index itself, with a list of abbreviations, consisting of twenty pages closely filled in with places in three columns. The colouring of the maps is excellent, and it is obvious that no attempt has been spared to make the book as complete as possible in every way. A. L.

The Young Collector's Hand-book of Ants, Bees, Dragon-Flies, Earwigs, Crickets, and Flies. By W. Harcourt Bath. (London: Swan Sonnenschein, 1888.)

ANY boy who may wish to form a collection of insects will find in this little hand-book all the information he will be likely to need at first for his guidance. The author does not pretend to go deeply into the subject, but he has brought together a sufficient number of facts to show beginners that the study of entomology will well reward any labour that may be devoted to it. His explanations are simple and clear, and the value of the manual is much increased by a large number of good illustrations.

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. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.*

An Earthquake in England.

AS no account has been given in NATURE of a recent earthquake, perhaps room may be found for the following. I was standing near my garden door at 8.20 a.m. on Sunday, November 20, when the quiet was suddenly broken by a heavy smothered crash, followed by reverberations as in a clap of thunder of rather short duration. I felt no shaking of the ground, but many persons here felt it, and the shaking is stated to have been very marked near Dagnall, between here and Hemel Hempstead. The sound was like the falling in of an immense mass of rock—followed by echoes—in a cavern.

Some persons say they heard a second, but much less loud, crash later in the morning, but this was not heard by me.

At Ampthill, near Bedford, persons left the town to meet the first train from London to inquire of the passengers as to a possible explosion having occurred in London.

The crash was heard in Bucks, Beds, Herts, Suffolk, Essex, Cambridge, and possibly in other counties. I have seen reports from Newmarket, Hitchin, Cambridge, Wimpole, Heydon, Royston, and Saffron Walden, in addition to accounts from many positions close to this place.

It is curious that Stow records, under A.D. 1250, the thirty-fourth year of the reign of Henry III.:—"Upon St. Lucie's Day, there was a great earthquake in this town (St. Albans) and the parts thereabouts, with a noise underground as tho' it thundered, which was the more strange for that the ground is chalky and sound, nor hollow or loose as those are where earthquakes often happen; and this noise did so fright the daws, rooks, and other birds which sat upon houses or trees, that they flew to and fro, as if they had been frighted by a gosshawk." WORTHINGTON G. SMITH.

Dunstable.

On the Constant P in Observations of Terrestrial Magnetism.

THE formula for P given by Mr. Rücker (NATURE, vol. xxxvi. p. 508) has evidently been obtained by expanding the usual expression rigorously to terms of the second order; but as the usual expression differs from Gauss's theory by terms of the second order, Mr. Rücker's expansion is necessarily inexact to the same extent, and in fact his second order term has no existence in Gauss's theory.

Going only to terms involving r^{-5}, Gauss's equations may be written—

$$f(u) = Lr^{-3} + L^1r^{-5} \quad . \; . \; . \; . \; . \; . \quad (1)$$

$$f(u_1) = Lr_1^{-3} + L^1r_1^{-5} \quad . \; . \; . \; . \; . \; . \quad (2)$$

$$\frac{m}{H} = \tfrac{1}{2}L\left(1 + \frac{S}{F}\right) \quad . \; . \; . \; . \; . \; . \quad (3)$$

where $f(u)$ signifies either sin u or tan u according to the form of instrument employed.

By putting

$$A = \tfrac{1}{2}r^3f(u) \quad . \; . \; . \; . \; . \; . \; . \; . \quad (4)$$

$$A_1 = \tfrac{1}{2}r_1^3f(u_1). \quad . \; . \; . \; . \; . \; . \; . \; . \quad (5)$$

$$B = \frac{r_1^2r^2}{r_1^2 - r^2} \quad . \; . \; . \; . \; . \; . \; . \; . \quad (6)$$

we find from (1) and (2) respectively

$$\tfrac{1}{2}L = A\left\{1 - B\left(\frac{A - A_1}{A}\right)r^{-2}\right\} = A\,(1 - Pr^{-2}). \quad (7)$$

$$\tfrac{1}{2}L = A_1\left\{1 - B\left(\frac{A - A_1}{A_1}\right)r_1^{-2}\right\} = A_1(1 - P_1r_1^{-2}) \quad (8)$$

Whence, by inspection,

$$P = B\left(\frac{A - A_1}{A}\right) \quad . \; . \; . \; . \; . \; . \; . \; . \; . \; . \quad (9)$$

$$P_1 = B\left(\frac{A - A_1}{A_1}\right). \quad . \; . \; . \; . \; . \; . \; . \; . \; . \; . \quad (10)$$

To find $\tfrac{1}{2}$L we may use either (4) and (9), or (5) and (10); and in either case the result will be as accurate as our fundamental expressions.

Expanding (10) to terms of the second order,

$$P_1 = B\left(\frac{A - A_1}{A}\right) + B\left(\frac{A - A_1}{A}\right)^2 \; . \; . \; . \quad (11)$$

and therefore the mean of (9) and (10) is

$$P_0 = B\left\{\left(\frac{A - A_1}{A}\right) + \frac{1}{2}\left(\frac{A - A_1}{A}\right)^2\right\} \quad . \quad (12)$$

whence, by putting

$$C = \log A - \log A_1$$

and remembering that

$$\frac{A - A_1}{A} = \frac{C}{M} - \frac{C^2}{2!\,M^2} + \frac{C^3}{3!\,M^3}, \text{ \&c.} \; . \; . \; . \quad (13)$$

in which M is the modulus of the common system of logarithms, we have to terms of the second order—

$$P_0 = \frac{r_1^2r^2}{r_1^2 - r^2}\left\{\frac{\log A - \log A_1}{M}\right\} \; . \; . \; . \; . \quad (14)$$

Equation (9) is what I gave in my letter on p. 366 of the last volume of NATURE, where I was careful to say that it was derived from Gauss's original equations. When properly used it is as accurate as equations (1) and (2). Equation (14) was given by Mr. Ellis in his letter on p. 436. It is slightly easier to compute than (9), and differs from that expression by a term of the second order which is less than the accidental error of observation. The second order term added by Mr. Rücker renders his expression less accurate than either (9) or (14), if Gauss's theory is accepted as correct. WM. HARKNESS.

Washington, D.C., November 4.

I THINK that on reconsideration Prof. Harkness will admit that it is not I who have fallen into error. If only two observations are made, equations (7) and (8) are identical, and there is no need for the introduction of P_0. In like manner if numerous measurements were available in which the error of observation was *nil*, any pair would give the same value of L, and P_0 would again be unnecessary. If, however, the equations are affected by errors of observation, and it be agreed that in combining them we may replace the P's by a single quantity, P_0, it must not be arbitrarily defined. Prof. Harkness assumes that in the case of two observations it must be the mean of P and P_1, but he gives no reasons, and he does not state what value he would adopt if