berlin that when pronounced upon by 'experts' in glacial topography, there will be seen to be a difference between the two types as illustrated by the photographs. If so, it should be a requisite that such an expert should have been to the top of some of the unsubdued peaks to prove that they have not been glaciated. The mere conclusion based upon a conception of what seems probable should not suffice. I know for my own part that until I got to the top of some of the high peaks on the Upper Nugsuak I could not believe they had been ice-covered; yet I found that the ice had not only covered them, but had extended at least twenty miles further. From my studies the conclusion was forced upon me that isolated peaks, as well as those rising well above the general level, may be glaciated for a long time and still remain very angular.

I am not engaged in an 'attempt' to place Professor Chamberlin in error, as he states, but intend to point out what I believe is an error of judgment. What glacial geology needs above all other things at present is a greater body of fact upon which to base our conclusions. We now have the fact that many parts of the Greenland coast are angular; we have the further fact that a region of angular topography has been glaciated. It is the *truth* that we wish to see discovered, whether this proves that all of Greenland has been glaciated or only a part; but until more facts are obtained I hold that Professor Chamberlin's conclusion that the ice did not extend into the heart of Baffin's Bay is based upon evidence of such a questionable nature that it ought not to be accepted. I, therefore, say again, let us get facts and trust more in them than in 'expert judgment.' When this is done glacial geology will have a better reputation.

R. S. Tarr.

Cornell University.

So long as Professor Tarr continues to insist that a glaciated and a partially subdued topography cannot be distinguished by its contours, although his own observations show the discriminations of two observers, on separate trips, to have been essentially correct, and so long as he persists in calling a topography unqualifiedly angular which these observers have distinguished from the unqualifiedly angular, it seems idle to continue to discuss the subject. In pursuance of his urgency of the importance of fact and truth and better methods in glaciology there is but one defense which he can properly make, and that is to publish in Science, whose readers he seeks to influence, the photographs which accompany his Washington paper. Glacialists will then be able to judge for themselves whether glaciation is or is not indicated by the topography.

T. C. Chamberlin.

History of Elementary Mathematics.

In Professor Blake's appreciative review of my 'History of Elementary Mathematics' there are two or three statements which appear to me open to objection. It must be admitted that, if the logarithm of x be defined by the relation $x=b^{\log x}$, b being constant, then, strictly speaking, Napier's numbers are not logarithms. It is the knowledge of this fact which led me to write in my history (p. 160): "In determining, therefore, what the base of Napier's system would have been, we must divide each term in the geometric and arithmetic series by 10^7." In the light of this remark, my statement that the base 'demanded by his [Napier's] reasoning is the reciprocal of that of the natural system' seems correct. The real question raised by Professor Blake's criticism is this: In considering the matter of a base, what is the best method of describing the nature of Napier's logarithms to a modern student? My claim is that the method of dividing each of Napier's numbers and logarithms by 10^7 and then finding the *fixed* base—a method which I followed in imitation of W. R. MacDonald, M. Marie and others—is more readily grasped by the elementary student than the one involving the difficult notion of a *variable* base, suggested by Hagen and Blake.

The sentence '$\sqrt{2}$ cannot be exactly represented by any number whatever' is correct from the Greek point of view, for on page 29 I say that 'by the Greeks irrationals were not classified as numbers.'

I am unable to find anything on page 74 which would 'lead one to suppose that rigor demands our ability to construct* * *every in-

scribed polygon we may wish to use.' The example in question refers to a problem, to inscribe in a circle a regular polygon of any given number of sides.

FLORIAN CAJORI.

COLORADO COLLEGE,
COLORADO SPRINGS, March 2, '97.

SCIENTIFIC LITERATURE.

Microscopic Researches on the Formative Property of Glycogen. Part I., Physiological. By CHARLES CREIGHTON, M.D., Formerly Demonstrator of Anatomy at Cambridge. London, Adam and Charles Black. 1896. With five Colored Plates. Pp. 152.

Dr. Creighton's work, as stated in the preface to the present volume, has been directed especially to the problem of glycogen in the formative processes of disease, but it was found necessary to turn aside at numerous points in search of a physiological basis or paradigm, and as a result we have the present volume, dealing mainly with the bearing of glycogen on normal growth. Emphasis is laid upon the fact that the glycogen of animal tissues is not destined solely for conversion into sugar, but that in embryonic formations, as well as in pathological new growths, glycogen presents itself in its tissue-making, not its sugar-yielding character. Dr. Creighton's microscopic studies lead him toward the somewhat broad generalization "that the formative property of glycogen is analogous to or parallel with that of hæmoglobin; * * * that glycogen plays the part of a carrier to the tissues; that it contributes somewhat to the building up without losing its own molecular identity; that it is present at the formation of tissues and employed therein without becoming part of them, and that it acts thus, in some cases as the precursor or deputy of hæmoglobin, and until such time as the vascularity of the part is sufficiently advanced; in other cases as the substitute of hæmoglobin from first to last—in those tissues which are built up in whole or in part without direct access of blood."

The observations which lead to this somewhat startling view are made upon tissues, organs or whole embryos, usually fixed in potassium bichromate and hardened in absolute alcohol, the presence or absence of glycogen being determined in the sections of tissue by the usual method of treatment with a weak solution of iodine in potassium iodide. Attention is called to the fact that methyl-violet, contrary to the view frequently held, also gives a distinctive reaction with glycogen, the dye picking out the spots of glycogen from all other parts of the section as distinctively as iodine itself. This method, however, possesses no practical advantages over the iodine method.

Dr. Creighton has studied especially the relation of glycogen to the growth of the bronchial tree and of the choroid plexuses; its relation to the formation of the renal tubules and the development of the intestinal mucous membranes; its distribution in fœtal hoof, nail and hair, and in the developing and functional striated muscular fibre; its relation to the enamelling and cementing of teeth; its presence in cartilage and in the developmental and other immature secretions of the mammary glands, etc. As noted by many previous observers, glycogen is found to be especially prominent in these young embryonic tissues, especially at the centers or points of rapid growth, and at a time in fœtal life when the vascularity of the part is limited or not even established. The point, however, upon which most stress is laid is that glycogen is the dynamic principle in the developing tissue; in epithelial cells, for example, as in the formation of the renal tubules, the glycogen being the precursor of hæmoglobin as a formative agent. Thus, in the tubular formation within the kidney the advancing and differentiating epithelium is supposed to depend mainly, if not solely, upon resources contained within itself, *i. e.*, the glycogen, pending the complete establishment of vascularity, when the glycogen disappears. Similarly, in the muscular tissue of active or mature life, glycogen, like the hæmoglobin, is looked upon as a reserve store for emergencies. Although not essential to the activity of the muscle, it may, perhaps, says Creighton, take the place of the circulating blood in one way as the store or reserve of hæmoglobin does in another, or possibly there may be muscles in which the reserve is chiefly hæmoglobin, and others in which the reserve is mainly glycogen.

The physiologist has no hesitancy whatever