moraines, the joint product of the Erie and Saginaw lobes of the Laurentide ice sheet. Unusual features abound. "Half-filled valleys and abnormal drainage lines, isolated knobs and morainic outliers, clusters and chains of lakes, kettles and kames conspire with esker-like ridges to produce a type of topography and scenery which seems artificial and almost bizarre." Two of these lakes, High and Gordy's, owe their existence and outline to the presence of eskers, whose origin is ascribed to deposition in tunnels or crevasses in the wasting ice sheet.

THE ONTARIO COAST.

The Ontario coast between Fairhaven and Sodus bays (near Oswego, N. Y.) is described by J. O. Martin, of Cornell (*Amer. Geol.*, XXVII., 1901, 331–334), as consisting of truncated drumlins connected by stony beaches which enclose bays and marshes. Active 'long-shore movement was noted when waves came obliquely on the shore; a cobble weighing seven ounces was moved sixteen yards in ten minutes by waves whose breaking height was a foot. The recession of the shore line is rapid, in some cases several feet a year. The farmers know this, as they have to set back their shore fences from time to time. Several submerged boulder pavements, having the outline of drumlins but standing at a considerable distance off shore, seem to indicate former drumlins now swept away.

GLACIAL CORRIES IN THE CARPATHIANS.

Recalling a recent note on corries in the Bighorn Mountains of Wyoming, reference may be made to de Martonne's studies of similar forms in the Carpathians ('Sur la Formation des Cirques,' *Ann. de Géogr.*, X., 1901, 10–16. See also *Bull. Soc. Géol. France*, XXVIII., 1900, 275–319, and *Bull. Soc. Sci. Bucharest-Roumanie*, IX., 1900, No. 4). After a careful study of several examples, this author concludes not only that cirques or corries are certainly of glacial origin, but that they are as safe indication of glacial action as moraines, striations and rounded rocks; that they are of longer duration than the latter, and hence of greater value for the detection of somewhat remote glacial periods; and that they give definite indications of the character of the glaciation by which they were produced, being due to glaciers of the Pyrenean type, and not to a general nor to a local ice sheet. High mountains may thus owe a significant share of their form to glaciation, although whether de Martonne would go as far in this direction as Richter has (see Science, April 5, 1901) does not appear.

W. M. Davis.

SHORTER ARTICLES.

DEFINITIONS OF PHYSICAL QUANTITIES.

The standards of 'scholarship' must be essentially alike in all branches of knowledge, although differences in detail will show themselves according to the subject. I suppose that the attainment of these standards in the physics of to-day must include accuracy in conceiving fundamental quantities and their connection with each other. Within the past half century much careful thought has been devoted to gaining such clear conceptions and constructing a framework of relation among them. In proportion as the younger physicists inherit the results of that thought undiminished, they will themselves be trained for discriminating and exact thinking. It is therefore a matter of regret that some of our leading authorities are habitually lax in presenting certain definitions that are built into the foundations of mathematical physics. I refer particularly to deliberate statements found in text-books of great general excellence. These are fair marks for criticism, because they must aim at consistent and systematic exposition, and because they influence strongly minds that are in the formative stage. Their example should not encourage a student to confound ideas that are really distinct, nor to tolerate inaccuracy in himself. This can be said without implying a demand for pedantic nicety in writing for experts, who are able to catch the right cue, even from an elliptical expression. I shall illustrate my meaning with a few quotations from Professor Thomson's 'Elements of the Mathematical Theory of Electricity,' and from Professor Webster's 'Theory of Electricity and Magnetism.' These are chosen because they are books of acknowledged value; at the present time each may be taken to register high-water mark within its own range. Since they are representative, we are all concerned that they should everywhere furnish good models.

Let us first take the general law of inverse square, on account of its widespread application. We find the definition of 'Newtonian Forces, the most familiar examples of which are the mutual attractions of the sun and the planets' (Webster, p. 113), followed by the general expression for potential energy in such cases (p. 114). The latter contains no indication of the factor which becomes gravitation constant, or dielectric constant, or permeability factor; yet it has been stated previously (p. 111) that "Potential energy is defined as work. The unit of energy is, therefore, the *erg*." The medium-factors for electric and magnetic phenomena are introduced later (p. 354), but the gravitation constant is nowhere restored in the developments, so far as I am aware.

The potential function, or potential, is very commonly defined as representing so much work. Thus, "The potential at P is the work done by the electric forces when the unit charge is taken from P to an infinite distance" (Thomson, p. 27). Or we are told that the potential function is obtained as a particular value of the potential energy, when one mass-factor is unity (Webster, p. 144). This is inconsistent with the dimensions of potential as generally accepted, and as given by the authors themselves (Thomson, p. 449; Webster, p. 559). It is consistent, however, with their definition of field as a force. The negative vector-parameter of the potential function is "The strength of the field, that is, the force experienced by a unit of mass, concentrated at the point in question" (Webster, p. 144). "The electric intensity [field] is the force acting on a small body charged with unit positive charge, when placed at this point" (Thomson, p. 13). But the dimensions of field are not those of force. Electromotive force, as difference of potential, is then of course work also; we find this explicitly stated (Thomson, p. 282; Webster, p. 333). Current, again, is work as well. "$W = 4\pi i$. Thus the work [W] done on unit pole, when it travels round a closed curve, * * * is equal to $4\pi i$, if i is the strength of the current" (Thomson, p. 325). Professor Webster gives this in the form $\Omega = I\omega$ (p. 413). Here Ω is magnetic potential, I current and ω solid angle.

The clue to all these confusions (except the first) is the same elementary consideration. There is a failure to distinguish, in the context and in set terms, between a numerical equality, and a 'physical equation' in which the quantities equated are of the same dimensions. But a sense of such differences must be cultivated, as a part of correct physical thought; although they may be ignored sometimes for the immediate purposes of the mathematician or of numerical determinations in the laboratory. It is probable that repeated contact with statements like those cited dulls our first impression of the contradictions in them. In order to restore its vividness, we need only to construct parallel instances, with which custom has not familiarized us. Thus, density is mass; that is, the mass of a unit volume. In a similar (numerical) sense, force, or momentum, or kinetic energy is mass in special cases. I have pointed out elsewhere ('Principles of Mechanics,' p. 242) that the true dimensional relations for the electrical quantities can be preserved very simply by defining field and potential, respectively, as force and work *per* unit (in the body affected) of the measured quality that is subject to the influences of the particular field. There is no unclearness if the (dimensional) division is indicated by this verbal device or its equivalent.

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THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

THERE is not much to add to the information we gave last week in regard to the Glasgow meeting of the British Association. The president of the Association was directed to write a letter to the American embassy in the name of the Association, containing expressions of regret on the death of President McKinley.

The attendance was 1,912, distributed among the different classes as follows: 310 old life members, 37 new life members, 374 old annual members, 131 new annual members, 794 associates, 246 ladies and 20 foreign members. This is a smaller attendance than at the previous