

It might be supposed that the estimations would agree better when the angles of position are the same for both arcs compared together, than when they are different. But this supposition is not borne out by my observations; for after correcting them by the above formula, the average deviation from the truth in the case of the careful comparisons is 4.4 per cent. when the angle of position of both arcs on the retina is the same, or within 10° of the same; and 4.1 per cent. when it differs more than 10° ; while in the case of the instantaneous comparisons these numbers are 7.9 and 6.3 respectively.

When the *lower* arc is horizontal, or nearly so, it is (on the average) estimated as being shorter than when in a vertical position, but the difference is so slight that it is doubtful whether it would not disappear with a larger number of observations. The best correction formula I have obtained for this is to apply the factor

$$(1.04 - .048 \cos d)$$

to the result already obtained: d being the deviation of the lower arc from the horizontal. But the application of this factor only reduces the sum of the squares of the differences between calculation and observation in the case of the careful comparisons from 1163 to 1111.

The angle of position of the *upper* arc seems to make no difference in the results.

T. W. BACKHOUSE.

West Hendon House, Sunderland, October 24.

Proper Motions of the Stars.

MISS CLERKE, in her very interesting article (*NATURE*, vol. xlv. p. 572) on the motion of the sun in space, seems to think that we have only the two alternatives of supposing that the brightness of a star is independent of its distance, or that the motions of the stars increase with their distance. I suspect that, when the proper motions of all stars down to the 9th magnitude have been tabulated, the necessity of adopting either alternative will disappear. My object in writing this letter, however, is to call the attention of spectroscopists to the question thus raised. The spectroscope, when used in connection with a powerful telescope, ought to be able to show whether the fainter stars as a rule move more rapidly in the line of sight than the brighter ones; for if the average motion in the line of sight is the same in both cases, astronomers will be slow to accept an explanation of phenomena which supposes a different average velocity on the whole. But even instruments incapable of deciding this question may throw light on the subject. It now appears certain that if a Sirian and a solar star of the same mass were placed at the same distance from us, the Sirian star would appear more than one magnitude brighter. Hence, before we can use magnitudes as in any sense a test of distance, we must ascertain the relative proportion of Sirian and solar stars in the groups which we are comparing. It would also be very desirable that the magnitudes of the stars employed by Profs. Eastman, Boss, and Stumpe, should be photometrically determined. The photometer has at all events the advantage over the eye that its results are in all cases (allowing for errors of observation) comparable.

W. H. S. MOCK.

Dublin, October 17.

California Foxes.

IN *NATURE* of September 10 (p. 452), there is a paragraph in praise of the intelligence of the (English) fox, with examples in proof. Permit me to say that his California cousin is next door to a fool. My young son has amused himself for the past three summers in trapping (in large box-traps) the small California foxes which infest these mountains, and which live on a mixed diet of Manzanita berries and astronomer's chickens. I pass over the fact that each trap has painted over its door "Danger to all who enter here!", and I proceed to show that our California foxes are barely one remove from idiots. When they are caught, my boy is in the habit of fastening a small leather collar about their necks, and of chaining them with light chains to stakes near the Observatory buildings. Many of them have escaped by parting the chains (by dint of strength, not of intelligence), and have been again caught within two or three days in the same traps! One of them was caught three times in quick succession! I presume an English fox, once caught, would emigrate to North Britain, or at least to the next county. My own ideas of the intelligence of the fox, until I came here, were derived from Goldsmith's "Animated Nature," and, generally, from English writings.

I have now become satisfied that the California fox is *arriéré*. Either the struggle for existence is not sharp here, or he has made up his mind that existence is not worth struggling for.

Lick Observatory, October 8.

EDWARD S. HOLDEN.

A Plague of Small Frogs.

MY wine-cellar has been visited during the recent rains with a curious plague of small frogs (*Rana temporaria*) all the same size, about one inch long. There would be nothing surprising in this visitation were it not for the apparent absence of any means of communication from outside, the level of which is six feet above that of the cellar; there is no drain near that part of the house. There is a step up before you go down into the wine-cellar from the adjacent cellar, against which the door closes, leaving no crack any animal so large could squeeze through. The cellar has solid stone walls and a bricked floor. During the recent floods the water stood some three or four inches deep there, apparently oozing through a tiny hole level with the floor on the outside wall, into which the point of a pencil could only penetrate for an inch. Even had it been possible for these little creatures to come in that way they must have burrowed down six feet from the outside level. Only one or two were found in the cellar adjacent, which is lighted by a grating into the garden, whereas in the wine-cellar two or three dozen were caught, many of them drowned by the flood.

Is it not unusual for bats to fly in the day-time? Here one has been doing so for two afternoons, coming out about 2.30, and flying backwards and forwards after insects in most brilliant sunshine. The gardener tells me he has never observed them do so before; and having sometimes caught them in the day-time, always noticed that when thrown into the air they would drop at once, and run instead of flying.

R. HAIG THOMAS.

BOTANY OF THE EMIN RELIEF EXPEDITION.

THE botanical exploration of Tropical Africa leaves so much to desire that it was somewhat disappointing to find that Mr. Stanley brought nothing back which would give any idea of the nature of the dense forests which he traversed. The conditions under which such an expedition is necessarily executed make natural-history-collecting extremely difficult. Travellers, however, often suppose that because they cannot make extensive collections they can do nothing to add to our knowledge. Yet to fill a small portfolio with well-selected and significant specimens is not a very difficult matter. And these may often furnish the basis of useful and important conclusions as to the general nature of the flora. Sir Joseph Hooker was able to give the first account of the vegetation of Kilimanjaro from a small parcel of plants collected by a missionary, the Rev. Mr. New, who was supplied for the purpose by Sir John Kirk, with "a bundle of old *Guardians*." An officer of the Ashanti Expedition brought from Comassi the fruit of what proved to be a new species of *Duboscia*. And quite lately Lord Lamington sent to Kew a small parcel of plants collected by himself in an expedition through the Shan States, which contained good specimens of an interesting plant only known previously from imperfect material collected by Griffith. It has now been worked out and figured in the Kew "*Icones Plantarum*."

Nor is it so difficult as it might be supposed to do even more than this. And I am not sure that a little careful and intelligent plant-collecting would not be a healthy and useful distraction to the tedium and strain of an arduous journey. Nothing could probably exceed the difficulties under which Joseph Thomson travelled in Masailand; yet he managed, notwithstanding, to get together a tolerably extensive and most valuable botanical collection. Upon this Sir Joseph Hooker was able to base the first attempt at a rational theory of the geographical relations of the high-level flora of Eastern