recognition. Physiography now is in the low position that natural history occupied in the first half of the century, when its text-books gave brief descriptions and pretty little wood-cuts of a great variety of forms, dwelling on their slight differences more than on their great resemblances. In a score or more of years, physiography will be fortunate if it attain as high a position as is now held by biology, the successor of the old natural history, in which a few forms are first studied minutely, and the knowledge of detail thus gained is broadened by giving emphasis to the resemblances that relate these few types to all the rest of the animal and vegetable world. As far as the economic relations of plants and animals to human history are concerned, some might be content with such a statement as 'a horse is a horse;' but the study of zoölogy for itself, without regard to its relations to history, must regard a horse as a highly specialized form of a general type, and must discover how his specialization was accomplished.

Physiography must make the same advance. It might serve the needs of physical geography if physiography made no distinction between a new plain smoothed by constructive process and an old base-level plain smoothed by destructive process; but to physiography itself the omission of this vital distinction is absolutely fatal. Placing such apparently similar forms together would involve the same order of error as that of classing whales with fishes, or of grouping the unwrapped cephalopods of the mesozoic with the straight forms of the low paleozoic. Time must be recognized as an element in geographic description even to a greater degree than it has been by Prof. Archibald Geikie in his study of 'geograpic evolution;' for topographic development is the key to a real understanding of the forms of the land about us. Physiography must, moreover, follow the example of biology in studying its simpler type-forms carefully before attempting to understand the complex associations of forms that make up a country or a continent.

Continental homologies have gone far enough already, if indeed not too far, in the present state of knowledge: attention should be directed instead to the minute morphology and systematic development of individual topographic forms. The difficulties of such work are great, especially in teaching; for while it is admitted that 'seeing is believing,' and methods of instruction in chemistry, physics, and organic natural history are all remodelled with this principle in view, geography can at best secure but an imperfect application of the principle, and has to get along with maps, views, and models, instead of studying actual forms themselves. Maps are nearly always on too small a scale, and too poorly drawn to show what ought to be seen. Photographs are of course extremely useful, but they generally include too many varieties of form, and present too much detail, to serve best in elementary instruction; and they are as a rule taken with a geographic rather than a physiographic object. Illustrations in books of travel are too often of no scientific value: the traveller is generally an explorer instead of a geographer, and the artist too often stays at home. Most of Holzel's oleographs are admirably artistic, and all are highly valuable, and they probably come as near to being 'types' as any thing published. The illustrations in the reports of our Geological Survey are also most excellent in this respect. Models are too often merely copies of actual places that have been, for such a reason as complexity of structure or the like, chosen for this kind of illustration: the model of Monte Rosa mentioned by Mr. Keltie, excellent as it must be as the work of so artistic a geologist as Professor Heim, and so appreciative a topographer as Herr Imfeld, must have about the same relation to the needs of a class in physiography as a menagerie would have to the needs of a class in biology, or as Leverrier's computations about Neptune would have to a class in mathematics. Mr. Keltie recognizes, however, that, for teaching purposes, "it should be remembered that it is not extraordinary features that are desired, but typical aspects of the earth's surface," but he does not say where we shall find a scientific and sufficient investigation of the forms that are to be chosen as 'typical aspects.' There is no such investigation. The absence of any thorough and consistent physiographic terminology at once points out the immaturity of this study. Beginnings may be found here and there, but certainly not in 'numerous text-books.' The Sixth Annual Report of the Geological Survey, just issued, contains, for example, a number of illustrations that will be seized upon when the proper text-book appears. The choice little woodcuts on page 229, entitled 'Topographic Old Age,' and 'Topographic Youth,' are particularly good, but these terms will certainly be new to most readers.

Let me repeat, therefore, that while the principles of physiography are coming to be pretty well understood, the facts have yet to be set forth in their proper light, and the world must be explored over again to find them. Let any one who doubts this read over the ordinary books of travel and the older geological and geographical reports, and see what sort of a physiography he can make out of them. Before the methods of teaching physiography are perfected, before the proper illustrations are constructed, much discussion is needed as to the principles to be taught, and as to the forms that are to be chosen for types. The Geographical Society still has a large work before it in this direction. W. M. DAVIS.

Cambridge, Mass., Aug. 28.

The Blair Educational Bill.

IN *Science* of Aug. 19 is a note on the Blair bill, by James Lawrey of Iowa. Mr. Lawrey declares that "any State that would accept national aid has not the spirit necessary to a sound government." Such a statement comes with very poor grace from one who resides in a State in which the schools are most richly endowed by the general government. Whence came the great educational funds of the western States, save from the munificent bounty of the general government? Has the spirit of the people of the State of Iowa, or of any western State, been, in any way, injured by the vast donations of land by the general government to these States? I understand that the great north-west was ceded to the nation for the benefit of all the people, by certain States having a good claim to the same. The later acquisitions by purchase and by conquest were all intended certainly for all the people. But in what way are the people of Pennsylvania or of Virginia benefitted by the school funds of Iowa or Nebraska, derived from the sale of lands belonging to all the people? These great land-grants are but little understood by the people of the East. A few years ago, when in Nebraska, I was told that the school lands of that State, if laid out in a belt two miles wide, would extend from the Atlantic to the Pacific Ocean.

I believe in the aims of the Blair Bill most fully, but I think it should be modified, in several particulars. 1. The money should be given to each State for the benefit of all school children in the same, but with no other restrictions. 2. The western States should receive no benefit from the grant until the old States have been granted sums to counterbalance the grants to the western States.

It is certainly a grave mistake on the part of our rulers to collect vast sums of money, more than are needed to conduct the government in an economical manner, but when once it is collected it should be returned in the most direct manner possible.

The South needs the aid. With ungallant restrictions removed, she will accept and make good use of it, I feel as sure as I do that it would do good in my own State. GEO. G. GROFF.

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Wind Pressure and Velocity.

REFERRING to Mr. H. Allen Hazen's letter in your issue of the 2d inst., I beg to call attention to the fact that the temperature of the wind enters as an important factor in the determination of the pressure due to a given velocity. In 1876 (*Engineering and Mining Journal*) I first pointed out that a variation in temperature from 0° F. to 100° F. produces a difference in the amount of pressure, for a given velocity of wind, of over one-fifth the total amount. I have since discussed the subject more fully in a little treatise on 'The Windmill as a Prime Mover' (New York, John Wiley & Sons, 1885), giving detailed formulæ and complete tables, showing the relation between the pressure and velocity of wind.

Further *accurate* experimental determinations are certainly necessary, but all data entering the problem (among them, the temperature of the impinging air) should be carefully noted, and given due weight in any generalization drawn from the experiments.

ALFRED R. WOLFF.

New York, Sept. 5.