birds of eastern America it is bound to supersede all other works. It is a boon to the amateur, a convenience to the professional, and will prove a help and incentive to the study of birds. Such books are now among the greatest needs in all departments of natural history.

C. HART MERRIAM.

National Geographic Monographs, prepared under the auspices of the National Geographic Society. No. 1, Physiographic Processes; No. 2, Physiographic Features. By J. W. POWELL, late director of the United States Geological Survey. New York, American Book Company, 1895. Twenty cents a number. $1.50 a year (ten numbers).

The first two numbers of the geographic monographs, announced in SCIENCE No. 10, have lately been issued under the above titles. The series is to appear monthly during the school year, the special object of the publication being "to supply to teachers and students of geography fresh and interesting material with which to supplement the regular text-book."

A series of essays like this deserves a warm welcome from those who are interested in raising the standard of geographical teaching, and the two numbers now issued are of particular importance in several ways. They affirm, with an emphasis not hitherto given in this country, that the proper foundation of geographical study is an understanding of physiographical processes; they mark the entrance of various members of our National scientific bureaus into the work of publishing the best selections from their knowledge in essentially elementary form, with the intention of aiding teachers and scholars in our schools; they represent not simply the temporary effort of an individual, but the continued efforts of a body of experts to introduce subjects of better quality and treatment into ordinary geographical study. Such an undertaking, if successfully maintained, cannot fail to impress itself strongly all through our educational system, for, instead of appalling the reader at the outset with a large treatise of heavy cost, it continually tempts him to go further and further by the successive appearance of attractive and interesting but inexpensive pamphlets, month after month and year after year.

The publishers present the monographs in good form, well illustrated, and certainly at a very moderate price.

It is particularly interesting to receive in these two numbers the results of Major Powell's long consideration of physiographic questions. For some years his attention has been so largely given to administrative work in connection with the National Geological Survey that we have had comparatively little from his pen; but now we learn the general views that have been gradually forming during his long experience of the many aspects of geography and geology; here we find tersely presented his matured opinions on the essential elementary conceptions concerning deformation and denudation, about which our teachers are as a body so indifferent, so skeptical or so timid. Mountains are not described as the result of chaotic uplifts, but as the unconsumed remnants of broadly uplifted and deeply eroded masses. The product of long-continued denudation is not illustrated by a canyon or a valley, as so many of the text-books in current use imply, but by a broad surface of faint relief, close to baselevel. The lesson of our West that volcanic action is not so dependent on neighborhood to the sea as has been generally supposed is given perhaps too much importance; for no association of vulcanism with the ocean is mentioned. Among geologists, these announcements may not be regarded as novel, nor are they so presented; but it is certainly novel to have them addressed to teachers of geography, and to have them emphasized

as of fundamental importance to such teachers by placing them in the first two numbers of a series of geographical monographs. Much good must result from this earnest inculcation of modern physiographical principles.

The character of the two monographs may be inferred from the following outlines: The 'processes' open with an account of the three moving envelopes of the earth—air, water and rock. Their mutual interpenetration and characteristic movements are described; the more important headings being rainfall, run-off, floods; kinds of rock, structure of the rock envelope, age of rocks, interchange of land and sea; vulcanism, diastrophism and gradation. The 'features' are classified as plains and plateaus of various kinds, mountains, valleys, hills, cliffs, special forms, stream channels and cataracts, fountains, caverns, lakes, marshes, coast forms, islands. The intelligent teacher cannot fail to be interested and broadened by a careful study of these suggestive pages.

There are, however, a number of considerations which cast a shade of doubt on the plan of beginning this series of monographs with two general essays of comparatively abstract treatment. From the very nature of the case, when so small a space as thirty pages is allowed for subjects so large as 'physiographic processes' and 'physiographic features,' there can be little room saved for the introduction of concrete illustrations. Consequently, instead of inculcating physiographic process by example, it is here inculcated almost entirely by abstract generalities. Our teachers are already educated rather too much in this way; they have not enough knowledge of fact to take the best advantage of so rich a feast of generalization as is here presented. The same comment may be made on the classification of features; the broad scheme of classification here announced is of much value to the expert, who has already in mind a multitude of examples with which to fill each pigeonhole in the scheme; but it is of much less value to the school teacher, whose knowledge of geographical facts is generally very narrow, except in so far as they are concerned with empirical data, such as the position of cities, the length of rivers or the height of mountains. With features as the result of processes, teachers have heretofore had very little to do; and they can hardly now be ready to use an extended classification of land forms, few of which are made real by illustration or example. It may be doubted whether these general monographs would not have met a better appreciation two or three years hence, after other monographs had presented in detail a good number of individual features as the result of particular processes.

There is another way in which the discussion of processess and the classification of features as here given may embarrass the teacher. He may naturally expect, from the leading place of these monographs, that they are authoritative as to plan and terms, and that the latter monographs will follow the beginning thus made. But, as a matter of fact, it is at present too early in the development of the new subject of physiography to expect any one plan of description or any one scheme of terminology to gain general adoption; particularly a plan or scheme not hitherto published, not modified by expert criticism, and not generally assented to by various investigators. As a suggestion to his fellow experts, these plans of treatment from one of so wide a knowledge as Major Powell are of high value; but as formulations of method, according to which later writers of monographs should arrange their own studies, they are of unknown value, because as yet untested by repeated use and public criticism. It is highly probable that each of the later writers of the monographs will depart from the plan here presented and introduce methods and terms of his

own; so little advance has yet been made towards a general concensus of opinion in this new subject, the rational study of the forms of the land.

In its fundamental principles the classification of features proposed by Major Powell will endure, for it is based on structure and process, not on external form alone. In some other respects it does not seem acceptable, for there is a certain inconsistency and incompleteness in its terminology that is disturbing. For example, diastrophism having been defined in the first monograph as meaning upheaval or subsidence, with or without faulting or flexure, and gradation having been defined as including all processes of disintegration, transportation and deposition, we read in the second monograph that diastrophic mountains and diastrophic hills result essentially from the action of gradational processes on uplifted masses; but that diastrophic valleys, diastrophic cliffs, diastrophic cataracts and diastrophic islands result from movement alone without degradation; and no place is given to mountains of essentially constructional form, corresponding in origin to the diastrophic valleys and cliffs.

Valleys of gradation, cliffs of gradation and gradational cataracts result from processes of degradation; yet it must of course be understood that the land masses acted on by gradational processes had in these cases, as well as in the case of diastrophic mountains or hills, in some way gained an effective height above baselevel; hence it would be more consistent to call most mountains and hills 'gradational;' and thus reserve the adjective 'diastrophic' for mountains and hills made by diastrophism, like diastrophic valleys and diastrophic cliffs. Gradational islands are deposits of land waste near shore, and gradational hills are heaps of debris left directly or indirectly by glaciers; while sand dunes are given an equivalent value with gradational hills, instead of being placed with glacial hills under a general gradational heading.

Sea plains are plains of ultimate denudation with reference to the sea as the controlling baselevel; the sea plain may be enlarged by sedimentation along its margin, but no mention is made of the numerous plains resulting from the uplift of smooth sea-bottoms. Lake plains are formed with their baselevel depending on the level of lakes; lake-bottom plains, revealed by the deepening of the lake outlet ("the waters of the lake rush through the newly opened channel, and the lake is drained in whole or in part," is an unfortunate suggestion of a sudden change that must be very rare in nature), are included, but without special name, under the same heading with plains produced by denudation of the surrounding land down to lake level; and without any indication that the latter are rare and the former common.

The gradual change of opinion regarding the comparative efficacy of marine and subærial erosion gives some justification of the small share of space devoted to the processes of the seashore; but it is to be regretted that they are so disproportionately condensed. After nearly two pages about inland cliffs of gradation, sea cliffs are dismissed with less than two lines of text: "On sea coasts and lake shores, sapping is carried on by the waves, and cliffs are often produced." Floods are rather fully treated and flood plains are given about two pages, but deltas are dismissed with the briefest mention. Coast-forms in the second essay have less than two pages of the total thirty. The explicit omission of seashore features, or their postponement to a later monograph, would have been preferable to so brief a treatment.

Those who have enjoyed Major Powell's eloquent accounts of his western explorations will be glad to see again here something of the fervor of his style; but in a

few cases it has led him too far for the creation of the best impression on readers so literal-minded and so ready to accept and quote authority as teachers are. It is over-eloquent to say: "The tides sweep back and forth across the surface of the sea, and alternately lash the shores with their crested waves," or "The purple cloud is painted with dust, and the sapphire sky is adamant on wings." After all the efforts to drive 'burning mountains' out of school geographies, it is disconcerting to read here about 'floods of fire' from volcanoes. In view of the importance of the gentler processes of nature, it is unfortunate to find in the closing summary of the second essay a very figurative expression regarding the three great physiographic processes: "How fire, earthquake and flood have been involved in fashioning the land and sea." The plain-spoken teacher will have difficulty here in distinguishing between poetry and prose.

There are occasional brief or over-generalized statements that must raise unnecessary questions in the teacher's mind. In mentioning the tides, the apparent diurnal rotation of the moon around the earth is worded: 'As the moon revolves about the earth from east to west.' A little later, it is said: "The seas are heated under the tropics;" but schoolmasters are the very persons who know that the tropics and the torrid zone are not one and the same. The surface currents of the ocean are referred entirely to convectional movement in the ocean itself; no surface currents being ascribed to the winds; and it is said that "all surface currents drift eastward in going towards the poles;" although this is wide open to qualification. It is inconsistent with the teachings of modern physics to speak of the 'flow of . . . heat from the fiery globes of space.'

The corrections of small things is a vexatious matter. It is little less than a nuisance to the author to have to stop for so small a trifle as the choice between 'under the tropics' and 'within the tropics.' This distracts him from the main line of thought along which he is constructing his essay. Minute corrections call for mental characteristics that are petty in comparison with the creative ability that produces the essay itself; and from an author as independent and original as Major Powell self-correction of these relatively trifling verbal matters is hardly to be expected. Yet it will be unfortunate if the editing of the future monographs does not involve such revisions as will reduce their inconsistencies to a minimum; for when teachers discover that they can take exception to certain parts of their text, their confidence in the rest of it is weakened. They have not as a rule much sense of perspective in these matters; and, as with book-keepers, a little error is in their opinion about as dangerous as a great one. They are confirmed in this habit of thought by the character of the contests, of which they are frequent witnesses, that grow out of the rivalry of publishers and the strife of book agents. Knowing this, the best way to prevent the confirmation of the habit is to give it no opportunity for practice. Even though the personality of the author be in a measure lost, it is best to scrutinize very carefully all books intended for school teachers, and exclude from them every statement and phrase that will distract the reader from the essential line of thought and set him to differing from the author on matters of subordinate value. For this purpose an experienced book agent makes a most useful proof-reader; and his services should be secured, if possible, by those who are acting for the National Geographic Society in the supervision of these monographs. His advice will be found very serviceable to authors whose previous practice in writing has been on essays for scientific journals and governmental reports.

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