

the evidence, only known to himself, is or is not conclusive to him, to introduce it as undisputed fact in this manner in the present publication. After this we have not enough interest to read the remainder of the book, and besides it is so full of mistakes, as *Urus* for *Ursus* (p. 505), shorter for longer (p. 511), &c., that it is a wearying effort to understand in places what the author really means.

J. S. G.

AMERICAN GEOLOGICAL SURVEYS

Geological and Geographical Atlas of Colorado and Portions of Adjacent Territory. By F. V. Hayden, U.S., Geologist in Charge. (Washington: Published by the Department of the Interior, 1877.)

IN the magnificent Atlas just issued by the Department of the Interior we have the consummation and crown of all the labours which Dr. Hayden and his staff have carried on so triumphantly for the last five years, and of which they have already given us so much interesting and important information in a series of Annual Reports. Before examining the work from a scientific point of view, no reader can refrain from expressing his admiration of the style in which the Atlas has been produced by the United States Government. As a specimen of cartography, typography, and lithography, it is altogether worthy of the highest praise. For beauty and indeed sumptuousness of execution, it may be classed with those *livres de luxe* which from time to time have been issued from the National Imprimerie of France.

The Atlas consists of two series of maps, the one of a general, the other of a detailed kind. The first series, on the scale of twelve miles to one inch, comprises four sheets, each embracing the whole State of Colorado and part of the neighbouring territory. The first of these illustrates the system of triangulation adopted in the survey; the second shows the drainage system of the area; the third by a simple and clear arrangement of colours, exhibits at a glance the economic features of the whole region—the agricultural land, pasturage, forests, and woodlands, sage and bad lands, mineral tracts, and the portions rising above the limit of timber-growth; the fourth contains a condensed and generalised geological map of the same territory. Nothing can surpass the lucidity of expression and artistic finish of these maps.

The second series—twelve in number—is on the scale of four miles to one inch, and consists of six topographical sheets and six identical sheets, coloured geologically. The topographical details, though numerous, are so selected as not to neutralise each other, or mar the broad, clear picture which the maps were designed to be. By means of contour-lines of 200 feet vertical distance, the surface-configuration of the whole region is depicted as in a model. We can follow the lines of the broad valleys, of the deep, narrow cañons, and of the hundreds of minor tributaries which have scarped out their courses on either side. Here we look down upon a vast table-land, deeply trenched by stream-channels; there upon a succession of bold escarpments or mesas which bound the table-land and hem in the neighbouring valley. Huge mountain-ranges rising out of the plateaus are so vividly drawn that they seem to

stand out of the paper. Yet no shading is employed. All the effects of inequality are produced by contour-lines, so faithfully set down that a single line may be tracked in its sinuous course along the whole of a mountain front until it comes out upon the table-land beyond. When will our map-makers learn to use this, the only true method for expressing the surface of a country? The best of our atlases are disfigured by strips of shading running across the map like so many caterpillars, to represent mountain-ranges. Even our Ordnance maps, so admirable in most respects, are sometimes so loaded with shading, that a steep hill-side only a few hundred feet high is made as black as our highest mountains, and the topographical names can hardly be read, even with a magnifying-glass.

But, above all, welcome are these six geological maps. In the previously published maps and charts accompanying the Annual Reports, only small detached areas were represented, and even from the careful descriptions of the various geologists of the staff it was hardly possible to frame a satisfactory conception of the geology of Colorado as a whole. Ever since the marvels of its deep gorges and vividly painted cliffs were made known, that region has possessed a high interest to the geologist. He has now the means of gratifying his desire for further knowledge. With the help of these maps and the two accompanying sheets of sections he can realise most satisfactorily every great feature of Colorado geology. The ancient Archæan ridge—the nucleus or back-bone of the American continent—may be traced running north and south nearly along the present hydrographical axis of the country. Flanking that ridge comes a series of palæozoic deposits, the oldest of which have been identified palæontologically with Silurian formations. Rocks, regarded as of Devonian age, overlap the Silurian beds, and repose against the ancient crystalline ridge on the south-west side of the San Juan Mountains. They are soon buried under later accumulations, and they seem to be of but local development, since in most places where the rocks are found in juxtaposition, the Silurian are directly succeeded by Carboniferous strata. These last-named rocks cover large tracts of country, running as bands round the Archæan area, and lying in basins across it. Far to the west where the Grand River has so deeply trenched the Utah plateau, the flat Carboniferous beds appear from under the brilliant red Triassic strata. The difficulty of drawing any line between Triassic and Jurassic formations in that region is again acknowledged on these maps, the lower red series being doubtfully assigned to the older, and the upper variegated deposits to the later system. Cretaceous rocks are abundantly developed, and cover a vast extent of territory. In particular they spread over the wide plateaux between the San Juan and Gunnison rivers, and form the platform on which the enormous volcanic outbursts have been piled up from the West Elk Mountains southward into New Mexico. It is more easy to trace on these maps, too, the area respectively occupied by the Laramie, Wahsatch, Green River, Bridger, and Uintah formations which represent post-cretaceous and tertiary times. Glacier moraines, lake-deposits, drifts, sand-dunes, and recent alluvia, all find adequate expression on the maps. Especial care, too, seems to have

been bestowed upon the eruptive rocks which form so important and interesting a feature of Colorado geology. The more characteristic varieties are represented by distinct shades of crimson or orange, and they have been mapped in such a way as to convey at a glance, and even without the aid of sections, a tolerably clear notion of the volcanic phenomena of the region. On the one hand we see the great lava-sheets capping the mesas and spreading far over the plateaux, on the other we notice the great centres of volcanic activity, with their abundant flows, dykes, and breccias.

Two sheets of sections, drawn across all the more interesting and important portions of the geology, complete the vast fund of information given by the maps; while, that nothing may be wanting to enable readers to realise what has been done by the Survey, and the conditions under which it has been accomplished, two large sheets of sketches are given, which most vividly represent the forms of the mountains, plateaux, mesas, and river-channels, as seen from various commanding heights.

Dr. Hayden, with whose personal supervision this great work has been accomplished, has increased tenfold the obligations under which he has laid geologists all over the world for the number and value of his contributions to geology. He now furnishes us with new light whereby to read his former researches and those of his able colleagues. May we venture to hope that he may find leisure to confer yet one further benefit before the progress of his Survey plunges him into a new whirl of work? If he could be prevailed upon to sketch out a plan for digesting the materials of his published Annual Reports, he could doubtless find among his staff some competent writer who, under his guidance, could produce a well-arranged systematic guide-book or text-book to complete the value of the work of his Survey. Such a book of reference as would give a reader who has never had access to the Annual Reports a clear and comprehensive view of Colorado geology, would be of very great service.

These remarks may be fitly closed with an expression of the warmest admiration of the liberal spirit in which the United States Government has conducted these Surveys of the Territories and has published their results. This costly atlas has been distributed gratuitously all over Europe. That this is a wise policy cannot be doubted. Whether actuated or not by a desire to diffuse scientific information, the authorities at Washington do well to make as widely known as possible the geological structure and economic resources of their country. They cast their bread upon the waters, and the harvest comes to them in the form of eager, active emigrants from all parts of Europe. ARCH. GEIKIE

OUR BOOK SHELF

Forest Flora of British Burma. By S. Kurz, Curator of the Herbarium, Royal Botanical Gardens, Calcutta. (Calcutta: Office of the Superintendent of Government Printing, 1877.)

By the completion of the work whose title is given above, we have the third valuable contribution to a knowledge of the rich vegetation of our Indian forests. In all three works, namely, Col. Beddome's "Flora Sylvatica of Southern India," Brandis's and Stewart's "Forest

Flora of North-West and Central India," and the book now before us, there is much in common, and the plans of the two latter are very similar. There is, however, one great difference between Beddome's and Brandis's Floras and the present issue; while the first two are most profusely illustrated, the work under consideration is entirely without plates. This, perhaps, is not to be regretted considering that the work in its present form constitutes two good-sized volumes; and further than this, Indian plants have of late been very well represented, notably in the two forest floras just referred to. Another distinction, and perhaps one more affecting foresters generally, for whose benefit these floras are ostensibly prepared, is the meagre information regarding the uses of the plants mentioned. Mr. Kurz excuses himself for reducing this portion of his work to a minimum, and refers to Brandis's "Forest Flora" for information on this head. We regret that Mr. Kurz did not see his way to greater condensation in his descriptions, and, if need be, the use of smaller type, so as to reduce the bulk of the book. At the same time its efficiency would have been much increased had he followed Dr. Brandis in giving extended notes as to the uses, for to no similar work can we point with so much satisfaction in this respect as to that of Dr. Brandis.

Regarding the nomenclature of genera and species, it is a pity that some kind of uniformity should not prevail amongst the different authors. Many forest officers would, to say the least, be somewhat confused as to the use of a proper name when he finds in two books published by authority and appearing within a year or two of each other a different generic distinction for the same plant; thus Brandis keeps up the rubiaceous genus *Adina*, and figures *A. cordifolia* of Hook. fil. and Benth., placing *Nauclea cordifolia*, Roxb., as a synonym. Kurz, on the contrary, retains *Nauclea* as a genus, sinking under it *Adina cordifolia*, which is spelt *Andina*, and attributed to Roxb. On this subject of nomenclature, however, Mr. Kurz says: "I confess myself an admirer of, and adherent to, the botanical laws as laid down by the International Botanical Congress at Paris in the year 1867, and published by Prof. Alph. de Candolle. These are translated into nearly all modern languages, and are now generally adopted in Europe, except at Kew. However, I have deviated in several cases in favour of Hooker's 'Indian Flora,' or kept up old-established names, not because I assent to such irregularities, but simply because I thought it not fair that I, a German, should introduce my individual convictions into a practical work written solely for the use of English people."

Notwithstanding the remarks which we have been obliged to make, Mr. Kurz's Flora is one of very great value, and, taken in conjunction with those we have before referred to, forms a pretty complete forest flora of British India. We are reminded by the passing of this work through our hands of the loss Indian botany has sustained by the lamented death of its author.

LETTERS TO THE EDITOR

- [The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.]
- [The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

American Storm Warnings

THE author of the papers on the American Storm Warnings (NATURE, vol. xviii, pp. 4, 31, 61) seems well acquainted with the storms and storm-warnings of America, and at least with some of the results arrived at in Europe, and if he had confined himself to what he really knew, and to the description of the means