

As might be expected from the nature of the case, the section on Optics is the most complete. Mr. Wright's earlier book on "Light" is extremely instructive; the suggestions it contains are in many cases amplified and improved in the present work, and much that is new is added. There is one point, however, on which Mr. Wright does not express his meaning with his usual clearness. He says, when treating of the spectrum (p. 304), that it is in most experiments permissible to converge more light upon the slit by the use of a lens. This statement is hardly sufficiently strong: it is not only a permissible course, but also the best course, to form on the slit an image of the source of light, using a lens of such a focal length that all the rays which pass through it, after converging to the slit, diverge so as all to pass through the lens and prism used to form the spectrum. In some cases it may be best to dispense with the condensers and lantern, and merely place the source of light close up to the slit itself. And again, in section 179, the rays emerging from the slit should not be a narrow parallel pencil, but a divergent pencil of such an angle as to fill the lens completely; while in Fig. 171 the light should not be shown as focussed on the prism, but on a screen behind the prism, and at about the same distance as the screen on which the spectrum is formed.

#### DRY DENUDATION.

*Die Denudation in der Wüste und ihre geologische Bedeutung: Untersuchungen über die Bildung der Sedimente in den Ägyptischen Wüsten.* Von Johannes Walther, a. o. Professor an der Universität, Jena. (Leipzig: S. Hirzel, 1891.)

THIS book forms the third part (being paged continuously) of the sixteenth volume of the Transactions of the Königlichen Sächsischen Gesellschaft der Wissenschaften. The questions propounded by the author for investigation are the following:—What meteorological forces are active in the deserts? What is their destructive effect on the rocks? What are the ultimate results of this? Is the present sculpturing of the deserts due to the influence of other forces than those which are now active? How can fossil deserts be recognized? The last is left unanswered; the others are considered in the light of information collected from books of travel, and from the author's own studies during two visits to the Egyptian desert.

In regard to rainfall, he points out that no part of the African desert is absolutely rainless, and that, as the storms, though rare, are heavy, the mechanical effects of water are more marked than they would be in a region where precipitation was more uniform. But in a desert, where the absence of plants and of soil exposes the rock to the effects of atmospheric variations, changes of temperature are yet more potent in causing denudation. These changes, owing to the dryness of the air, are great. The diurnal range may be full 30° C., the annual as much as 70° C. By the constant expansion and contraction due to these variations, the rocks are split, and the results are more important in producing denudation than are chemical changes. The author gives a number of illustrations to show how rock-masses in the desert are destroyed by the action of heat and cold, wind, and drifting sand.

NO. 1120, VOL. 43]

The surfaces of old walls are corroded; strata of different hardness in the face of a cliff are worn back unequally; masses of rock are isolated, and the blocks and pillars are carved into strange forms; denudation, in short, seems to proceed as actively in a desert as in a damp climate, and along very much the same lines. Isolated hills of tabular form are also very characteristic of desert denudation. These may be either on a large scale—outliers of an extensive plateau—or on a small one, like models, but a few feet high. In each case the cause is the same: a harder stratum at the top has preserved the softer material below. The author also describes the valleys of the desert, usually dry, and the cirques which, as was pointed out some years since by Mr. Jukes Browne (*Geol. Mag.*, Decade 2, vol. iv. p. 477), seem to occur in the deserts of Egypt even as in regions where ice may be supposed to have acted. The description of the latter is important, since it indicates that there is not that necessary connection between glaciers and cirques which some geologists appear to have imagined.

In regard to the excavation of the valleys, and perhaps of some other physical features on a larger scale, we think that the author is disposed to attribute rather too much to the sculpturing effect of heat, cold, and wind (with which of course drifting sand is included), and to overlook the probability that many of the bolder physical features may be memorials of an age when the region was well watered. It is often more than probable that deserts have not always been deserts, but that they are districts of local desiccation, which sometimes may be still in progress. So it is with the Aralo-Caspian area; the Great Salt Lake of Utah and the Dead Sea are mere remnants of fresh-water lakes on a far grander scale. When a large part of the present Jordan valley was one sheet of water, when glaciers replaced the cedars of Lebanon, and the peaks of Sinai were white with perennial snow, the Egyptian desert must have been no longer arid, and permanent streams must have occupied the wadis. Probably since that time the change in the physical features, though doubtless not unimportant, has been in the main superficial; the effects of the arid epoch through which Egypt and some other regions are passing may be compared to those of the Glacial epoch further north. The work has been that of the file rather than of the chisel.

That changes of temperature and the action of drifting sand have been agents of denudation of considerable importance was, of course, well known, and is stated in most text-books of geology, but Prof. Walther has done good service in emphasizing the fact, and in collecting together a number of interesting observations and illustrations which will be useful for reference, especially to teachers. T. G. B.

#### OUR BOOK SHELF.

*The American Race.* By Daniel G. Brinton. (New York: N. D. C. Hodges, 1891.)

By "the American race," Dr. Brinton means the aboriginal race of America, and in the present work he makes what he believes to be the first attempt to classify it systematically on the basis of language. Whether lan-