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dangerous impurity. Mr. Snelus seems to have been the first to work out this problem, and it was then perfected by the other inventors mentioned. The success of the process is to a considerable extent dependent upon the mechanical details of the plant and of its operation, — details perfected, in part, by the late Mr. A. L. Holley, one of whose latest inventions was a form of rapidly removable converter especially adapted to this modification of the older process. This new method has not been introduced as rapidly outside of Great Britain as in that country, where the scarcity of pure ores renders it of very great importance. In the United States the abundance of ores comparatively free from phosphorus renders the steel-maker to a great extent independent of the 'basic process.' All of the larger makers now have their own mines of good 'Bessemer ores,' and do not feel much interest in this latest of the great inventions of the opening age of steel.

The 'creators of the age of steel' have rendered inestimable service to mankind, and all mankind will be interested in reading the story told by Mr. Jeans. R. H. THURSTON.

THE GUATEMALTEC LANGUAGES.

Zur ethnographie der republik Guatemala. Von OTTO STOLL. Zürich, Orell Füssli & Co., 1884. 9+180 p., map. 8°.

A grammar of the Cakchiquel language of Guatemala. Translated by D. G. BRINTON. Philadelphia, McCalla and Stavely, 1884. 72 p., map. 8°.

To suppose that dialects of the Maya family are the only languages spoken by the Indians of this extensive Central-American republic would be at variance with existing facts, although they cover, indeed, the largest part of its area. The present tribes speaking allophylic languages (that is, languages belonging to other families) are the Pipil Indians, speaking an Aztec tongue, and now found in two districts only (near Escuintla, Salamá, etc.); the Pupu-luca Indians, on the border of San Salvador, belonging to the Mije stock; and the Caribs, at the mouth of Rio Dulce and in the adjacent territory of Honduras, who still speak the language of the Lesser Antilles. Otto Stoll, who, during a five-years' stay in the mountainous parts of Guatemala, has made extensive linguistic and ethnographic studies of the aborigines, has established the above classification, and also mentions the former (if not present) existence of two other dialects which may possibly form linguistic families for themselves,

— the Sinca on the southern coast, and the Alaguilac on Middle Motagua River, both from the historian Juarros.¹ The first three of the above languages are illustrated by vocabularies and linguistic comparisons with cognate dialects.

Of sixteen Maya dialects, the learned investigator offers a useful and complete vocabulary extending over three hundred terms. Subjoined to these are short texts, conversations in Indian, historic and ethnographic notices from the conquest down to our times, and an elaborate bibliography. To judge from their lexical and grammatic character, the dialects have evolved, according to Stoll (pp. 173-175), in the following historic order from the parent language:—

1. *Huastec* forms the most archaic group, now separated from all the others by its northern location.

2. *Maya*, with its subdialects of Peten and Lacandon.

The following groups (3-6) have detached themselves from the Maya of Yucatan, and their forms are of a much less archaic type:—

3. *Tzentäl* group, embracing Chontal of Tabasco, Tzentäl proper, Tzotzil, Chañabal, Chol,—all in southern Mexico; Mopan in northern Guatemala.

4. *Poconchi* group, embracing Qu'ekchi, Poconchi, Pocomam, Chorti, in central and eastern Guatemala.

5. *Qu'iché* group, comprehending Qu'iché, Uspantec (dialect discovered by Stoll), Cakchiquel (the dialect studied more especially by the author), Tz'utujil,—all in south-western Guatemala.

6. *Mam* group, comprehending Ixil, Mam, Aguacatec, in the western sections of the republic.

The third group constitutes a much younger branch of the Maya of Yucatan than the fourth, fifth, and sixth groups.

The Cakchiquel language is a Maya dialect, spoken on the Upper and Middle Motagua River, and around Guatemala, the capital of the republic of the same name. It was therefore called also 'lengua metropolitana' and 'lengua guatemalteca.' By request of the American philosophical society of Philadelphia, Dr. Brinton has just translated and published in its proceedings, and also in a handy, separate edition quoted above, a Spanish grammar of that language, dated 1692, and composed by an unknown author. To render the exposition of the language, which is extremely harsh of pro-

¹ Sinca is declared to be a Mixtec language by Alphonse L. Pinart.

nunciation, more complete, Brinton has added extracts from two manuscript grammars of his own library, — that of the Dominican Benito de Villacañas, who died in 1610; and that of Fray Estevan Torresano, composed shortly after 1753. Cakchiquel possesses a rich literature,

consisting of theological and some semi-historical works of native writers, of which but little has ever been printed. A map facing the titlepage points out the location of the principal tribes.

INTELLIGENCE FROM AMERICAN SCIENTIFIC STATIONS.

GOVERNMENT ORGANIZATIONS.

U. S. geological survey.

Publications.—Although advance copies of the third annual report of the survey were issued some time ago, it was incomplete as regards the illustrations. The complete report, bound, has now been received at the office, and will soon be distributed. —The fourth annual report has been issued, although it is not yet ready for distribution. It contains five hundred and five pages (i.—xxxii., 1–473), and is illustrated with eighty-five plates and fifteen figures. The report of the director presents a *résumé* of the operations of the survey for the fiscal year ending June 30, 1883; and the administrative reports following give a more detailed account of the work. The latter are by Messrs. Henry Gannett, Arnold Hague, G. K. Gilbert, C. E. Dutton, T. C. Chamberlin, R. D. Irving, S. F. Emmons, G. F. Becker, O. C. Marsh, C. A. White, C. D. Walcott, L. C. Johnson, L. F. Ward, Carl Barus, and Albert Williams, jun.

The accompanying papers are by Capt. C. E. Dutton, Mr. Joseph S. Curtis, Mr. Albert Williams, jun., Dr. C. A. White, and Mr. Israel C. Russell.

Capt. Dutton's paper is on Hawaiian volcanoes, and consists of thirteen chapters, covering a hundred and forty pages, in which the geography of the islands, and their volcanic phenomena, are described. The paper is illustrated with twenty-nine plates and three figures. The paper by Mr. Joseph S. Curtis is entitled "Abstract of a report on the mining geology of the Eureka district, Nevada." It occupies twenty-eight pages. A general outline of the district is given. The structure of 'Prospect Mountain' and of Ruby Hill are detailed; and the occurrence and source of the ore, and the future prospect of Ruby Hill, are considered. Three plates present a horizontal section and two vertical cross-sections. Mr. Albert Williams, in fifteen pages, treats of popular fallacies regarding precious-metal ore-deposits. 'A review of the fossil Ostreidae of North America, and a comparison of the fossil with the living forms,' by Dr. Charles A. White, follows Mr. Williams's paper. There are two appendices to Dr. White's paper: viz., 'North-American tertiary Ostreidae,' by Professor Angelo Heilprin; and 'A sketch of the life-history of the oyster,' by John A. Ryder. The whole paper, including the plate explanations, occupies a hundred and fifty-two pages, in which there are forty-nine full-page plates. 'A geological reconnaissance in southern Oregon,' by Israel C. Russell, a paper of thirty pages,

with three plates and ten figures, and the index of nine pages, complete the volume.

Bulletin No. 3, 'On the fossil faunas of the upper Devonian along the meridian of 76° 30' from Tompkins county, N.Y., to Bradford county, Penn.,' by Henry S. Williams, was issued in May. It contains thirty-six pages, four of which are devoted to the index, and is the first of a series of articles on the comparative paleontology of the Devonian and carboniferous faunas. The price of this bulletin is five cents.

Bulletin No. 4, 'On mesozoic fossils,' by C. A. White, is all in type, and will soon be issued. The total number of pages, including the explanations of plates, is a hundred and twenty-four. There are three papers, as follows: "Description of certain aberrant forms of the Chamidae from the cretaceous rocks of Texas;" "On a small collection of mesozoic fossils collected in Alaska by Mr. W. H. Dall;" and "On the nautiloid genus *Enclimatoceras* Hyatt, and a description of the type species." There are nine woodcut plates.

Bulletin No. 5 is by Mr. Henry Gannett, chief geographer of the survey, and is almost ready to be issued. It contains three hundred and twenty-six pages, and is called 'A dictionary of altitudes in the United States.' Mr. Gannett began the compilation of measurements of altitudes when connected with the Geological and geographical survey of the territories; and three different editions of the results were published by that organization, the last bearing the date of 1877. They related principally to the country west of the Mississippi, while the present work embraces the whole country. The elevations are arranged alphabetically under the states and territories.

Bulletin No. 6, 'Elevations in Canada,' by J. W. Spencer, is in press, and supplements bulletin No. 5.

Bulletin No. 7 is also being rapidly put into type. It is entitled "Mapoteca geologica Americana: a catalogue of geological maps of America (north and south), 1752–1881, in geographic and chronologic order," by Jules Marcou and John Belknap Marcou. This catalogue is modelled on 'Mapoteca Colombiana,' by Uricoechea of Bogota, which was published in London in 1860, and is now out of print, and rare. Besides a list of some thirty numbers relating to maps on the geology of America, in Cotta's 'Geognostische karten unseres jahrhunderts,' published at Freiberg in 1850, the only list of geological maps of America is the 'List of general geological maps relating to North America,' in the 'Geology of North America,'