failing in either the first or the second half.

Ultimately, of my fifteen intensities between 5 and 40 years, I have treated only nine (at 5.100, 5.671, 5.960, 8.050, 9.750, 12.840, 15.225, 19.900, and 35.500 years respectively) as certainly or probably due to real periodicities, because they show in all cases perfect or fair continuity and in most an agreement with other records. The smallest of these fifteen intensities (21.72 at 7.417 years) in fact equals not 3a but 3.683a. If with this revised figure, the probabilities are calculated in the way suggested by Dr. Walker, the odds that at least nine of the fifteen intensities are not due to luck work out at more than 2000 to 1, while the odds in favour of seven at least are 14,000 to 1.

This remarkable result, which seems to establish beyond all reasonable doubt the reign of periodicities in wheat prices, is not affected by the fact that of the fifteen intensities only four are so high that any one of the four, if it occurred alone and had to be judged by height alone, would have odds of more than 20 to 1 in its favour. Each intensity does not occur alone. Every period, moreover, to which I attach importance rests on more evidence than mere height in my periodogram.

With reference to the last paragraph but one of Dr. Walker's note, on the relation of my synthetic curve and the rainfall, I should like to emphasise the point made in my paper (pp. 449-450) that the synthetic curve as now drawn represents only a first approximation of the roughest possible character; the correlation co-efficient of 0.38 between it and the rainfall from 1850 to 1921 is sufficient to demonstrate some connexion between the wheat price cycles and the rainfall, but is in no sense to be treated as a measure of the degree of connexion. In constructing the synthetic curve, for instance, the periodicities have all been treated as of equal importance; inspection shows that weighting according to the intensities would almost certainly give a better fit and so a higher co-efficient of correlation. In many other ways a more accurate determination of the cycles is required. How high a correlation might ultimately be obtained as the result of this, it is impossible now to say, but it might easily prove to be very high indeed. Unfortunately, I have no resources for carrying my own investigations further for the present; I can only hope that others may be better placed.

W. H. BEVERIDGE.

One Possible Cause for Atmospheric Electric Phenomena.—A Query.

MAY I ask Sir Arthur Schuster or Dr. Chree or some other authority whether there is any serious objection to an idea like the following:

The sun being radio-active emits not only gamma rays, which ionise the atmosphere, but also alpha and beta particles. The alpha particles will be stopped by the upper layers of atmosphere, charging them positively, while the beta particles will be more penetrating, and might even reach the ground, charging it negatively; though I admit that thirty inches of mercury is a serious obstruction. But, as Arrhenius showed, the beta particles would be

magnetically inveigled towards the poles, where they might descend with down currents: whereas the alpha particles—most numerous near the tropics—would be sustained by up currents; and thereafter the separated charges would reunite with familiar dielectric disruption.

OLIVER LODGE.

Normanton, Lake, Salisbury, Sept. 29.

School Instruction in Botany.

IN the article on "School Instruction in Botany" in *NATURE* of September 2, p. 329, the report on the botany gardens of the James Allen's Girls' School, recently published by the Board of Education, was reviewed. As I am not only the author of the report but also the initiator and organiser of the botany gardens at Dulwich, I shall be glad if space can be afforded me to reply to the following comment at the end of the article: "No mention is made in the Report of the utilisation of the botany gardens for the observation of animal life." The omission is due to the fact that the report was written in 1915 (see prefatory note) when some of the "gardens," which are now of great help in studying animal life, were in an undeveloped condition.

For example, in 1915 the oak trees in the new wood were only from three to four years old and looked somewhat like sticks, as shown in Plate 10. Since 1915 the trees have grown so much that black-birds, hedge sparrows, and a thrush have built nests, laid their eggs and in all cases but one reared their young in our wood. Advantage of this has been taken and many girls have visited the nests. During outdoor lessons, girls have learned to recognise birds which frequent the school garden, and have become familiar with their calls and songs.

In the spring term the awakening of the numerous frogs which hibernate in the school pond is eagerly awaited. For a short period the pond is densely populated by hundreds of croaking frogs. Later, the development of the tadpoles through all the stages is watched with the keenest interest by girls of all ages. Observation of animal life in the pond includes the study of the life-histories of china mark moths, dragon flies, newts, great water beetles, water boatmen, and water snails. On one occasion last term many girls watched the various stages in the emergence of a china mark moth from its chrysalis.

In these and in other ways the botany gardens at the James Allen's Girls' School are utilised for the observation of animal life.

LILIAN J. CLARKE.

James Allen's Girls' School,
East Dulwich Grove, S.E.22, September 28.

Transcription of Russian Names.

IN his further letter (*NATURE*, July 15, p. 78) Lord Gleichen refers to the Royal Geographical Society's System (II.) for the transcription of foreign alphabets into English. A copy of this system has just reached us and impresses us with its completeness and utility, especially for rendering place-names into English.

With regard to the transcription of Russian names we agree with Lord Gleichen that French, German, and hybrid transcriptions are unsatisfactory, but we would advocate, with Prof. Brauner, an international system, and for this purpose the Czech transcriptions have much to recommend them.

In the first place, the Serbian alphabet contains fewer letters than the Russian, and is thus inadequate to allow of accurate transcription from Russian by

the Serbo-Croatian rules. Czech transcription has the advantage of being complete.

The following examples may serve to make this clear. Russian *a* has only one sound, as in "master." It has the same sound in Czech, but the English *a* has several sounds. If *ж* is rendered by *j* it is liable to mispronunciation; if transcribed to the Czech *ž* this liability does not arise. Russian *y* is always pronounced like the Czech *u* (like *oo* in the English word "hook"). Russian *x* can be correctly rendered by the Czech *ch*.

"Hard mute" and "soft mute" (ѣ and ъ) can only be transcribed into Czech, using the hook ' after the consonant. Russian *ы* has no other European sound except the Czech *y*. The different pronunciation of the Russian *e*, ѐ, э cannot be easily expressed in English, but this becomes easy by using the Czech *ě* for the first two, especially the second.

It may be pointed out that the Czech transcription is already employed in the International Catalogue of Scientific Literature, and for some years German journals (e.g. *Zeitschr. f. anorg. Chem.*) have employed letters with diacritical marks in their transcription of Russian names (e.g. "Žemczuznyj," which in Czech is "Žemčuzný").

The objection, urged by Lord Gleichen, to the use of diacritical marks exists, but is relatively small. Most scientific journals already have such type, which is indeed necessary if Czech names are to be printed correctly. Newspapers naturally lag behind such a journal as *NATURE* in matters of this kind, but in time these too will doubtless find it necessary to have letters with diacritical marks in their founts.

Lord Gleichen also asks how many English people can correctly pronounce Czech letters like *č*. It is regrettable, but nevertheless true, that the correct pronunciation of foreign words is not a great characteristic of the British people, but it is as easy to learn how to pronounce Czech words as it is those of other languages. The example which was chosen by Lord Gleichen is poor, because the sound "č" exactly corresponds to the English sound "ch" (e.g. "church").

J. G. F. DRUCE.

Bled, Carniola, Jougo-Slavia.

A. GLAZUNOV

(formerly docent at
Petrograd Polytechnic).

Prague, Král. Vinohrady, Wenzigova 21,
Czecho-Slovakia,
August 5.

Colour Vision and Syntony.

IN *NATURE* of September 9, p. 357, Prof. E. H. Barton has shown how a syntonic hypothesis of colour vision may be made to represent the trichromatic theory of colour vision. There are numerous facts which are quite inconsistent with any form of the trichromatic theory. These are given in detail in my recent book on the "Physiology of Vision" and subsequent papers, and no attempt has been made to answer any one of them. Every fact points to the visual purple being the visual substance which, sensitising the liquid surrounding the cones, sets up a visual impulse in the cones when decomposed by light. Houstoun's explanation of the physical processes is in complete accordance with the facts, and so far as I am aware no valid objection to it has been found.

Any theory of vision must explain the movement of the positive after-image in the retina. For example,

if the positive after-image of a small white triangle on black velvet be obtained with one eye, on moving the head with a jerk, both eyes being covered, an irregular white figure will be seen some little distance away from the clearly cut black triangle, the negative after-image in the original position which is seen when a small amount of light is allowed to enter the eye through the lids. Another very simple method of seeing this movement of the positive after-image is to look at three windows on awaking, which are separated by walls; on closing and covering the eyes, well defined positive after-images of the windows separated by black spaces corresponding to the walls are seen. On covering the eyes and moving the head from side to side the after-images all blend into one, the black spaces being obliterated.

Let us compare the model given by Prof. Barton with the known facts of vision. For any particular light the three vibrators acting together should give the luminosity curve for that light. Barton has placed the red vibrator at about $\lambda 760 \mu\mu$; here the red has very little luminosity, whereas a driver of the length of the vibrator at this point will produce most effect. Again, drivers corresponding to the infra-red or ultra-violet will affect the red or violet vibrators respectively, whereas these regions are invisible.

When we come to colour blindness the trichromatic theory fails completely. How on this theory can the fact that more than fifty per cent. of dangerously colour blind people can pass the wool test be explained? The fact that a dichromic may have a luminosity curve similar to the normal, that the trichromic have only three colour sensations and designate the yellow region as red-green, and the other degrees of colour and light perception, has to be explained.

F. W. EDRIIDGE-GREEN.

London, September 19.

The Green Ray at Sunset and Sunrise.

THE review by Sir Arthur Schuster of Mulder's book on the green ray or green flash at rising and setting of the sun, in *NATURE* of September 16, p. 370, leads me to make the following remarks:

There are, in reality, two distinct phenomena which go under the name of the green flash. The first, probably the one most usually seen and the only one to which the epithet properly applies, is certainly an after-image in an eye fatigued by the red light of the sun. I have seen it many times, only at sunset, and in many localities—on the Red Sea (twice in one evening owing to the sun being occluded by a narrow bank of cloud prior to its actual setting), in Devonshire, and even in London as the sun set behind University College Hospital.

This phenomenon can be reproduced quite easily in the laboratory by means of an artificial red sun, as I demonstrated a few years ago at a meeting of the Physical Society of London.

The second phenomenon, which I have never been successful in seeing and of which I can say little, is evidently due to atmospheric dispersion; and, from the published accounts, I should judge that it should be called the blue sun or multicoloured sun or spectrum flash. It would seem to be much more rare, as I gather from Sir Arthur Schuster's previously made descriptions that it requires rather special conditions.

If this subject should get into elementary textbooks, as recommended, at least let the account of it be complete.

ALFRED W. PORTER.

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London.