matters they would assuredly derive greater pleasure and profit from their pursuit, and do much more towards the progress of science. Mr. Young himself, however, notwithstanding the good advice he gives, is not always careful in drawing conclusions, geological evidence being sometimes quite overlooked. Thus, we find him stating that the coal-measures (meaning, of course, the whole series of strata above the Millstone Grit) are "evidently of land and fresh-water origin," because they have yielded no marine organisms, save in one thin local bed near the top of the series. The occurrence of this stratum with its marine remains, indicates, as he believes, the return for a short time of the sea, which had for a very long period "been completely shut out by barriers." Mr. Young is welcome to his belief. If every bed or series of beds in which no marine organisms occur must necessarily be of fresh-water origin, the lakes of old must have been something worth seeing. There are several points suggested by the catalogue that we should like to have taken up, but our space is exhausted, and we can only conclude by strongly recommending Mr. Armstrong's work to the notice of our geological readers. J. G.

LETTERS TO THE EDITOR

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

On the Solution of a Certain Geometrical Problem

A WRITER in the number of NATURE for September 21, Mr. R. A. Proctor, in the course of a letter on the state of geometrical knowledge in the university, alludes manifestly to the solution of a problem which I have adopted in my edition of Euclid. The matter is of small importance in itself, but nevertheless as some points of interest are incidentally involved, I request you to allow me the opportunity of offering a few remarks.

The problem is this: to describe a circle which shall pass through a given point and touch two given straight lines. Your correspondent considers that in giving a solution which depends on the sixth book of Euclid, instead of one which depends only on the third book, I exhibit signal geometrical weakness.

The problem, I need scarcely say, is very old; indeed, so old that a writer who had been long engaged in teaching could not pretend to solve it afresh, for he would certainly have in his memory one or more solutions which had become quite familiar to him. The solution by the aid of the third book is well known, for it occurs in several of the collections of geometrical exercises. The solution which I have adopted is also old, but seems not so well known. It is, I think, conspicuous for simplicity, elegance, and completeness. The demonstration is of the best and most impressive kind, requiring no laborious effort to understand and retain it, but being almost self-evident from the diagram. Even if the problem be treated as an isolated exercise, the solution which I have preferred will sustain a favourable comparison with that which more commonly occurs.

But the determining cause of my choice was the position which the solution occupies as one of a connected series. I have just before treated a similar problem by the third-book method, so that if the same method had been used for the present problem, there would have been only repetition without any substantial increase of knowledge; whereas by the course adopted the student is introduced to fresh and valuable matter. The principle of similarity and the notion of a centre of similitude are most instructively involved, and the student is prepared for a subsequent investigation, which is similar but more complex. To sum up, the third-book method would have constituted no advance in the subject, where the sixth-book method takes a step important in itself and in its consequences; and therefore, following the example of an eminent geometer, I adopted the latter method. I may perhaps venture on the strength of my own experience as to the utility of the solution, to recommend it to the attention of other teachers.

It is very important to bear in mind the distinction between what I may call absolute and relative merit which I have just exemplified. The solution of a single problem furnished by a candidate under examination, or by a contributor to a mathematical periodical, is very different from the investigation of one out of a chain of propositions in a mathematical treatise. In the former case there are no antecedent or subsequent conditions to regard; in the latter case we have to consider what agrees best with the whole scope of the work, with what is to follow as well as with what has gone before. A writer, after arranging a paragraph or a chapter in what seems the best manner, may find himself constrained at a subsequent stage to make changes which would have been unnecessary, perhaps even undesirable, if the earlier portion had stood alone. Then, if a reader opens the book at random and criticises a passage without any regard to the author's sense, the criticism may very naturally be quite inappropriate.

There is, however, a very important consideration of another kind which has been frequently disregarded, but which is pressed upon our notice by the interest at present felt in geometrical studies. Let us determine the reason which leads us in some, or in many, cases, to prefer a solution which involves only the third book of Euclid to a solution which depends on the sixth book; this, I apprehend, is merely a persuasion that Euclid's order is a natural order, so that in a well-arranged system the propositions of the third book ought to precede those of the sixth book. I am of this persuasion myself; I think that no scheme can be perfect, and, on the whole, I am well satisfied with Euclid's. But there are places where Euclid is strong, and there are places where Euclid is weak; and the position which he has assigned to the last three propositions of his third book, must rather be classed with the latter than with the former. His object, of course, must have been to lead up to his construction of a regular pentagon, and we cannot be surprised at the introduction of that remarkable process. But I have always envied the advantage in this respect to be claimed for the non-Euclidean systems, which transfer these propositions and place them after the doctrine of similar triangles; thus the long and rather artificial treatment which they receive from Euclid is superseded, and the propositions become almost intuitive. Hence, in fact, if we have recourse to the sixth book of Euclid when we might have accomplished our end by the aid of the first thirty-four propositions of the third book, we may be fairly liable to the charge that we have not adopted the simplest and most natural method; but the last three propositions of the third book are quite different in kind from the others, and instead of using them, it may be really as simple and as natural in many cases to use the principle of similar triangles.

I shall be obliged to any person who may be skilled in practical geometry if he will state what he considers the best method of *actually* solving the problem, supposing that both circles are to be determined which satisfy the conditions. I assume that we have the aid of compasses and also of one of the ordinary contrivances for drawing parallel lines. This is a matter of some interest, though of course unconnected with the theoretical solution of the problem.

I should be glad to make some remarks on the general subject which led to the notice of the particular problem I have discussed, but at present I have not sufficient leisure. I must content myself with having shown that the course into which I am supposed to have drifted by geometrical incapacity, was adopted deliberately under the guidance of reasonable geometrical knowledge.

I. TODHUNTER

St. John's College, Cambridge, Oct. 2

Structure of Fossil Cryptogams

IT was unfortunate that at the recent meeting of the British Association, Prof. Williamson's paper had to be discussed in a very hurried manner, and he is, no doubt, justified in taking care "that there shall be no misunderstanding as to the real point at issue." I do not think that he has brought it out very plainly in his paper in NATURE, and perhaps, as he mentions me as an opponent of his views, I may be allowed to state precisely in what respects I differ from him.

First, as to matters of fact. Prof. Williamson speaks of the central structure of the stems of the extinct Lycopodiaceæ as a "vascular medulla," by which he explains that he means a "structure containing vessels," and that there shall be no misapprehension he adduces *Nepenthes* as possessing it; the instance is a well-known one, and leaves no room for doubt as to Prof. Williamson's meaning. Now from the examination of specimens, and of the drawings of them published by Mr. Carruthers (the accuracy of which I believe Prof. Williamson does not dispute) I am quite satisfied that the central structure consists wholly of