larly employed on such work. We are accustomed to quote with pride the old saying, that wherever wood would float an English pendant was to be seen, and it is true at the present time, that every sea, well known or slightly known, is visited more or less frequently by our men-of-war. But unfortunately many of these places are roughly surveyed, the coast lines inaccurately laid down, and the positions of the principal dangers doubtful. Here much valuable work can be done by those not surveyors, who have time and are willing to take the opportunities often given them, to improve our knowledge by making a correct survey or verifying the charts of the coasts they may visit. To these Mr. Laughton's book will be exceedingly valuable, and though in his introductory chapter the author modestly says that he writes "not for the guidance of surveyors, but for those who know little or nothing at all about it," we are sure that many old surveyors will find their work easier from having the principles so clearly brought before them. The work is the more valuable in showing what can be done with the means at hand on board every vessel, though not especially equipped for the work. The second chapter describes the choice and measurement of the base line, and the methods for determining the exact latitude and longitude of the first position. The rules given are exceedingly clear and simple, and can be readily followed by anyone in the habit of using the sextant and artificial horizon. The hints on the choice and adjustment of the sextant will be found very useful to every navigator. Mr. Laughton's practical way of dealing with the subject is shown in his suggestion to get an old sextant and let it fall on the deck in order to acquire a thorough acquaintance with its mechanism in putting it to rights again. But it is a pity that the description of the instruments should be placed between the rules for the choice and measurement of the base line, indeed it would be better if this chapter were re-arranged. A great deal more might be said on the selection of objects for triangulation, this is a point on which the beginner encounters his greatest difficulty; some hints also as to the best way of noting angles would be useful, this want is supplied when levelling is treated of. Chapter III. is devoted to the construction of charts and various projections of the sphere, it is very clear and concise, and will prove valuable not only to the chart-maker, but also to the navigator, who will here gain a clearer knowledge of the plan on which the chart he uses is laid down, than is to be found in most books on navigation. We recommend, especially to young surveyors, the method advocated for graduation of charts according to the gnomonic projection, it is more comprehensive and certainly more mathematically correct than the methods usually employed, and we do not remember to have met it described in any other work. The part of Chapter IV. relating to the determination of positions is perplexing, and would with difficulty be understood by an inexperienced surveyor, without examples. The author might have well supplemented this part by showing graphically the way of protracting the angles, and finding the points of intersection. It is not clear why he has omitted from the description of instruments all mention of the protractor, an instrument as essential to the surveyor and navigator as his pair of compasses. The remarks in the last few pages on the "danger angle," or as it was called by old surveyors the "approximative angle," will be found very useful by all navigators, especially those who since the introduction of iron ships have experienced the difficulty and uncertainty of determining positions quickly by the compass when the course is changing rapidly. The running survey is ably treated, but we regret there is no illustration of the mode of surveying a harbour; this is a serious omission, but notwithstanding this, and the want of illustration of the choice of stations and selection of objects, we can recommend the book as the best out on the subject.

The Lepidopterist's Guide, intended for the Use of the Young Collector. By H. Guard Knaggs, M.D., F.L.S. Second Edition, illustrated. (London: Van Voorst.)

THE want of such a "Guide" as the present was long felt by "young collectors" before the appearance of this book; but now this want is so well supplied that a second edition has not only been issued, but nearly exhausted, and we call attention to it with confidence, because, although eminently popular in its style and treatment, it is the work of a practical hand, and is as reliable as it is full and complete. In these days of cheap books it is marvellously cheap, and we are led to wonder how a scientific manual of upwards of 120 pages, closely printed, and copiously illustrated, can be produced for one shilling. Everything that the young collector is likely to require information upon will be found by a little searching, which a copious index would greatly facilitate, and which we hope to see appended to a future edition. We have no doubt this Guide will continue to receive the support it so well deserves.

C.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. No notice is taken of anonymous communications.]

The Variation in Outline of American "Flint" Arrow-heads

I FIND, after a careful perusal of the sixteenth chapter of Mr. Evans's magnificent work on British Stone Implements—on javelin and arrow-heads—that he has considered the American forms far more uniform, less varied in outline than they really are. I am familiar with many collections made at distant parts of the Union, and have an immense assortment of my own collecting now in the Museum of the Peabody Academy, at Salem, Mass. In these several collections is every form that Mr. Evans has figured, and several that he has not mentioned.

On page 362 of Mr. Evans's work, I find the author asserting as a prevailing type, "that with a notch at the base on either side." While this form unquestionably is very common, it cannot be considered as the "prevailing" one, inasmuch as several distinct patterns equal it in numbers found, and some exceed it, as those that "have merely a central tang, with little or no attempt at barbs." A second statement of Mr. Evans strikes me as very remarkable. He says, "the leaf-shaped form is very rare." This is a very great error. In any locality where arrow-points are to be found at all, they are always to be met with; and I have gathered scores of them that for symmetry far excel any of the figures given by Mr. Evans.

Nor can I admit the correctness of Mr. Evans's assertion concerning arrow-points, that "for the most part the chipping is but rough, as the material, which is usually chert, hornstone, or even quartz, does not readily lend itself to fine work." I believe no arrow-points have ever been discovered that can exceed, in beauty of finish, those I have myself gathered from the fields and meadows of central New Jersey. And I am the more surprised at Mr. Evans's remarks, inasmuch as the specimens I have found, that have been wrought from white or rose quartz, are remarkable for the smooth surfaces and sharp edges they present. So, too, of our jasper and hornstone specimens. Remarkably diversified in form, uniformly well finished, they strike the beholder with astonishment, when the "intractability" of the material is recognised. I have seen but few specimens of arrow-points not found in the United States; but judging from them and the illustrations of Mr. Evans's work, I unhesitatingly assert, that although we have no convenient flint in New Jersey or near it—Prof. T. A. Conrad has discovered true flint and chalk in Colorado—we have, in the jasper, chert, hornstone, quartz, and slate arrow-heads, examples of such weapons, as are in no wise inferior to those of Europe in beauty of finish, or less diversified in the various so called "types."

Mr. Evans seems to have based most of his impressions concerning our antiquities upon Schoolcroft's ponderous tomes, which present little or nothing of value, of our "antiquities," whatever may be their reliability as concerning the "Indians," at the time when the volumes were compiled.

In conclusion, I will give a list of the arrow-points gathered on Wednesday, July 31, during the course of a three hours' search, and over fields that have yielded hundreds during the past and present summers.

Nos. 1—5, genuine leaf-shaped arrow-heads; four of black jasper or hornstone; all symmetrical, perfect. The largest specimen measures five-eighths of an inch in width at widest part, which is near the base, which is a beautifully wrought half-circle. The length is one inch and eleven-sixteenths. The other four specimens are somewhat smaller; one a little broader; and none can be considered as rough or badly-made examples.

Nos. 6—8 are what may be called triangular arrow-points, but are different from the ordinary examples of that pattern, in that they have very concave sides and base, and a rounded rather than pointed tip. Nothing in any way similar is figured by Mr. Evans, nor was I acquainted with this pattern when I wrote of our arrow-heads in the April No. of the *American Naturalist*. These arrow-points vary little in length and width; being about an inch and a quarter to an inch in length, by about one in width. The main portion of the specimen and the projecting barbs are nearly the same length, and have all the same degree of finish. One specimen is of brown jasper, one of hornstone, and the third, we suppose, is what Mr. Evans means by "chert."

Nos. 9—14 are triangular arrow-points, with straight or very slightly convex sides, and well-marked concave bases. None measure over an inch in length, by three quarters of an inch in width. One specimen is of "chert," three of hornstone, one of green, and one of chocolate jasper. The finish of all is good, and of two in particular very fine. The chocolate-coloured jasper example has a row of uniformly shaped notches or serrations, throughout the greater part of one side.

Nos. 15 and 16 are triangular arrows, both of which have straight bases, and one with straight sides, the other with very convex sides. Both are well finished, and the smaller quartz specimen with the convex sides is as smooth, well-edged and pointed, as though it had been "rubbed" down.

No. 17 is a yellowish "flint-like" stone, chipped into an arrow-point of the triangular pattern, but with a notch in the base, and also at each side. This form I have figured in the *American Naturalist*. It is but sparingly met with, and is there called a stemmed arrow-head, or one with a projecting base, which I think now is scarcely correct; the notches at the sides and base give it a "stemmed" appearance only.

Nos. 18—20 are three fine specimens, having projecting stems, which are narrower than the body of the specimens, and are not notched, but taper to a blunt point. Mr. Evans's figures 300 and 301 and the base of 302 well represent the specimens now lying before me.

Nos. 21—25 are stemmed arrow-points, with notches, that is, the "base" projects beyond the base of the body of the specimen, which gives "barbs" to the weapon—a style not given by Mr. Evans; or the base or "tang" is narrower than the body of the specimen, and flaring at its termination, produces the notches, by which the shaft was attached. A poor example of this pattern is Mr. Evans's figure 303. One of these "tanged" arrow-points has a projecting "tip," like that figured by Mr. Evans, as a peculiar feature of his leaf-shaped arrow-head, figure 283.

Nos. 26—33 are plain "tanged" arrow-heads, very similar to Mr. Evans's figure 304, which he refers to as "a magnificent specimen." The only marked difference in the little series before me and the illustration mentioned is that the tangs are all broader and a little shorter. The specimens themselves are not much smaller. They are of slate, jasper, hornstone, and "chert."

No. 34 is a lozenge-shaped arrow-head, very similar to Mr. Evans's figure 277, but is somewhat smaller. It varies from everything I have found as yet, and is a reproduction of those lozenge-shaped specimens, only of handsomer outline, that Mr. Evans has found on the Yorkshire wolds. The finding of this specimen lessens the number of forms found in Europe, that have not occurred here.

Besides these thirty-four specimens, which are all perfect, I gathered innumerable "chips" and broken specimens, some of them being of patterns not enumerated in my list. I have here briefly referred to nine distinct patterns, numbers of which, save two, were found during one day's hunting; and the result in numbers and varieties was nothing more than "a good average." I cannot therefore admit any one form to be a "prevailing" type, and the idea of inferior finish and of general

elegance of appearance, is, we respectfully assert, a very great mistake.

CHAS. C. ABBOTT

Trenton, New Jersey, Aug. 5

Millions of Millions

THE fact that I have myself slipped into an error by writing eleven noughts instead of ten in setting out a number expressed by a row of sixteen integers, only serves to confirm my former remark that millions of millions are awkward numbers to deal with, and that it will be well to avoid them by making use of the very simple rule-of-three sum indicated at the end of my list of errata to Professor Mayer's paper.

A COWPER RANYARD

Fertilisation by Moths

It has recently been suggested to me that the following note on the readiness with which moths wander, and their efficiency in fertilising orchids, is worth publication; I therefore forward it to you.

In the summer of 1869 I caught here on an island of less than six acres, in the middle of Derwentwater, twenty specimens of the common 'shark' moth (*Cucullia umbratica*); of these, seven had the pollinia of the butterfly orchis (*Habenaria chlorantha*) sticking to their eyes. I know for certain that there were no plants of *H. chlorantha* growing on the island, and all the moths must have come from places separated from the island by half a mile of water.

W. C. MARSHALL

Derwent Island, Sep. 9

Origin of Insects

MR. J. J. MURPHY, in writing "that it is true that the water-beetles are wingless" (*NATURE*, No. 140, p. 373), has surely made a *lapsus calami*, since many water-beetles are not only winged but use their wings. Other orders furnish examples of an aquatic winged insect fauna. The hemipterous genera *Notonecta*, *Corixa*, &c., are well-winged, and use their wings (especially *Notonecta*). *Corixa* affords an example of the elytra (*i.e.* the front wings) assisting in respiration, but probably not in the way that Mr. Murphy means. At the base of the anterior margin of the elytron there is a channel which retains a supply of air. Of course everybody knows the use of the elytra in *Dytiscus* to catch and retain air.

The Lepidopterous genus *Acentropus* affords another instance. The perfect winged insects frequently descend into the water. The females are sometimes winged and sometimes apterous, and the winged male has been seen entering the water in pursuit of—it is supposed—the apterous virgin female.

I think that it is possible that these apterous females exhibit the same kind of "parthenogenesis" as occurs in the *Psychidae*. It would be well if those observers who have an opportunity would try to ascertain if parthenogenesis ever occurs in *Acentropus*.

F. BUCHANAN WHITE

Solar Spots

BY an observation of the sun this morning at 11h. 25m., I find that several parts of his surface are in a disturbed condition, and that several largish spots (*macule*), surrounded with penumbrae, are visible. In the north-west quadrant of the disc, near the west limb, there was a group seen, in which two rather conspicuous spots were situated, and below these, in the southern hemisphere, there were three others of somewhat considerable dimensions. In the same hemisphere there was an irregular train of spots of various forms and sizes, extending almost to the margin of the south-eastern part of the disc. In the north-east quadrant I could discern no spots at all. Light clouds were continually passing over the sun during the time of observation. I used a 4-inch metallic-mirror reflector, with the aperture contracted to three inches.

WILLIAM F. DENNING

Bristol, Sept. 8

Correlation of Colour and Music

A VERY brilliant rainbow, which occurred on the evening of September 6th, recalled to my mind the note on the correlation of colour and music by Mr. W. F. Barrett, which appeared in