very common on the tundra often swarm with *Limnæa*, *Physa*, *Pisidium* and *Valvata*. The marl which results is in some localities so abundant, that at Old Fort Yukon it was collected, ground up and mixed into whitewash which was used on the buildings of the original trading post, nearly forty years ago.

In the vicinity of the Klondike the author notes the hummocky appearance of the hills 'very much like magnified morainic knolls in a glaciated country,' though having a considerable elevation. Water worn pebbles and remnants of terraces up to nearly twelve hundred feet were observed by him personally.

Notwithstanding the evidences of antiquity afforded by some features of the landscape, Professor Heilprin considers that many of the more pronounced features of the region are comparatively recent. While the placer gravels of the streams and benches seem to indicate more than one denudational phase, and the principal stream-valleys are wide and open, many of their lateral tributaries are narrow and V-shaped, and the former appear to have been modified by late stream displacements. The present stream-beds, even of the Yukon, are not the most conspicuous orographic depressions but have been carved out much more recently, and it is even suggested that the emergence of the land from lacustrine conditions may have happened 'a few hundred years' ago.

The author estimates that denudation in the immediate valleys of the main streams is taking place at the rate of a millimeter a day, which, according to his computation, would equal 'a valley trough of about a foot and a third' in a single year. Allowing one hundred and twenty days for the period when erosion is not wholly prevented by congelation, the reviewer computes that the total denudation for the year would amount to less than five inches at the author's rate. Now the summer rainfall for the Upper Yukon is very small, less than an inch a month, and the surface of the ground is covered with a dense spongy mat of vegetation. There seems to be no particular reason why there should be any appreciable denudation, except in the actual beds of the streams themselves. The water of all these small non-glacial streams is notably clear, and they carry practically no sediment at the points where they enter the main river. Consequently it seems probable that the estimate of Professor Heilprin requires revision, even his second one, in which he proposes a rate of 175 feet in five hundred years. For a short period, and in certain limited portions of its bed the Yukon is able to move a considerable weight of débris, but the gravels and sands in great part antedate the existence of the present river, which has actually cut through them at but a few points in its 2000 mile course.

Professor Heilprin, in view of his limited opportunity for research, very properly disclaims any attempt to decide upon the geological structure of the region. However he devotes a good deal of space to an argument in favor of the deposit of gold in the placers, not from preëxisting stringer leads or veins in the country rock, but as a deposit, *ab initio*, from gold held in solution in water, upon or among the already deposited gravels. This is a contention which may properly be left to metallurgical experts to discuss, to the reviewer it seems unsupported by any direct evidence in this region. The author agrees with previous observers in affirming the non-glaciated character of the Klondike, and the presence of comparatively recent indications of volcanic activity. Pleistocene mammals are represented by fossil bones in the gold gravels as elsewhere in Alaska, and there is little doubt that the placer deposits as a whole are post-glacial and their material largely due to denudation by ice action during glacial times.

W. H. Dall.

The Design and Construction of Dams, including Masonry, Earth, Rock-Fill, and Timber Structures; also the principal types of Movable Dams. By Edward Wegmann, C.E. Fourth Edition, revised and enlarged. New York, John Wiley & Sons. 1899. Quarto, cloth, xii + 250 pages, 97 plates. Price, $5.00.

Many mathematicians have occupied themselves with the deduction of the shape which a high masonry dam should have in order to possess both stability and economy. Such economic profiles are of interest and value to the designer, but practically each engineer de-

vises his own economic profile to satisfy the imposed conditions. The method developed by the author is an excellent one for this purpose, leading to no complicated equations and having the advantage of constantly keeping before the computor the statical principles of stability and strength.

The fundamental assumption in these computations is that the compressive stress on the base of the dam uniformly varies from a minimum value at the back face to a maximum value at the front or down-stream face. This assumption cannot be a correct one, except in the case of a rectangular section, but it may be properly used in the absence of knowledge as to the correct distribution of stress, because its errors are on the side of safety. Strictly the base of the dam is under a shearing stress due to the horizontal water pressure as well as under a compressive stress due to the weight of masonry, and of the former no account is taken in practical computations. Probably the error in the fundamental assumption regarding the compression more than balances the opposite error, due to the neglect of the shear, so that masonry dams designed under the common theory undoubtedly possess all the needed element of security. This conclusion may be justified by the fact that masonry dams rarely fail; the author mentions but three instances of failure, two of these being constructions of the eighteenth century when the principles of design were not well understood, and the third being a case where the stone and cement were of so poor quality that leakage occurred.

Previous editions of this work were devoted entirely to masonry dams. The present edition gives additional information regarding recent structures, and also includes the description of dams of earth, timber and loose rock. For such structures few computations are needed, the size and shape being determined almost entirely by experience, while the details may vary according to local conditions and the judgment of the engineer. The numerous devices adopted in California to construct rock-fill dams without leakage are of especial interest. Movable dams of the needle, shutter, and bear-trap types are also fully described; although only a few of these have been built in America, they will undoubtedly be extensively used in future river improvements.

The work forms the most complete treatise on the subject of dams that has yet appeared. With commendable industry the author has searched the annals of engineering literature in order that no important structure might escape notice, and his list of bibliography, covering five pages, will be of value to all engineers. From the descriptive point of view, the book gives nearly all needed information regarding the important dams of the world. From the theoretic point of view, it gives everything necessary regarding masonry dams which resist overturning by virtue of their weight alone, but it is somewhat lacking in regard to the theory of arched dams. This theory, it is true, is a difficult one, but, as the Bear Valley dam in California, and the Zola dam in France, depend for their stability largely upon the arch action, a numerical discussion of their stability would have been of interest and value. Without doubt a dam arched toward the current is stronger than a straight one of the same cross-section, particularly in the emergency of ice thrust or a high flood, and it is said that the instinct of the beaver leads him to so construct them. Even if a little more material be required, it is well for the engineer to make his masonry dam an arched one and thus render the structure one of beauty as well as one of strength.

M. MERRIMAN.

The Botanists of Philadelphia and their work. By JOHN W. HARSHBERGER, Ph.D. Philadelphia. 1899. 8 vo. Pp. 457.

In this octavo volume of 457 pages we have a collection of brief biographical sketches, not only of all the people who have contributed to a knowledge of the flora of Philadelphia and the area included in a radius of sixty miles, but nearly all who have studied it afield. Commencing with such well-known pioneers as John Bartram, Humphry Marshall, Muhlenberg, Barton, Schweinitz, and Darlington, it comes down to the present members of the various botanical clubs of the city, the whole series arranged in chronological order. The Bartram Gardens, the collections of the Philadelphia Academy of